European Commission

Technology initiative for disabled and elderly people

Bridge phase–synopses

December 1994

Directorate General XIII
Telecommunications, Information Market and Exploitation of Research
Technological developments relating to telematics applications (networks and services)

TECHNOLOGY INITIATIVE FOR

DISABLED AND ELDERLY PEOPLE

Bridge phase synopses

December 1994

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INDEX BY PROJECT NUMBER

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LEGEND

EC Member States		Other countries	
A	Austria	CH	Switzerland
B	Belgium	EST	Estonia
D	Germany	FL	Liechtenstein
DK	Denmark	H	Hungary
E	Spain	IS	Iceland
F	France	LITH	Lithuania
GR	Greece	N	Norway
I	Italy	Rus	Russia
IRL	Ireland	SI	Slovenia
L	Luxembourg	SL	Slovakia
NL	The Netherlands		
P	Portugal		
S	Sweden		
SF	Finland		
UK	United Kingdom		

Role		Type	
C	Contractor	I	Industry
P	Partner	R	Research institute
A	Associate partner	U	University
S	Subcontractor	O	Others

INTRODUCTION

This booklet provides synopses of 55 projects funded under the TIDE (Technology initiatives for disabled and elderly people) programme of the European Union during its Bridge phase (1993-97).

OBJECTIVES AND SCOPE

The overall idea behind TIDE throughout its various phases is the promotion of research and technological development to meet social and industrial goals. From the industrial perspective, TIDE's goal is to improve the European industry and market in products and services that meet the needs of older and disabled persons. From the social perspective, TIDE aims to develop new technological tools and applications for people with disabilities and older people, to enable them to live autonomously and participate more fully in the social and economic life of the Community.

In its Bridge phase, TIDE is specifically aimed at stimulating a single market in assistive technology in Europe to facilitate the socioeconomic integration of older and disabled persons.

For the purposes of TIDE, assistive technology (AT) is defined as:

Technology which can help compensate for functional limitation, facilitate independent living and which can enable disabled and older people to realize their potential.

A broad range of basic technologies underpin assistive technology applications – amongst the most important in the context of TIDE are information, communication and control technologies. Technology here refers to both devices and services.

BACKGROUND

The potential of technologies to support independent living amongst older and disabled persons has only begun to be adequately realized. Exploitation of this potential will have important consequences for the quality of life of older and disabled persons, the market for AT products and services and for possible reductions in health and care budgets.

A major demographic change is taking shape in Europe. There is a significant growth in the absolute and relative number of older people in all Member States such that by the year 2020 it is estimated that one in four of the European population will be over 60 years of age. Of

particular note however, is the rapid increase in the numbers of very old people (80 years and over) whose demands on societal resources, particularly social and health-care services, increase with advanced age. The demographic profile in relation to disabled persons is also undergoing change due to improvements in health-care and medical practice. It is estimated that today there are approximately 80 million people in the EU who experience some difficulty at work or in everyday life associated with disability or the effects of ageing. In this context, the widespread desire of older and disabled persons to maintain autonomy is particularly significant – giving rise as it does to demands for a wide range of products and services which can assist the maintenance of daily functioning, which can compensate for impairment and can help older and disabled persons to realize their potential. Responding in an adequate manner to the needs arising presents a number of significant challenges to society.

These challenges, however, are paralleled by a number of possible opportunities which, if seized, will have both social and economic benefits for Europe. Older persons represent an important social and cultural resource which society has undervalued and underused. They also represent an important economic resource. The growth in the population of older Europeans, many of whom have considerable spending power, will give rise to significant market opportunities for products and services which address their needs (particularly their need for independence). Similarly, the market potential for products and services which address the needs of disabled persons is likely to improve, due *inter alia*, to increased awareness amongst disabled groups regarding the potential of such products to support independent living and to the growing assertiveness of disabled groups in representing their needs.

Developments in technology can play an increasingly important part in addressing the growing market opportunities presented by the needs of older and disabled persons. The early and efficient deployment of technologies in this sector can help European industry to compete with international competitors, many of whom have a favourable market position due to progressive legislation etc. In addition, a strong European assistive technology industry has the potential to create a large number of jobs, many of these in SMEs distributed throughout the Community.

There are a number of barriers however to the exploitation of this potential market. Characteristically the European market for AT is extremely fragmented with many small players involved. There is little coordination between these players and between the small and large companies involved. There is also inadequate information available on the true state of the market within and between Member States or on the service delivery systems which play a large part in these markets. TIDE, however, is helping to create a framework for cooperation and coordination between the parties involved – industries, researchers, users. This it does through supporting collaborative RTD projects involving partners from

different Member States. TIDE is also helping to develop the supportive infrastructure and market conditions which can help realize a single market. Important in this context are the TIDE horizontal activities which examine the AT market, factors involved in the uptake and use of AT, and initiatives which encourage standardization, regulation and rationalization. All these initiatives are aimed at tackling the fragmentation of the market and at contributing to a single market in AT in Europe.

TIDE – PAST, PRESENT AND FUTURE

In response to the challenges outlined above, the TIDE programme was initiated in 1991 with a pilot action (budget ECU 18 million) which involved 21 technology development projects (see TIDE pilot action synopses, March 1993). A major study of assistive technology in Europe, the HEART study, followed. HEART surveyed, analysed and assessed the critical factors influencing the market for AT in Europe (e.g. standards, legislation, training, etc.). This was followed by a Bridge phase where the 55 projects in this publication were funded (budget ECU 42 million). The TIDE Bridge phase will run to the end of 1997.

The Bridge phase will be followed by a further phase (initial budget ECU 65 million) where the TIDE initiative is included in the main R&D plan of the European Union 1994-98 – the so-called fourth framework programme, as a sector of the telematic applications programme. It is expected that new project start-ups under TIDE will commence early in 1996.

In this latest phase of TIDE, the scope of the work has been broadened to include a line dealing with information and communication technologies (ICT) in support of services for independent living.[1] Proposals will be invited in two main areas – one focuses on access to technologies and services to support independent living, the second focuses on technologies which compensate for functional limitations.

The first area encourages the development and access to a wide range of products and services which can support autonomy and help improve the quality of life of disabled and older persons. In a complementary manner, the second area aims to develop special devices and services for disabled and older persons which can compensate for functional limitations and so can help them to integrate more fully into society. In addition, a number of horizontal activities will be supported which aim to enhance the impact of RTD on the quality of life of disabled and older persons (e.g. studies of uptake and use of technologies) and on European industry and markets (e.g. market studies).

[1] European Commission (1994), 'Towards a programme of work for telematics for the integration of disabled and elderly people in the fourth framework programme', DG XIII, September 1994.

TIDE, in its new workplan, encourages and supports the 'design for all' principle and research into its broader application. The 'design for all' principle aims to encourage the design of products and services in such a way that they become accessible to and usable by as large a grouping of users as feasible including disabled and elderly persons. When using the 'design for all' approach, designers have in mind a 'broader average' or wider range when creating products and services and do not simply take as an implicit reference the needs of the stereotypical well-educated, healthy, young person. The approach can thus increase the market potential of products and services so designed.

In sum, the launching of TIDE has achieved significant success in stimulating communication across the Member States and across the different sector actors. Response to the programmes of work published showed a willingness amongst the sector actors to cooperate on a socially and economically worthwhile technology development agenda.

There is still a long way to go to the successful exploitation of a single market. TIDE, however, has started a momentum which is gathering increasing impetus. The initiative is likely to lead to a greater market share for European companies and a greater capacity of the market to respond to user needs by creating socially desirable goods and services which have significant consequences for independent living and community care budgets. TIDE thus represents a major EU-wide initiative with important potential social and economic implications.

RESPONSE TO THE TIDE BRIDGE PHASE

The 55 Bridge phase projects included in this publication were based on a programme of work outlined in the 'TIDE 1993-94 workplan'. This workplan, developed in consultation with a wide range of sector actors, drew up a plan of work for coordinated European action in the field. As a result of this consultation a number of RTD tasks in the AT field were defined against which proposers could bid. Proposals were also invited for non-RTD activity also known as horizontal activities, e.g. market studies, studies into economic, legislative factors, etc. which are implicated in the development, uptake and use of assistive technologies.

The number and value of the proposals received significantly exceeded the funds available for the Bridge phase. A total of 293 proposals were received, to a total value of ECU 455 million and total requested funding of ECU 270 million. Participants in the proposals came from 22 countries.

As a result of an independent evaluation process carried out by experts from the sectors, 55 projects were chosen for funding. The evaluation team commented on the generally high quality of the proposals received. Proposals received covered all main aspects of the workplan. The consortia which made proposals displayed a good mixture of industry, universities, research establishments, user organizations and other non-profit-making organizations. SMEs were particularly well represented in the proposals received; the proposals also included a number of major companies, for example consumer electronics, telecommunications and transport companies.

BRIDGE PHASE WORKPLAN CONCEPTS – FRAMEWORK FOR 55 PROJECTS

A number of key principles underlying the TIDE programme were spelled out in the workplan for the Bridge phase projects. Projects submitted for funding were required to demonstrate their compliance with these principles. Thus it was required that development of AT under TIDE would be geared towards the market and towards developing prototype products and services with good industrial potential rather than to the production of research reports (market-oriented principle). Developments were to focus on innovation and adaptation of new technologies to satisfy the needs of elderly and disabled persons and, in addition, to endeavour to create international standards (technology adaptation and innovation principle). TIDE projects were further required to address the multidisciplinary nature of technological development, uptake and use (multidisciplinary approach principle). Of prime importance was the requirement for projects to study user requirements and incorporate findings in their work (user-focused principle). Finally, it was required that developments were evaluated by users or consumers (technology verification principle).

As a result of widespread consultation with the sector actors described above, the following areas or lines of work were defined:

Line 1. Access to communications and information technology and support for interpersonal communication

Access to and interaction with multimedia environments
Technology to facilitate personal communication
Innovative services and applications

Line 2. Control technologies

User and system interfaces for control
Robotics
Mobility and transport

Line 3. Restoration and enhancement of function

Functional assessment and training
IT for individualized plans for rehabilitation and maintenance within the Community
Technology for rehabilitation and maintenance of motor function
Substitution devices for motor function

Line 4. Integrated systems technology

Smart environments and systems
Orientation and navigation systems
Education and training
Working environments for disabled and elderly people

Line H. Two roles were defined for the horizontal activities:

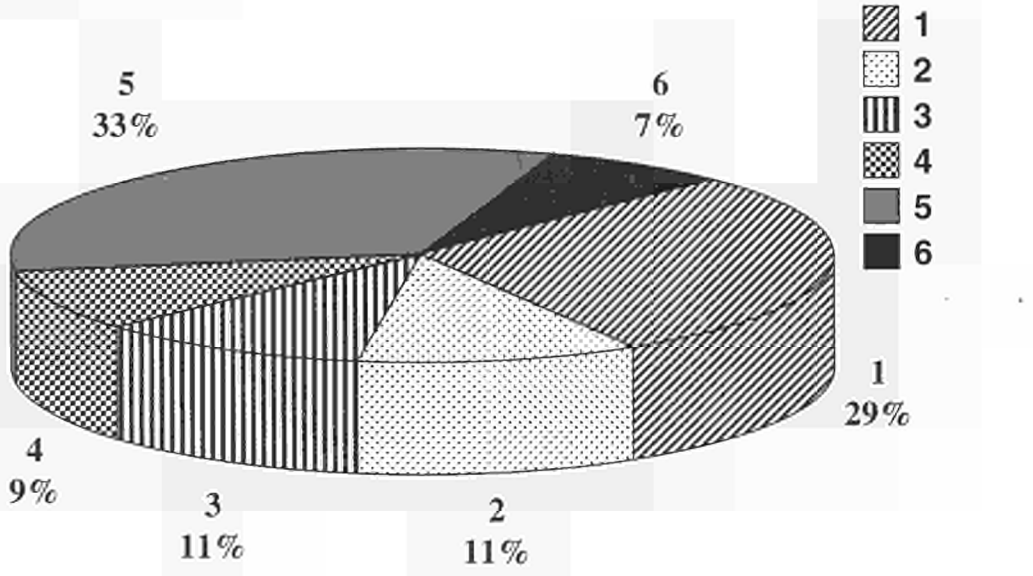
(i) adding value to the technology projects work by harmonizing, organizing and collating results; and

(ii) exploratory, preparatory and stimulatory actions in support of the TIDE objective of stimulating the creation of a single market in AT in Europe.

PROJECT GROUPINGS

The Bridge phase projects have been grouped according to six application domains as shown in Table 1. These domain areas are further broken down into application areas which provide a useful classification of the projects and which will allow the reader to identify projects which deal with similar content. The table cross-classifies projects by the major types of disability addressed and where projects specifically deal with a service or the issue of ageing, this is also indicated. Of course the grouping of multifaceted projects into specific categories is of necessity somewhat arbitrary, the present scheme however is considered to be of heuristic and practical value.

The pie chart below shows that 33% of the projects funded in the Bridge phase fall into the application domain – restoration and enhancement of function which cover the more traditional areas of rehabilitation technology. The second largest group (29%) deals with the facilitation of access to technology and related services for older and disabled persons. Projects supporting technologies in the increasingly important domain – life at home and remote care constituted 11% of funded projects; a similar percentage of projects address mobility and transport concerns. The remaining 15% of projects are divided between those which address technologies for control and manipulation (9%) and projects which deal with user and market issues (7%).



1. Access to technology and related services
2. Life at home and remote care
3. Mobility and transport
4. Control and manipulation
5. Restoration and enhancement of function
6. User and market issues

TABLE 1. TIDE BRIDGE PHASE PROJECT GROUPING

APPLICATION DOMAINS/ APPLICATION AREAS	Project Acronym	Project Number	DISABILITIES / IMPAIRMENTS							
			Mobility	Vision	Hearing	Speech	Language	Cognition	Ageing	Service
1. ACCESS TO TECHNOLOGY AND RELATED SERVICES										
EDUCATIONAL AND	MATHS	1033		x						
VOCATIONAL	WANTED	1088						x		
SUPPORT	VICAID	1199						x		
TELEWORKING	HYPIT	1175	x	x	x	x	x		x	x
	COMBAT	1135	x	x	x	x	x		x	x
	AVISE	1251*	x	x	x	x		x	x	x
TELECOMMUNICATION	SPLIT	1215			x				x	
AND	IBIDEM	1038			x				x	
TELEINFORMATION	INSIDE	1150	x						x	x
	MART	1113*								
	HARMONY	1226*		x					x	x
COMPUTER	ACCESS	1001	x	x		x	x	x	x	
ENVIRONMENTS	ETRE	1021	x	x						
AND PUBLIC	TACIS	1229	x	x						
TERMINALS	LAMP	1249	x		x	x			x	
	SATURN	1040	x					x	x	x
2. LIFE AT HOME AND REMOTE CARE										
HOME SYSTEMS	DEFIE	1221		x	x	x				x
	HS-ADEPT	1102	x	x		x				x
	HEPHAISTOS	1004	x	x						x
LOCATION	SCALP	1002	x					x		
AND REMOTE	CASA	1068		x						x
SUPPORT	HELP-ME	1105		x	x					
	IMSAS	1078	x						x	x
	AURORA	1027	x							x
3. MOBILITY AND TRANSPORT										
ADVANCED	OMNI	1097	x						x	
WHEELCHAIRS	SENARIO	1045	x						x	
ORIENTATION	ASMONC	1228	x	x					x	
	OPEN	1182	x	x						
	MOBIC	1148	x	x					x	
INFORMATION ON	TURTLE	1194	x							x
PUBLIC TRANSPORT									x	

* Horizontal activity.

TABLE 1 CONTINUED

APPLICATION DOMAINS/ APPLICATION AREAS	Project Acronym	Project Number	DISABILITIES / IMPAIRMENTS							
			Mobility	Vision	Hearing	Speech	Language	Cognition	Ageing	Service
4. CONTROL AND MANIPULATION										
INTEGRATED CONTROLS	FOCUS	1092	x						x	
ROBOTICS SYSTEMS	MOVAID	1270	x						x	
	EPI-RAID	1024	x							
5. RESTORATION AND ENHANCEMENT OF FUNCTION										
TRAINING OF NATURAL SPEECH OR SIGNING	HARP	1060			x	x	x			
	DICTUM	1189			x	x	x			
SYNTHETIC SPEECH DEVICES	VAESS	1174				x	x			
	ALADIN	1035				x				
TOOLS FOR SIGN LANGUAGE	SIGNBASE	1282			x	x	x			
	ESLI	1242			x	x	x			
	SIGN-PS	1202			x	x	x			
AUGMENTATIVE COMMUNICATION SOLUTIONS	COMSPEC	1169	x			x	x	x	x	x
HEARING ENHANCEMENT	OSCAR	1217				x	x		x	
	SICONA	1090				x	x		x	
	HEARDIP	1094				x	x		x	
	PROSOUND	1230				x	x		x	
VISION ENHANCEMENT	POVES	1211		x						
MOTOR REHABILITATION	AMBLE	1064	x						x	
FUNCTIONAL ELECTRICAL STIMULATION	EPCES	1083	x							
	MULOS	1057	x						x	
	FESTIVAL	1250	x						x	
ABILITIES TRAINING	VETIR	1216	x							x
6. USER AND MARKET ISSUES										
	USER	1062*	x	x	x	x	x	x	x	x
	MARTEL	1058*							x	x
	TT-RT-SMEs	1144*	x						x	
	CERTAIN	1264*	x	x	x	x	x	x	x	x

* Horizontal activity.

1. ACCESS TO TECHNOLOGY AND RELATED SERVICES

The White Paper on growth, competitiveness and employment (EC 1993[2]) points to the opportunities provided by the information society. It also warns of possible dangers of a two tier society and of the exclusion of persons and groups who because of inadequate skills etc. are unable to benefit from the information age. Equality of access for all citizens to information and communication technologies (ICT) – is important in its own right but of ever-greater significance since ICT is increasingly a means whereby citizens access a wide range of societal resources, for example employment, training, information, social contact, etc. Being competent in the use of ICT is no longer an option, but rather a necessity for living in the information society.

The TIDE projects below aim to promote greater access to the benefits of the information age, particularly for older and disabled persons; however, in so doing many contribute to increasing accessibility for all citizens.

Access to IT&T and associated technologies and services can be hindered or denied for many reasons – technical (e.g. poor design of systems, manual and cognitive problems with interfaces); economic (e.g. cost of equipment, tarrifing structures); social and cultural (e.g. lack of awareness, inadequate provision of adaptive devices). Disabled and older persons often have additional barriers to the use of technology, for example poor dexterity can make using a keypad or dialling a telephone number difficult; the advantages offered by GUI (graphic user interfaces), which are now a *de facto* industrial standard, pose particular problems for blind users; persons with cognitive impairments and older persons unfamiliar with computer screens who can find the demands of using automated teller machines, remembering personal identification numbers, slotting cards into unforgiving slots, etc., particularly troublesome.

Broadly speaking, there are two aspects to increasing accessibility – the development and adaptation (design, construction, etc.) of technologies, systems and services which address the specific needs of disabled and older persons and secondly, the 'design for all approach' which involves the incorporation of the needs of older and disabled persons into products and services with a view to increasing their accessibility to a larger range of people.

The projects below aim to facilitate access to a wide range of technologies and services towards a variety of ends. The projects aimed at providing educational and vocational support, address, for example, the needs of blind persons to have access to mathematical expres-

[2] European Commission (1993), 'Growth, competitiveness, employment – The challenges and ways forward into the 21st century', EC White Paper, COM(93) 700, Brussels.

sions – an important element in school and work life (MATHS); while WANTED and VICAID aim to improve the employment performance and economic competitiveness of persons with an intellectual impairment by supporting them in carrying out work tasks in a workshop setting. Multimedia and laptop computers are used to guide workers through work sequences, allowing, *inter alia*, for greater flexibility in changing work routines and reducing trainer input. All three projects on teleworking – HYPIT, COMBAT and AVISE – aim to increase access to teleworking opportunities for people with disabilities and to facilitate the technical and social infrastructure involved. The projects in the telecommunication and teleinformation group are concerned with the development of products and services which can increase access of persons with hearing disabilities (SPLIT, IBIDEM); visual impairment (HARMONY) and older persons (INSIDE) to the benefits of the information age. MART looks at the requirements for telematic applications (e.g. alarms, remote care, teleshopping, etc.) and related policy considerations. The final set of projects dealing with computer environments and public terminals, facilitates access through improving or developing interfaces, input/output devices, etc. which serve the needs of older persons and persons with different disabilities (blind persons, persons with speech-motor and language-cognitive disabilities and severe mobility impaired persons). While four of these projects address the special needs market, the final project, SATURN, has potentially wider applicability since it aims to develop user-friendly prototype smart cards and terminals and influence standards for cards and terminals so that they are more user-friendly and accommodate the needs of all users but particularly the needs of people with motor disabilities and older people.

EDUCATIONAL AND VOCATIONAL SUPPORT

1033 MATHS	Mathematical access for technology and science for visually disabled users
1088 WANTED	New forms of working plans and test plans for intellectually disabled people
1199 VICAID	Vocational integration through computer assistance for intellectually disabled people

TELEWORKING

1175 HYPIT	Human resources and management product interface
1135 COMBAT	Corporate marketing to overcome the barriers facing disabled teleworkers
1251 AVISE	Travail à distance: telework and people with disabilities

TELECOMMUNICATION AND TELEINFORMATION

1215 SPLIT	Multilingual speech to face-movements transformation for use as a training system in lip-reading and language acquisition and as a basis for a new telecommunication service
1038 IBIDEM	Image-based interactive device for effective communication
1150 INSIDE	An integrated netsystem for infoservice to disabled and elderly people
1113 MART	Definition of an environment to maximize the market for telecommunications-based rehabilitation technology
1226 HARMONY	Horizontal action for the harmonization of accessible structured documents

COMPUTER ENVIRONMENTS AND PUBLIC TERMINALS

1001 ACCESS	Development platform for unified access to enabling environments
1021 ETRE	Interactive pseudo-graphics Braille printer with erase capability
1229 TACIS	Tactile acoustic computer interaction system
1249 LAMP	Laser mouse
1040 SATURN	Smart card and terminal usability requirements and needs

2. LIFE AT HOME AND REMOTE CARE

The home is becoming an increasingly important location for activities in the information society with the introduction of technologies for housekeeping, work, education, leisure, care and cure, etc. For older people and people with disabilities, many of whom have limited mobility, the home has always been of particular importance. This importance is increasing with the widespread move towards community as opposed to institutional care throughout the Member States.

Technological developments can play a significant role in supporting older persons and persons with disabilities in their desire to remain in their own homes and live autonomously. Applications are developing which can assist older and disabled persons in carrying out activities of daily living, which can help them control their environment, manage their households and which allow them to summon help in emergencies. In addition, older and disabled persons can access many social and medical services from the home and have care delivered remotely to the home (e.g. active and passive monitoring, teleconsultation and support, etc.).

With the assistance of AT an increasing number of older persons and people with disabilities can satisfy their desire to remain in their communities rather than opting for institutional care. The decline of the social infrastructure for informal care (e.g. increased participation of women in the labour force, decline of the nuclear family, increase in alternative lifestyles etc.) along with the cost containment climate in the health and social services is adding impetus to the development and uptake of supportive technologies.

The projects below fall into two main groups. The first contributes towards the development of integrated systems and flexible interfaces, some with multimedia elements, remote control features, etc. These facilitate older people and people with disabilities to live independently by providing access to the benefits of home system technologies, for example the use of a range of home appliances, environmental control devices, access to services from the home (DEFIE, HS-ADEPT, HEPHAISTOS).

The main focus of the second grouping is the provision of security and remote support, i.e. alarm systems with active and passive features, access to remote services and biomonitoring. The IMSAS project is concerned with the provision of security in a rural context. This is a major issue, as fears regarding security are often a precursor to institutionalization, particularly in the rural context. The SCALP project is developing a system for monitoring the location of patients and staff in institutional settings which can prioritize the urgency of calls. The system also has relevance for the growing numbers suffering from different forms

of dementia, who wander and have difficulties in finding their way. The additional freedom of movement afforded by such systems within bounded environments will be evaluated within a broad context which includes social acceptability concerns.

In general, these systems can support greater autonomy for older persons and people with disabilities and reduce the demands on formal and informal carers.

HOME SYSTEMS

1221 DEFIE	Disabled and elderly people flexible integrated environment
1102 HS-ADEPT	Home systems – access of disabled and elderly people to this technology
1004 HEPHAISTOS	Home environment private help assistant for the elderly and disabled

LOCATION AND REMOTE SUPPORT

1002 SCALP	Safety call and location of elderly and disabled people
1068 CASA	Concept of automation and services for people with special needs
1105 HELP-ME	Handicapped elderly lonely person's multimedia equipment
1078 IMSAS	Integrated multimedia social alarm system
1027 AURORA	A friendly multifunctional interface for disabled and elderly security management

3. MOBILITY AND TRANSPORT

The ability to move around plays a critical role in the maintenance of independence and quality of life. Mobility is important if we are to satisfy our daily needs, have access to work and recreational activities. Mobility difficulties are not confined to people in wheelchairs but include non-wheelchair users who suffer from impaired dexterity, frailty and cognitive impairments. Many of these difficulties relate to specific medical conditions (e.g. arthritis) or to general and progressive loss of functional ability which can accompany the ageing process.

Severe physical disability is generally regarded as a significant barrier to mobility and the application of advanced technologies including intelligence to wheelchairs – which involves obstacle avoidance (OMNI), route finding (SENARIO), etc. – is undergoing continuous development. Less well recognized but of equal significance are barriers to mobility and inhibitors to making a journey posed by lack of information regarding routeing, destination, time, and delays (e.g. TURTLE, MOBIC); difficulties in relation to wayfinding, orientation and navigation (ASMONC, OPEN, MOBIC) and difficulties relating to personal security, i.e. knowing one's location, being able to summon help and reassurance if necessary (e.g. ASMONC, MOBIC).

This grouping of projects addresses these issues. The projects variously address the mobility needs of people with severe disabilities, the needs of blind and partially sighted persons, those with cognitive impairments and persons with dementia. Many of the projects offer potential benefits to the general population, particularly those – whom we know from research to be a significant number – who experience difficulty orientating themselves in unfamiliar environments, have poor wayfinding abilities or map-reading skills and the growing number of people of all ages and capabilities concerned for their security in the environment. Many of the developments underway in these projects are likely to have more general marketability in time.

Some of the projects in this grouping involve the adaptation of advanced technologies developed in other contexts (e.g. positioning systems – MOBIC); others involve the integration of many different technologies (e.g. sensors, IT&T, control devices – ASMONC), features and functions. Of note, also, is the fact that some of the projects dealing with transportation involve a constituency of critical actors (e.g. service providers, transportation providers, public administrations) interested in applying and evaluating the emerging technologies, thus facilitating the probability of successful uptake and use of these developments.

ADVANCED WHEELCHAIRS

1097 OMNI	Office wheelchair with high manoeuvrability and navigational intelligence for people with severe handicaps
1045 SENARIO	Sensor-aided intelligent wheelchair navigation

ORIENTATION

1228 ASMONC	Autonomous system for mobility, orientation, navigation and communication
1182 OPEN	Orientation by personal electronic navigation
1148 MOBIC	Mobility of blind and elderly people interacting with computers

INFORMATION ON PUBLIC TRANSPORTATION

1194 TURTLE	Transport utilizing rehabilitation technologies leads to economic efficiency

4. CONTROL AND MANIPULATION

Physical dexterity is an important aspect of day-to-day functioning. Many older people and people with disabilities, however, have difficulty manipulating objects. These difficulties range from being so severe that a person has poor control over limb movements or experiences a high level of involuntary movement, through to people who have a poor grasp or find it difficult to push dialling buttons. The impact of poor physical dexterity can have important implications for an individual's ability to gain employment, service their basic day-to-day needs and access leisure and other activities.

The opportunities offered by home systems technologies can have limited applicability for older and disabled persons who have severe physical disabilities. In such cases, specialized input devices are required which tend to be expensive since they cater for small and uneconomic market segments. However, modular interchangeable parts with common interfaces which can be used in the construction or manufacture of a wide variety of technical aids and assistive devices can lower unit costs considerably. Earlier TIDE projects developed systems which allowed the control of a range of environmental and domestic appliances from stationary and mobile positions. Bridge phase projects aim to extend the functionality associated with these developments, increase reliability and safety aspects, and engage in concerted actions towards standardization (FOCUS).

For persons with severe physical disabilities, developments in robotics offer increasing possibilities to extend their level of functioning and hence their independence and autonomy. These developments can be expensive but costs involved must be weighed against societal costs associated with formal and informal care, lack of employment opportunities, waste of human resources and broader equality and quality of life considerations. Two projects are developing robotic systems – the first, a modular and mobile system, assists the user to perform a range of activities of daily living, for example food preparation (MOVAID); the second undertakes the manipulative tasks required to perform a computer-based vocational or leisure activity (EPI-RAID).

INTEGRATED CONTROLS

1092 FOCUS	Focus on the central position of users in integrated systems

ROBOTIC SYSTEMS

1270 MOVAID	Mobility and activity assistance systems for the disabled
1024 EPI-RAID	Evaluation of the prototype and improvements to RAID robot workstation

5. RESTORATION AND ENHANCEMENT OF FUNCTION

Projects in this grouping cover the application of information and micro-electronic technology, etc. to the restoration and enhancement of function for people experiencing motor, communication and cognitive impairment. A wide range of projects falls within this domain and includes systems which assess dysfunction, and which support rehabilitation, training, restoration and maintenance of function. Included also are systems which improve prosthetic and orthotic devices and systems which support design, manufacture and assembly of AT.

Projects cover technical aids for speech and sign language training, synthetic speech production, hearing and vision enhancement, tools for augmentative communication and sign language and finally motor rehabilitation and training.

The importance of devices which aim to restore function is well recognized. There is a growing demand, however, for systems which can be self-maintained, are reliable, easy and safe to use, discreet, mobile and aesthetically pleasing, etc.

Due to the variety and specificity of user needs, developments in this group do not often benefit from economies of scale. Developments tend to occur in very small companies; profit margins tend to be low leading to a lack of funds to re-invest in R&D. In addition, there is often a problem in transferring technologies from research laboratories to the market. Present TIDE initiatives, which involve collaboration of different sector actors from a number of European countries and the sharing of scarce R&D resources, are a vital precursor to achieving the economies of scale and establishing a single market which can bring affordable technologies to a wider range of older and disabled persons.

TRAINING OF NATURAL SPEECH OR SIGNING

1060 HARP	An autonomous speech rehabilitation system for hearing-impaired people
1189 DICTUM	Development of an interactive communication training system using interactive media

SYNTHETIC SPEECH DEVICES

1174 VAESS	Voices, attitudes and emotions in speech synthesis
1035 ALADIN	Advanced language device for interaction

TOOLS FOR SIGN LANGUAGE

1282 SIGNBASE	Development of multimedia signed language databases
1242 ESLI	European sign language interactive
1202 SIGN-PS	The development of a printing system for sign languages

AUGMENTATIVE COMMUNICATION SOLUTIONS

1169 COMSPEC	Modular software for augmentative communication aids and access systems

HEARING ENHANCEMENT

1217 OSCAR	Optimal speech communication assistance for residual abilities
1090 SICONA	Signal conditioning communication aids for the hearing-impaired
1094 HEARDIP	Hearing aid research with digital intelligent processing
1230 PROSOUND	Profound deaf people rehabilitation with new speech/sound processing systems

VISION ENHANCEMENT

1211 POVES	Portable optoelectronic vision enhancement system for visually impaired persons

MOTOR REHABILITATION

1064 AMBLE	Gait assessment manumitted from the biomechanics laboratory environment

FUNCTIONAL ELECTRICAL STIMULATION

1083 EPCES	EMG signals from paretic muscles controlling electrical stimulation of the same muscle
1057 MULOS	Motorized upper limb orthotic systems
1250 FESTIVAL	Functional electrical stimulation to improve value and lifestyle

ABILITIES TRAINING

1216 VETIR	Virtual environment technologies in rehabilitation: a new approach to motor dexterity disabilities

6. USER AND MARKET ISSUES

It is now generally recognized that technology development, application, take-up and use are embedded not only in a technical but also in an important economic, social and cultural context. For example, hearing aids which may be very sophisticated technically and can improve hearing considerably may be rejected if too large and conspicuous or if the person with the hearing disability is embedded in sign language culture and prefers to communicate using sign language.

Knowledge related to economic, social and cultural factors and how they operate is essential to the development and effective stimulation of a single market in assistive technology in Europe. This knowledge, in turn, will help to make available technical aids and services of good quality, at affordable prices.

Accordingly, TIDE supports a group of 'horizontal activities' which aim to understand and develop the broader infrastructure for stimulating a single market in AT in Europe. Included in this endeavour is the collating of existing and emerging knowledge regarding user needs and requirements, functional impairments and technological solutions. The aim is to make this information available to the actors in the AT area – service providers, manufacturers, RTD facilities, users and carers. In this context, the USER project is gathering prescriptive information, methods and tools in relation to usability requirements which can be used by sector actors throughout the different stages of the AT development process – the aim being to improve the usability and marketability of products.

The issue of cost-benefit is of critical importance in stimulating and maintaining the development and dissemination of AT, particularly in the cost containment climate prevalent within the health and social services across Europe. CERTAIN is developing a methodology which can be used to evaluate the cost-benefit and cost-effectiveness of AT. The project will examine cost-benefits under various market conditions and situations of deployment of AT. The methodology so developed will be evaluated during the course of the project.

As part of its horizontal activities, TIDE is concerned to encourage innovation, awareness raising, information dissemination and technology transfer activities related to AT and to accelerate the development of technical norms and standards. The MARTEL and TT-RT-SMEs projects address technology transfer and awareness raising in relation to AT, the former particularly in relation to technologies and services for older people.

1062 USER	Usability requirements elaboration for rehabilitation technology
1058 MARTEL	Horizontal action on market awareness of technology for the care of older people
1144 TT-RT-SMEs	Technology transfer in RT for SMEs
1264 CERTAIN	Cost-effective rehabilitation technology through appropriate indicators

PROJECT SYNOPSES

Development platform for unified access to enabling environments

Project 1001 – ACCESS

Keywords: unified user interfaces, communication aids for speech-motor and language-cognitive-impaired people, access to hypermedia for blind people

This project aims to develop innovative approaches to the construction of communication aids for speech-motor and language-cognitive-impaired people and a hypermedia application for blind people, in the framework of a unified user interface development platform.

Project description: The project will provide new technological solutions for developing user interfaces, facilitating unified access to computer-based applications for users with different characteristics, abilities and preferences. In addition, demonstrators of specific applications addressing some particular problems of interpersonal communication, and of access to information in a hypermedia environment, will be designed, implemented and evaluated.

The key assistive technology issue addressed is the need for new development methodologies to replace existing *ad hoc* solutions; these solutions have until now provided only specific aids or adaptations. The proposed approach will enable designers to deal with problems of rehabilitation and access to technology in a consistent, systematic and unified manner.

The innovative results of the project will be:

(a) software tools enabling the unified development of user-adapted interfaces;

(b) two demonstrator systems for interpersonal communication: one for speech-motor and one for language-cognitive-impaired users;

(c) a demonstrator system facilitating blind user access to a hypermedia application.

Technical approach: To achieve the above objectives, the project will carry out research and development activities leading to:

(i) A user interface development platform and software tools allowing the unified construction of interfaces, according to the particular user abilities, needs and preferences. This includes a method enabling application developers to utilize different technological platforms and to develop user interfaces without concern for low-level implementation details.

(ii) A methodology and tools for the development of interpersonal communication aids, according to the requirements of target user groups, including a module enabling the translation of symbols between different communication systems.

(iii) A methodology and tools for the development of hypermedia applications accessible by both sighted and blind people, including the development of new non-visual interaction methods and metaphors.

Impact and expected results: The demonstrators are of direct industrial interest, as they constitute significant improvements in their specific domains, extending the scope and range of computer-based applications for disabled people. The tools, which during the project will be used to construct user-adapted interfaces for the three demonstrators, will be made available by the consortium as 'public domain' software, to impact on future developments of applications and approaches to be used in the market.

Participants	Country	Role	Type
Consiglio Nazionale Ricerche (CNR)	I	C	R
Foundation of Research and Technology (FORTH)	GR	P	R
University of Athens (UOA)	GR	P	U
Royal National Institute for the Blind (RNIB)	UK	P	O
Seleco	I	P	I
MA Systems and Control (MA)	UK	P	I
Hereward College (HC)	UK	A	O
R&D Centre for Welfare and Health (NAWH)	SF	P	R
Technical Research Centre of Finland (VTT)	SF	P	R
Pikomed (PIKO)	SF	A	I

Starting date
1 January 1994

Planned duration
36 months

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Safety call and location of elderly and disabled people

Project 1002 – SCALP

Keywords: dementia, alarms, location

The SCALP project focuses on location problems of elderly people with dementia in an institutional/hospital environment.

Project description: Within an institutional, hospital environment, specific services are needed to provide alarms in emergency situations and to locate patients and staff when necessary. Information services are also required to maintain human contact and to give guidance to elderly people with dementia.

The SCALP integrated system, when compared to available or emerging processes and techniques, will include:

(a) the possibility of determining the degree of urgency of the alarm;

(b) the possibility of identifying the location of the person who needs help;

(c) the possibility of receiving calls as soon as a person enters a building.

Technical approach: Following the identification of requirements from different types of users, the SCALP technology will use an innovative communication architecture to address the needs of disabled or elderly people with dementia and their carers. How these requirements are met through the SCALP system will be validated by means of a demonstrator installed in an institutional care environment in Spain.

Impact and expected results: SCALP will be an active contributor in European efforts aimed at defining and standardizing new radio systems for elderly and disabled people to ensure a safe and user-friendly environment, while also ensuring the dignity and independence of the patient. The new features offered by the SCALP technology will enhance services for disabled and elderly people.

Participants	Country	Role	Type
Thomson CSF	F	C	I
Bioingenieria	E	P	I
University of Zaragoza	E	A	U
Fundesco	E	P	O
HUSAT	UK	P	R
CHC	E	P	O

Starting date
1 June 1994

Planned duration
24 months

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Home environment private help assistant for the elderly and disabled

Project 1004 – HEPHAISTOS

Keywords: remote-control unit, smart homes

The HEPHAISTOS project will develop a multi-modal remote-control unit giving elderly and disabled people access to electronic home devices.

Project description: The HEPHAISTOS project will develop a multi-modal remote-control unit giving elderly and disabled people, in particular, access to electronic home devices.

Nowadays, not only average users but also many elderly and disabled users are facing the situation of complicated and inconsistent user interfaces for brown and white goods, different remote controls, a lack of integration of the audio and video media and a lack of remote control of other home facilities.

Elderly or disabled people, in particular those with special needs, feel overloaded with the large number of available functions and the variety of ways to get access to them. Taking these problems into account, the main objective of the HEPHAISTOS project is to develop the user interface for an advanced remote control for a wide range of electronic home devices. The user interface for the HEPHAISTOS remote-control unit will be easy to use by means of a graphical user interface enhanced with speech in- and output and direct manipulation via touch screen.

Technical approach: The project consists of four phases and a cross running activity. The analysis phase will investigate the requirements of elderly and disabled people, technical requirements, feasible technical solutions, and related standards. In the design phase the communication software and the multi-modal user interface will be developed. The command unit with the multi-modal user interface and its connection to home devices will be simulated in the simulation phase and prototyped in the demonstrator phase.

The development of software and hardware components will follow an iterative approach of design and evaluation. As a cross running activity the evaluation of the user interface will be carried out by ergonomic experts and — most importantly — by users of the target groups.

Impact and expected results: The main result of the HEPHAISTOS project will be a prototype of the control unit demonstrating easy and consistent access to modern home electronic devices especially for elderly and disabled people via a multi-modal user interface of the remote control. More specifically, the following results will be achieved:

(i) A specification of the graphical user interface, the direct manipulation strategies and the speech in- and output handling.

(ii) The HEPHAISTOS simulator.

(iii) The HEPHAISTOS demonstrator.

(iv) Evaluation results from two user test sites (Stuttgart, Germany and Athens, Greece) ensuring the successful adaptation of the Hephaistos user interface to the remote control for the special needs of elderly and disabled people.

The application of the HEPHAISTOS concept by the industry could be a starting point to overcome the barrier experienced by elderly and disabled people to buying and using modern home technology. Furthermore, HEPHAISTOS facilitates the elderly and disabled to live independently and supports their participation in the social and economic activities of the community.

Participants	**Country**	**Role**	**Type**
Helgeco SA	GR	C	I
Thomson Consumer Electronics	F	P	I
Zeltron Spa	I	P	I
Vecsys	F	P	I
National Technical University of Athens	GR	A	U
Universidad Politecnica de Madrid – Grupo de Bioingeniería y Telemedicina	E	P	U
University of Stuttgart – Institut für Arbeitswissenschaft und Technologie-management (IAT)	D	P	U

Starting date
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Planned duration
24 months

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Interactive pseudo-graphics Braille printer with erase capability

Project 1021 – ETRE

Keywords: Braille printer, polynorbornene, I/O devices

Drawing device for blind persons, with erase capability.

Project description: The consortium is going to develop a drawing prototype system (using the Braille printer's method), that allows the printing and erasing of pseudo-graphics (using closer points than the standard Braille writing, and special paper), with an enhanced user interface communication composed of a digitizing tablet, a speech synthesizer and a Braille keyboard. The first users will be the students of the special schools for the blind.

Technical approach: The system will be based on a new material. This material allows printing as normal Braille printers do, and erasure with heat application. Our aim is to develop a drawing prototype system that can do pseudo-graphics (using closer dots than Braille dots) and erase them. The system will have a digitizing table (placed under the printed paper) as an input device, that will allow drawing on its surface, or on signal points of a drawn sheet (i.e. answers to questions about the drawing). In order to increase the simplicity and flexibility of the user-system communications, the system will contain a speech synthesizer and a Braille keyboard.

The project includes the development of three applications for the system. Due to the open architecture of the planned system (that will allow flexible use of its communication devices), writing future applications to perform special tasks using its resources, will be very easy and will be based on a defined commands library. These applications will run from a host computer, or from an included RAM card slot.

Impact and expected results: Nowadays, we can find an important number of products oriented towards use by the blind that can increase their quality of life, but many of these high technology products are not oriented towards the blind child at school. Schoolchildren will be the first users of this product, which will be an enormous interactive aid to the teaching of geography, drawing, geometrics, etc., thanks to the special teaching-oriented software applications that the ETRE project will include. On the other hand, thanks to its easy applications programmability, other markets will be opened in the future, by developing new applications oriented towards other fields.

The first aim of the project is to integrate all the existing technologies (printers, Braille keyboards, speech synthesizers, etc.) to achieve the drawing prototype described, with minor changes to them.

The consortium will work mainly on the development of a main board to control the whole system, a board to control all the user interfaces (speech synthesizer, Braille keyboard and digitizing table), the improvement of characteristics of the special paper, the mechanical design for the prototypes and the software development.

The outcomes of the project will be demonstrated on two functional prototypes and three software applications; a 'draw and print' application, an 'interactive teaching' application that will allow the teacher to control the systems from a host computer (thus controlling all the system resources to build self-designed lessons), and a 'real image' printing application that will allow conversion of real scanned images, extracting desired special features (grey scales, contours) to pseudo-graphics. We expect that our results will be very useful for the special schools for the blind, opening up for them new teaching methods for a very wide age range of students.

Participants	Country	Role	Type
Ciberveu SA	E	C	I
ONCE	E	A	O
Inserm	F	P	R
UPC	E	P	U
MIW	F	P	I
Thiel GmbH	D	P	I

Starting date
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Planned duration
29 months

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Evaluation of the prototype and improvements to RAID robot workstation

Project 1024 – EPI-RAID

Keywords: robotics, independent living, workstation, automation

RAID is a robot workstation developed during the TIDE pilot phase to enable wheelchair-based computer-users to handle office materials and equipment. The EPI-RAID project aims to widen the potential user base and improve the performance of the system based on specifications derived from extensive user trials.

Project description: The original RAID workstation was intended to allow a wheelchair user with very limited movement to undertake a normal computer-based office job such as CAD or DTP, using the robot to handle documents, turn pages, service peripheral equipment such as scanners, staplers, copiers and computer disks, and present refreshments. Trials with this system showed that users were generally enthusiastic about the concept but required more functionality and reliability so that the robot could be used in a domestic environment for a wider range of tasks. In addition, the user group needed to be increased by broadening the range of disabilities which the RAID user interface could accommodate. EPI-RAID is planned to realize and test these improvements by building three enhanced systems for testing at different rehabilitation centres in France, Sweden and the UK. The end result will be a specification and demonstrator of a workstation able to meet the vocational and leisure requirements of a substantial cross-section of physically disabled computer users.

Technical approach: The project is divided into six work packages: WP1 and 2 involve the construction and assessment of an upgraded version of the workstation, known as RAID1A, embodying a series of enhancements based on earlier trial results. Three systems will be built to enable user trials to take place in rehabilitation centres in different countries. In parallel with this activity, a series of technical feasibility studies, WP4A, will be carried out to identify the best engineering options for implementing more far-reaching hardware and software improvements identified by users. In addition, a market research programme, WP6, will assemble a panel of user centres embracing the EU who will be asked to provide local input into the required specification for the full upgrade. These three strands, trials results, technical options and market research, will be combined to derive a specification for the new version to be known as RAID2, which will be built and assessed during WPs 4B and 5.

Impact and expected results: The result of the EPI-RAID project will be a specification and three demonstrator versions of an upgraded workstation to enable a wide variety of physically disabled users to undertake the manipulative tasks required to undertake a computer-based vocational or leisure activity with a high level of independence. In addition, a marketing plan and commercialization agreement will provide a mechanism by which the concept can be converted into a product for sale throughout the Union in a short time scale. The first version of the RAID workstation has already achieved limited commercial sales, and the development of RAID2 will enable a wide cross-section of disabled users to have access to computer based-tasks for vocational and leisure pursuits.

Participants	Country	Role	Type
Armstrong Projects Ltd	UK	C	I
Oxford Intelligent Machines Ltd	UK	P	I
Commissariat de l'Energie Atomique	F	P	R
Lund University	S	P	U
HADAR	S	P	O
Cambridge University	UK	P	U

Starting date
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Planned duration
27 months

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A friendly multifunctional interface for disabled and elderly security management

Project 1027 – AURORA

Keywords: interface, security, management

Development of an integrated user-friendly interface specifically designed for safety and security management of disabled and elderly people in the home environment.

Project description: Statistical enquiries carried out in Europe indicate that, in order to improve the quality of life in the home, security and safety management are the first requirements for all inhabitants but particularly for elderly and disabled people. The analysis of user needs in relation to security and safety management is considered one of the principal elements in defining a suitable system for each type of user. Most systems available on the market are designed for non-disabled people, but it is strongly felt that there is a need for systems that can be used easily by disabled persons. The project aims at finalizing an integrated user-friendly interface (EDCI) to manage emergency situations due to intrusion, fire, gas leak, flooding, and to manage calls for help made by the users. The main objective of the project is the optimization of the communication processes for users with different types of disabilities.

Technical approach: The following activities are foreseen: development of the user interface prototype, development of a reference system within which the EDCI will operate, and experimentation in the field with users.

The system is designed to be extremely modular in both hardware and software configurations.

The EDCI is composed of a portable device and a fixed module. The portable device shall allow different hardware configurations to match different types of handicap.

The fixed module is provided with a standard cabled interface, which will allow interfacing with alarm processing platforms available on the market.

The reference system is composed of an alarm processing platform and a remote supervision centre; both based on standard hardware available on the market.

Impact and expected results: Two products will result from the project: the user interface and the software for the remote supervision centre. These products can be easily integrated with alarm platforms, equipped with standard interfaces and with standard computers available on the market. The impact on users will be evaluated during the experimental trials on the basis of which the project will be revised.

Participants	Country	Role	Type
Consorzio AURORA	I	C	I
Silicon Electronica e Telematica	P	P	I
Team Srl	I	P	O
Universität Stuttgart	D	P	U
Organizacion Nacional de Ciegos (ONCE)	E	A	O
National Agency for Welfare and Health (NAWH)	SF	A	R
Associazione Opera Immacolata Concezione (OIC)	I	A	O
Associazione Oasi Maria Santissima (OASI)	I	A	O

Starting date
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Planned duration
35 months

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Mathematical access for technology and science for visually disabled users

Project 1033 – MATHS

Keywords: mathematics, visually disabled, non-visual interfaces, SGML

The MATHS project is concerned with the development of a software/hardware platform to enable blind and visually impaired individuals to input, manipulate and output mathematical expressions using a combination of auditory and Braille techniques.

Project description: With the advent of graphical user interfaces (GUIs) it has become increasingly difficult for visually disabled users to access computer technology on an equal level with sighted users. There is work which enables users to access text-based interfaces and an increasing level of general support for GUI features such as menus and windows.

The use of mathematics (reading, creating and manipulating mathematical expressions) is one area where there is still a major gap between sighted users and visually disabled users, since there are no tools to allow mathematical expressions to be used in this way without an auditory interface.

MATHS is developing a mathematical workstation for visually disabled users which permits them to interact with the mathematics via auditory and tactile interfaces, using new combinations of interface entities to provide equivalent access to mathematics. It is based upon standardized text notations and therefore has wide applicability. Not only are mathematicians and students potential users of the system, but also many others who are precluded access to certain workplaces by the lack of access to mathematics.

Technical approach: The core of the system is an SGML-based desk-top publishing environment. This environment is extended with a set of auditory facilities and Braille facilities to enable the visually disabled user to interact with it. In particular, the project is innovative in the development of systems to trade-off the effect of detailed mathematical manipulations and quick glances at an expression of mathematics, which convey different information to the sighted user. Non-speech audio is important in providing the latter access.

Impact and expected results: The major outcome of the project is the MATHS workstation itself, which is a software environment (together with hardware extensions) intended for use in a PC-compatible/Microsoft Windows environment. In addition to this, it is expected that the project will result in spin-off technologies which can be added to other software systems to

provide mathematical access to visually disabled users. The commercial partners are preparing exploitation plans examining the impact on users in such fields as education and the office environment, where the increase in access is expected to create more educational and job opportunities for users. R&D implications include the advancement of the use of audio interfaces and a contribution towards developing radically new ways for orienting users in navigating complex structures.

Participants	**Country**	**Role**	**Type**
Electric Brain Company Ltd	UK	C	I
F. H. Papenmeier GmbH	D	P	I
Grif SA	F	P	I
University of York	UK	P	U
Katholieke Universiteit Leuven	B	P	U
University College Cork	IRL	P	U
Technologische Universität, Wien	A	S	U
University of Bradford	UK	S	U

Starting date
3 January 1994

Planned duration
36 months

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Advanced language device for interaction

Project 1035 – ALADIN

Keywords: augmentative and alternative communication, speech/language impairments

Development of an effective conversation system for physically impaired non-vocal people.

Project description: The ALADIN project is developing a novel, linguistically-based software system which will enable a non-vocal physically impaired person to hold effective conversations. The software will run on a wide range of commercially available hardware platforms (computer plus speech synthesizer). The system will include a model of conversational interaction which will provide the user with appropriate conversational material, prompts, and predicted utterances. Both text and graphical interfaces are being developed which help the user to navigate through a conversation with minimal attention on the interface and maximum attention on the other speaker. The users of this system will be people who are non-vocal from birth, through cerebral palsy, and also people who have permanently lost the ability to speak through degenerative conditions or accidents.

Technical approach: No current communication system contains an inbuilt model of conversational interaction, which is what this project is developing. The knowledge for this is being obtained from an investigation of the results of conversation analysis research. A control interface is being designed for the system which will provide the users with predicted texts from a large pre-stored inventory in a way which is easy to use while maintaining their primary attention on the conversation. The software is being developed and tested iteratively with feedback from a panel of potential users. An authoring utility, training package, and a marketing strategy for the system are also being produced.

Impact and expected results: Approximately two million people in Europe are unable to meet all their communication needs through natural speech. Current speech output communication systems for non-speakers offer only a limited ability to converse effectively. The ALADIN system will offer a significant improvement in performance over existing systems. Because communication is such a fundamental and necessary human activity, improvements for persons with severe communication impairments will have a significant impact on all other areas of their lives.

Participants	Country	Role	Type
University of Dundee	UK	C	U
Instituut voor Revalidatievraagstukken	NL	P	R
IGEL GmbH	D	P	I
Kompagne VOF	NL	P	I

Starting date
1 July 1994

Planned duration
30 months

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Image-based interactive device for effective communication

Project 1038 – IBIDEM

Keywords: video telephone, hearing-impairment, remote monitoring, retinal images

The main objective of IBIDEM is to develop a video phone useful for lip-reading by hearing-impaired people as well as provide capabilities for remote monitoring based on a novel type of space-variant sensor and using standard telephone lines.

Project description: Long-distance communication for both social and practical purposes is becoming an increasingly important factor in everyday life. Hearing-impairment does, however, prevent many people from using normal voice telephones for obvious reasons. A solution to this problem for the hearing-impaired is the use of video phones. Currently available video phones do not however meet the dynamic requirements necessary for lip-reading. The spatial resolution is also too small.

In order to facilitate speech reading, signing and finger spelling, IBIDEM will develop a video phone based on a novel type of visual sensor matching the resolution of the human retina in both the spatial and temporal domains (a retina-like or space-variant sensor). Members of the IBIDEM consortium already hold a patent in Europe and the US for a prototype of such an imaging device. The geometry of the visual sensor, similarly to the human retina, has a high resolution in the central part and a degrading resolution in the peripheral visual field. This solution results in a reduction of the number of pixels of the acquired image (allowing a higher transmission rate on standard telephone lines) without degrading the perceptual appearance of the image.

A second objective of IBIDEM is the use of the same equipment for remote monitoring of health status. The system can be used for obtaining information about the status of a client in the form of images and could be extended to include various physiological parameters like heart rate, blood pressure, etc.

Technical approach: The IBIDEM project will construct a video phone using a camera with the retinal sensor, motorized system for moving the point viewed by the camera as well as an LCD to display the transmitted images. This video phone will be a high-quality low-cost aid for the hearing-impaired as well as being useful for remote monitoring.

Impact and expected results: The video phone will be designed with the active participation of members of the deaf and hard-of-hearing community, and will be demonstrated by inter-personal communication between two speakers, one or both with hearing disabilities, as well as in a situation of remotely monitoring health conditions using audio and visual information.

Concurrently, the consortium will evaluate the targeted market segment and disseminate the intermediate results and the foreseen achievements to interested users to facilitate exploitation.

Participants	Country	Role	Type
Unitek Consortium	I	C	I
IMEC	B	P	R
Thomson CSF	F	P	I
Knossos Technologies SA	GR	P	I
Universita di Genova	I	P	U
Scuola Superiore S Anna	I	P	U
Instituut voor Doven	NL	A	O
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Scienzia Machinale Srl	I	S	I

Starting date
1 September 1994

Planned duration
24 months

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Smart card and terminal usability requirements and needs

Project 1040 – SATURN

Keywords: smart card systems, terminals, standards, legislation, older people

The introduction of smart card systems for public use offers exciting possibilities to increase the accessibility of such systems to people who are elderly or have a disability.

Project description: Disabled and elderly people are often disadvantaged by having difficulty in using public information and service terminals, such as bank cash dispensers, public telephones and card-controlled entrance gates. At a time when smart card systems are being introduced, it is appropriate to ensure that the design of such cards is adapted to the requirements of these special users.

For example, some smart cards can be used a few metres from the terminal. This means that the card could indicate the presence of a blind person to the terminal which could then give a spoken message to help the blind person find and use the terminal.

The SATURN project will study and define the important user needs, focusing on the user interface; it will instigate an action programme to increase awareness of the issues amongst decision-makers, such as legislative and standards bodies and governments; and it will develop prototype solutions to enable smart card systems to be used easily and effectively.

A major aim of the project will be to establish demonstrators in different countries to increase awareness of the needs of elderly people and people with disabilities amongst decision-makers.

Technical approach: The project will study:

(a) user requirements specification for smart cards and terminals;

(b) examination of technical possibilities and economic constraints;

(c) design and construction of prototype adapted smart cards;

(d) design and construction of prototype interactive terminals;

(e) evaluation of adapted smart cards and terminals;

(f) standardization and legislation.

Participants	Country	Role	Type
Royal National Institute for the Blind	UK	C	O
Gemplus Card International	F	P	I
Human Factors Solutions	N	P	R
AT&T Global Information Solutions	UK	P	I
ICL Financial Terminals AB	S	P	I
Telia AB	S	P	I
University of Hertfordshire	UK	A	U

Starting date
1 February 1994

Planned duration
36 months

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Sensor-aided intelligent wheelchair navigation

Project 1045 – SENARIO

Keywords: risk avoidance, mobile robotics, path planning, M3S bus, man-machine interface, environmental perception

The project will develop a user/market-oriented prototype of a sensor-aided intelligent wheelchair navigation system using sophisticated risk avoidance algorithms and special sensors and interfaces.

Project description: The main objective of this project is to develop a user/market-oriented prototype of the proposed SENARIO system, using and improving the relevant technology. This wheelchair will allow people with various types of mobility problems (physical and mental) safe and easy mobility in familiar and unfamiliar environments. Senario aims to determine user requirements and to innovate and set/support standards in rehabilitation technology.

Technical approach: The SENARIO project is introducing intelligence to the navigation systems of powered wheelchairs, with the help of specifically designed advanced sensors. SENARIO is moving a step beyond AGV (automatic guided vehicle) technology, towards a user-oriented approach to autonomous vehicles.

The system will have two modes of operation:

(i) Teach mode

The system is taught pre-defined paths based on topographical representation of the vehicle's workspace. The user can select the desired paths in his/her near environment (e.g. home) from a topographical diagram during installation of the system.

(ii) Run mode

(a) Autonomous navigation (on pre-defined routes). The user selects a path from the programmable pre-defined paths stored using teach mode. The system will execute the selected path, following the trajectory information stored from start to target, and solve the possible collision problems.

(b) Semi-autonomous navigation (on free routes). The user instructs the system on a free route in a familiar environment. The system guards the surroundings of the vehicle avoiding risk situations, taking actions and/or warning the user depending on the level of risk that the vehicle is facing.

The system consists of five subsystems. The main control of the system is dedicated to a risk avoidance subsystem, which includes the central intelligence. Peripheral subsystems, with integrated intelligence, support the task of risk avoidance. The risk avoidance system inputs information from sensoring and positioning subsystems. The sensoring subsystem will be equipped with ultrasonic, odometer, inclinometer and other types of sensors. The positioning subsystem solves the initial position problem using a laser range finder system, active or passive beacons. Its action is supplementary to the sensoring subsystem. The control panel subsystem is dedicated to the user's instructions input, and the power control subsystem is responsible for the conversion of the system's instructions into vehicle movements.

Impact and expected results: The outcome of the project will be the prototype of the sensor-aided wheelchair navigation system, available for demonstration in familiar environments. SENARIO could be used by a variety of users — including persons with cognitive impairment with some restrictions on the available modes. The system primarily targets the wheelchair industry. The marketing policy will be focused on support of the M3S bus, thus the product supports all the end-effectors and input devices compatible with the standard. Components of the system could also be commercialized as individual products.

Participants	**Country**	**Role**	**Type**
Zenon SA – Industrial Automation	GR	C	I
Microsonic GmbH	D	P	I
Institute of Communication and Computer Systems National Technical University of Athens	GR	P	U
University of Reading	UK	P	U
National Institute of Health and Medical Research	F	P	R

Starting date
1 June 1994

Planned duration
36 months

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Motorized upper limb orthotic systems

Project 1057 – MULOS

Keywords: upper limb, orthosis, control, robotics, CMP

MULOS will develop modular, lightweight powered structures for the upper limb incorporating advanced force and position feedback control.

Project description: With increasing age, a number of aspects of upper limb function, such as joint range of motion (ROM), strength, sensation, proprioception and dexterity are prone to deterioration as a consequence of disease and injury. The preservation of motor function and range of joint motion is an essential feature of maintaining independence for the elderly, and orthotic devices for the upper limb play a major part in achieving this aim. While in the past, the preservation and restoration of joint motion have been achieved largely by therapists, such an approach cannot be economical in the long term as the number of older people in Europe increases dramatically. A key priority, therefore, is to harness technology to provide devices which can empower the independence of older and disabled persons through the improvement, restoration or substitution of motor function in the joints of the upper limb.

The loss of upper extremity function may be temporary, progressive or permanent. There is a very important need for powered mobilizing devices which are highly developed in terms of biofeedback and responsiveness. These devices are needed to restore function in cases of temporary deficit, prevent or defer deterioration in progressive conditions, and provide active assistance to limb segment movements for persons with severe neuro-muscular deficits caused by paresis or paralysis. Some devices will be 'worn' by the user if he or she has good mobility. Alternatively, powered mechanisms mounted on electric wheelchairs could help both function and training in those who have sufficient power to direct the servo-mechanism but not enough, particularly anti-gravity support, to perform useful functions on their own.

These requirements can be met by a unique and exciting possibility to produce a powered intelligent modular system which can be applied to joints of the upper limb for three distinct purposes:

(i) For passive movement (which has been shown to have beneficial effects upon the repair of bone, tendon, ligament and cartilage, and is tolerated remarkably well by patients, even in the presence of unhealed wounds).

(ii) To facilitate active movement by exercise (to increase muscle strength).

(iii) For the powered assistive role where there is progressive loss of function, there would be the ability to add-on as the condition deteriorated (e.g. in multiple sclerosis, muscular dystrophy, motor neuron disease).

The secret of success for such a combination and coordination of technologies will be in five essential features: modularity, simplicity, reliability, maintainability and cosmesis.

Technical approach: The technical objective of this project is to develop modular, intelligent, powered orthoses for the improvement, restoration or substitution of motor function in the shoulder and elbow joints, and pronation/supination of the forearm. From the industrial point of view, it will be necessary to harness information, control and materials technologies to produce a system at the correct price and specification to satisfy the perceived need for these orthotic systems. The MULOS system will be suitable for use either on a wheelchair or furniture or, in some cases, when worn as an exoskeleton. The partners are particularly concerned about the economic aspects of the proposed system and great stress is placed on the need for a device which can be afforded by as many users as possible.

This will require developments in the following areas:

(i) It will be necessary to produce a lightweight, cosmetic modular structure to fit individuals of the full range of sizes.

(ii) Drive systems will be required to allow controlled movement of up to four degrees of freedom under the control regimes appropriate to the mode of use.

(iii) It should use software which is easily understood by users with absolutely no expertise in computers.

(iv) It must have safety features to provide absolute safety in the event of malfunction or misuse.

Impact and expected results: The production of a modular-powered orthotic system applicable to the shoulder and elbow joints which is suitable both for powered assistance and for therapeutic measures. It will, in addition, be suitable for wheelchair mounting and it is intended that the system should be at the lowest possible cost.

Participants	Country	Role	Type
University of Newcastle upon Tyne (UNUT)	UK	C	U
University of Abertay (DIT)	UK	P	U
SM Scienzia Machinale Srl (SM)	I	P	I
TVI (Europe) Ltd (TVI)	UK	P	I
Free University of Berlin (FUB)	D	P	U
Dr Robin Platts	UK	S	O

Starting date
1 October 1994

Planned duration
36 months

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Horizontal action on market awareness of technology for the care of older people

Project: TP 1058 – MARTEL

Keywords: care, market awareness, technology, older people, association

A forum is held and an association of care provision organizations, care funding policy-makers and technology suppliers created in order to promote the market needs and technology opportunities for the care of older people.

Project description: The aim of this horizontal activity is to make suppliers of care services aware of the potential use of technology for the care of older people by building a forum to bring together care provision organizations, care funding policy-makers and technology suppliers. The purpose is to clarify the market needs and technology opportunities and create a European-wide association for maintaining this dialogue and promoting the awareness of technology for use in the care sector.

Demographic changes are giving rise to a need of increasing urgency to improve the efficiency and effectiveness of ambulatory and residential care of older people. However, industries which can provide technological products economically are reluctant to develop products for the care sector unless the care sector can convince manufacturers that it is a market with major sales opportunities. However, the social services organizations have too little experience of technology and its potential to be able to determine how it can benefit them, fit into their organizations and ameliorate the care crisis.

A TV quality video capturing the experiences of older users and service providers using state-of-the-art technology is made for presentation at the forum and outside, so as to avoid invading people's homes with large numbers of visitors.

A forum is held that includes suppliers of technology, customers for technology and users of technology to initiate an European-wide association for continuing the technology awareness dialogue between these actors in the care sector.

Technical approach: A survey is made to find the appropriate national organizations responsible for care provision and its funding and to identify the trials already taking place and the key players. A video story board is agreed and visits to the trial made and a video of two sites made. Focused workshop(s) are held to define scope and content of the forum and the association. The forum is organized, briefing packs published and the forum held with key speakers to attract members to the association.

Impact and expected results: The framework for setting up a European-wide association of care providers and a manufacturing industry for promoting the awareness of technology for use in the care of older people. This should speed up the addressing of the care sector by manufacturers with a consequent improvement in the quality of care for older people and containment of social-care costs.

Participants	Country	Role	Type
NSSL	UK	C	I
NAWH	SF	S	R
FMH	P	S	U
Empirica GmbH	D	S	I
Casbah Films	UK	S	O

Starting date
1 April 1994

Planned duration
22 months

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An autonomous speech rehabilitation system for hearing-impaired people

Project 1060 – HARP

Keywords: speech rehabilitation system, pre- and post-lingual deafness, deafness in elderly, cochlear implant

The objectives of the HARP project are to prove that technology already developed under ESPRIT project SPELL for foreign-language learning can be modified for use in teaching pronunciation in the speech rehabilitation of hearing-impaired people.

Project description: HARP is a two-year project. The work of HARP uses as its point of departure, the results from ESPRIT project 7153 (SPELL) which has developed courseware for teaching pronunciation to foreign-language learners. This courseware uses an IBM PC-compatible computer with a commercial speech processing card and a well-proven user interface based on Microsoft Windows. Direct extension of this software to address the needs of hearing-impaired people represents the key activity of the HARP project. The project will focus on the introduction of the HARP system into schools and clinics during the first year such that extensive trials can be undertaken to prove the system and make it ready for general market release by the end of the second year. A near-market product will be ready at the end of the second year.

The innovative aspects of HARP derive from the use of hidden Markov speech models which are tailored to the speech distortions of hearing-impaired talkers; from the use of intonation, rhythm and speech quality models for autonomous teaching of nearly normal pronunciation to hearing-impaired people; and from the creation of special graphical user interfaces for use by the hearing-impaired such that the system can be widely introduced into schools and homes. One of the hallmarks of the HARP project will be the involvement of hearing-impaired users from an early stage. These users will be made available by sponsoring partners who can give access to subjects.

Technical approach: The project objective is to introduce computer-based systems to schools, clinics and people's homes which will analyse the speech characteristics of speakers with hearing impairment and improve their spoken-language skills.

A total of four cohorts of patients will be addressed. These groups comprise:

(a) young children with pre-lingual hearing impairment;

(b) young persons who have post-lingual hearing impairment and remnants of speech skills;

(c) persons who have undergone surgery for cochlear implant;

(d) elderly persons who have developed serious hearing impairments.

The project will develop PC-based software and courseware which will be inexpensive and suitable for use in clinics and in the homes of hearing-impaired people. In this project, research topics will include phonetic analysis, phonetic distance metrics, multilingual systems, linguistics and computer-aided instructions, all with specific reference to the detailed needs and requirements of the four cohorts of hearing-impaired subjects as prescribed by the sponsoring partners. The languages to be studied on the project are English and French, which are to be analysed in order to extract their phonetic characteristics. The methods developed on the project will allow easy extension to other languages and the needs of porting the system to other languages will be assessed throughout the work. The final demonstrator will be a system able to process the voice of hearing-impaired speakers in order to automatically identify and give advice on pronunciation errors thereby providing rehabilitation assistance.

Impact and expected results: The technological objectives of the HARP project are to develop methods for analysing the characteristics of the speech of hearing-impaired speakers, to develop metrics for identifying differences between the users pronunciation and the optimal one and to provide feedback to the users so that they can improve their speaking skills. An improvement with respect to the state of the art will be necessary especially in the area of speech parameter extraction for speech from the hearing-impaired.

Participants	**Country**	**Role**	**Type**
Agora Conseil	F	C	I
CSTR	UK	P	U
FSS	UK	P	I

Starting date
3 January 1994

Planned duration
24 months

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Usability requirements elaboration for rehabilitation technology

Project 1062 – USER

Keywords: human factors, usability, tools

USER is a horizontal action designed to elicit, capture and integrate human factors information and encourage the application of usability principles within TIDE and within the RT/AT sector more generally.

Project description: USER will assist in progress towards a single market in RT/AT by providing a framework, prescriptive information and methods, tools and techniques which IT-based developers and service providers in the RT/AT sector can use effectively and economically to incorporate usability and usability requirements throughout the development process. This is to ensure that products and services meet market requirements and have a high degree of usability and acceptance.

The RT/AT market is new, SME-based, fractionated and has yet to mature. There is not a well-developed scientific, technical or design base from which to develop new products and services. RT developers therefore require practical guidance and design tools which are tailored to their particular skills and limited resources. To meet this requirement, available usability knowledge (from the human factors and ergonomics disciplines) needs to be abstracted, adapted, synthesized and presented to match development needs. A dissemination and technology transfer strategy is then needed which will encourage the take-up of user-centred design, development and evaluation strategies.

To achieve this general aim, USER will carry out extensive data capture, eliciting expert knowledge, from within and outside of TIDE. This will then be collated, presented and made accessible to developers. An iterative process of involvement with key stakeholders will be used to increase RT/AT developers awareness of usability principles and practices and to aid the transfer of USER results. A European strategy, which sets up networks of gatekeepers in European Member States, is an important feature of this process.

Technical approach: USER comprises seven related work packages. Expert knowledge will be generated from a variety of sources, integrated and then shared with the TIDE projects via project workshops and in other ways so that USER results are promulgated as rapidly as possible. Dissemination activities will include the production of a quarterly newsletter *(USERtalk)*. Contributions will be made to the RT/AT literature, technical and scientific conferences and a representation of USER results will be made to standards bodies

and specialist working groups, etc. The project will also publish the first edition of a 'usability handbook' which will be available to TIDE projects and to a wider RT/AT community. An evaluation strategy for the validation of results and methods by developers themselves is an integral part of the work programme. This involves the foundation of a network of key stakeholders within Europe, the UCC (USER corresponding committee), which will validate, guide and aid the development of USER and will also perform an essential role in technology transfer and dissemination.

Impact and expected results: USER is a technology transfer activity concerned with improving the quality and usability characteristics of products and services available to the end-user in the RT/AT sector. A major consequence will be to stimulate the uptake of usability and provide mechanisms for this to be accomplished through publications, workshops, *USERtalk* and the UCC. The project will also provide practical, easy to use and accessible usability tools and prescriptions, based on the experiences of TIDE and other expert sources, for developing usable and acceptable high technology RT/AT products. This will be available at the end of the project in the form of a handbook.

Participants	**Country**	**Role**	**Type**
HUSAT Research Institute	UK	C	R
COO SS Marche	I	P	O
Sintef Rehab.	N	P	R

Starting date
17 January 1994

Planned duration
24 months

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Gait assessment manumitted from the biomechanics laboratory environment

Project 1064 – AMBLE

Keywords: gait, ambulatory, kinematics, gyroscope

The AMBLE project will implement motion analysis in an ambulatory framework which can be freely used within any environment and over any distance.

Project description: The main clinical goal of this project is to achieve the first ever full kinematics assessment of disabled or older persons in their natural environment. Kinematics assessment under laboratory conditions has only limited value since few people experience gait difficulties when walking in a straight line in a carefully controlled environment. Ambulatory assessment of gait is the only way to evaluate patients' dynamic response to perturbation of their gait and this is a growing field of biomechanical investigation; however, there is currently no commercially available system to support ambulatory kinematic measurement.

Technical approach: The main technology deliverable from this project will be a combination of solid-state gyroscope and gallium-arsenide strain gauge devices which will be capable of delivering accurately and consistently the relative spatial locations of specific bony land-marks on the human body to which they are attached. This will be controlled by a graphical user interface (GUI) which will be friendly and meaningful to the clinicians using the system.

The solid-state gyro devices have recently been successfully implemented in a heads-operated pointing device for GUI; however, some further development is required to enhance their stability for use in this application. The basis of the system concept is an alternating sequence of vector directions and vector lengths by which each marker location is defined in terms of a spherical polar coordinate system originating from the previous marker in the system. The use of solid-state gyro devices is completely innovative in this context, as is the concept of a 'daisy-chain' of local spherical polar coordinate systems to characterize locomotion kinematics. This concept requires development and implementation. Furthermore, standard protocols for ambulatory assessment must be designed.

The steps involved in the project are as follows:

(i) Evaluate the technology and quantify target specifications for the performance of the system.

(ii) Launch the concept with a simple product in the form of a novel device for ambulatory measurement of human body-segment ruler angles.

(iii) On the basis of full cooperation between all partners: specify, implement and refine the various components of the overall system.

(iv) Review the system against the baseline of the target specifications.

(v) Complete the specification of assessment protocols.

(vi) Use the system in clinical trials within real clinical contexts.

Impact and expected results: The outcome of this project will be a prototype measurement system which should be attractive to clinicians currently engaged in evaluation of motor function in elderly and disabled patients. It is estimated that up to 10% of the adult population suffer from a disability which could benefit from such assessment. The involvement in the team of major clinical gait laboratories in each of three EU Member States and one EFTA country will ensure the relevance of this development.

Participants	Country	Role	Type
Advanced Medical Technology	UK	C	I
Hopital Cantonal Univ. Geneve	CH	P	U
Interactive Multimedia Systems	IRL	P	I
Katholieke Universiteit Leuven	B	P	U
Roessingh Centre for Rehabilitation	NL	P	R
SRS Focal Point	UK	P	I
Green Park Health Care Trust	UK	A	O

Starting date
1 June 1994

Planned duration
24 months

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Concept of automation and services for people with special needs

Project 1068 – CASA

Keywords: home systems, service centre

The CASA project aims to design, develop and evaluate a platform to provide services for elderly people, based on home system technologies and links to service centres.

Project description: The CASA project takes as a starting point the idea that the provision of services is fundamental to the development of 'assistive technologies' to the home. The project will carry out:

(a) social and market studies involving an analysis both of the requirements of elderly and disabled persons and existing service environments,

(b) development of products based on home system technology and design of a service centre interface,

(c) implementation of two test beds in Portugal and Spain in order to evaluate product and services.

Technical approach: The technical approach of the project involves application of home system technologies, development of user-friendly interfaces based on a TV set and infra-red remote control, and implementation of STN, ISDN and CATV access, to monitor services in the home. The service centre includes a video communication system to communicate with residents in their homes and a service supervisor unit based on a personal computer.

Impact and expected results: The results of the project are as follows:

(i) Design of home system products suited to the needs of older and disabled persons.

(ii) Development of the remote service centre software.

(iii) Market analysis of the requirements of older and disabled persons for services.

Participants	Country	Role	Type
I&T COM	F	C	I
Bioingenieria	E	P	I
HUSAT	UK	P	R
Pluricom	P	P	I
SIEM	GR	P	O
Telecom Portugal DCID, CET	P	P	I
AMPER ELASA	E	P	I
University of Zaragoza	E	P	U
COOSS	I	A	O
Fundesco	E	A	O
University of Aveiro	P	A	U

Starting date
1 June 1994

Planned duration
30 months

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Integrated multimedia social alarm system

Project 1078 – IMSAS

Keywords: multimedia, communications, community care

The use of emerging technology for the remote care of the elderly and house-bound.

Project description: It is widely recognized that it is important to maintain elderly and disabled people in their homes rather than in institutional care. The potential saving for health authorities due to return to care in the community is also acknowledged. However, to provide supervised care in the community, a social alarm system is required to enable carers to be informed of potential problems.

This project will determine the user needs specification for social alarm services and produce a pan-European user functional requirement for utilizing the developing multimedia technology. Innovative elements defined in this functional specification will be tested within a practical trial.

Technical approach: The project methodology will be that following the determination of needs, the practical difficulties will be identified. A design will then be developed, verified and then implemented in a pilot demonstration.

In its early stages the project will concentrate on a user-requirements analysis and definition of a European system for the monitoring of elderly or disabled persons in the community. This will result in a technical specification, which will emphasize standardization of system components and communications media.

The project will examine communication problems especially in areas of low density population, and will propose solutions for the application of social alarm services in these areas. Consideration will be given to aspects of privacy, intrusiveness and reliability.

Software and hardware will be developed to provide effective communications via a range of different transmission mediums, allowing contact to be established over dispersed rural areas. Hardware at the user interface will be specifically designed to facilitate ease of operation, i.e. requiring a minimum of manual and intellectual dexterity. Universal interface units will be developed to enable single units to communicate into a range of European protocols without modification.

The project will undertake practical trials to prove the viability of the functional specification.

Impact and expected results: The result of this project will be to provide a system specification that promotes a greater use of multi-network communication systems than currently exists. The impact will be to enhance the use of social alarm systems via the use of this improved functionality and to provide vital information at the fingertips of community carers.

Participants	Country	Role	Type
WS Atkins Consultants Ltd	UK	C	I
Forbairt	IRL	P	I
Screenphones Ltd	IRL	P	I
Western Health Board	IRL	P	O
Cardiff Institute of Higher Education	UK	A	U
Rigel Engineering SA	B	A	I
Securicor Alarms Ltd	UK	A	I

Starting date
1 September 1994

Planned duration
36 months

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EMG signals from paretic muscles controlling electrical stimulation of the same muscle

Project 1083 – EPCES

Keywords: wrist extension, EMG, paresis, electrical stimulation, spinal cord injury

In tetraplegic spinal cord injured patients with paresis of the wrist extension, EMG signals are used from the paretic muscle to control electrical stimulation of the same muscle.

Project description: The project shall develop a hybrid device comprising flexible mechanical orthoses and electrical stimulation (ES) for enhancement of motor function of paretic wrist muscles utilizing electromyographic (EMG) signals of the remaining muscle activity for control of the necessary ES in spinal cord injured individuals (tetraplegics). The centre for spinal cord injured at the National University Hospital in Denmark in collaboration with the Institute of Electronics at the Technical University of Denmark has developed a system, which uses the remaining voluntary EMG from the paretic wrist extensor muscles, primarily the extensor carpi radialis (ECR) to control ES of the same muscles, thereby providing the subjects with a control strategy for stimulation as naturally as possible.

The primary goal will be to establish a key grip using the flexor tenodesis effect of an active wrist extension — the latter motored by ES augmented muscles. Appropriate orthoses will be necessary to stabilize and guide the movement, including the thumb.

Technical approach: Innovative aspects include development of a control system (circuit plus software), which allows processing of the EMG to the ES for the same muscle without interference. Development of flexible mechanical orthoses for the necessary alignment of the hand.

Developments needed include optimization of the placement of electrodes; construction of a battery-driven control unit comprising an EMG amplifier, an ES generator, a shut-down triggering unit for excluding interference between EMG and ES and electrical noise; software for systems control; flexible mechanical orthoses correlated to the ES system and designed for the intended movement of the fingers.

Software and hardware resulting from the project include: electrodes for measurement of EMG and for electrical stimulation of the muscle; an ES generator, a microprocessor correlating ES and EMG signals; moulded orthotic components incorporating hinges and mechanical linkages to provide controlled movements.

Impact and expected results: The system shall be in the form of a small portable device for everyday use in the home. Special attention shall be given to the ergonomics and the overall design. Furthermore, the equipment shall be developed so that the clinical, technical and safety specifications can meet the requirements on a world market basis.

The further plan for the system, once a useful key grip has been developed, is to utilize the same technique for other muscle functions, for example flexion of the elbow in case of paresis to facilitate, for example independent eating, driving an electric wheelchair, or typing on a computer/typewriter. The method used in combination with hand surgery and/or implanted electrode systems may give rise to functions which otherwise would have been impossible. These systems may thus improve cervical spinal cord injured persons functional independence even more, to a degree where there is a significant improvement to their quality of life, and less direct and demanding involvement of a carer.

Participants	**Country**	**Role**	**Type**
DCM (contractor)	DK	C	R
ASAH Medico	DK	P	O
Consort Engineering Ltd	UK	P	O
Jones & Hunt Orthopaedic Hospital	UK	P	R
The Danish Paraplegic Association	DK	A	O
Roessingh Research and Development	NL	A	O

Starting date
1 September 1994

Planned duration
30 months

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New forms of working plans and test plans for intellectually disabled people

Project 1088 – WANTED

Keywords: working plan, test plan, intellectually disabled, multimedia

Supported by the latest multimedia technology and problem-oriented symbolism, standard production and test plans can be modified and adapted for use by intellectually disabled people.

Project description: Existing PPC, CAP and working plan systems are clearly aimed at planning aspects and do not contain the activities to be carried out in sequence. For that reason, sequences and auxiliary means are identified in such systems by intelligible number systems, or as a global description of several single activities (e.g. contour milling after design). These kinds of descriptions are not appropriate for intellectually disabled people, who need a more graphical way of description of the production process, sequences and auxiliary means, because most of them cannot read or write. Using generic symbol sets for procedure steps, activities, tools and auxiliary means, it is intended to build up a symbolism, which will be used by the trainers to describe the work quickly and easily and in a manner appropriate to the needs and possibilities of intellectually disabled people. Symbols should easily be identified and associated with the corresponding activities. After a transformation of the symbols to more realistic ones (e.g. scanned pictures of the objects), the intellectually disabled people who are qualified for the production activities can be trained by using coloured pictures, photographs and video sequences.

Technical approach: For information retrieval, access methods have to be defined, which do not use textual input, but associative methods in a graphical manner, supported by the hardware of the graphical interaction system. Inputs can be given by selecting graphical symbols or objects with lightpen, touch-screen or specialized input (function) keys. These methods for information access must be evaluated during the project together with people with disabilities, specialists and software engineers.

Impact and expected results: The main impact is that the operational areas of intellectually impaired workers are expanded. The results can be applied in workshops for disabled persons, and also in companies that employ a small number of disabled people.

In addition, the instruction time for the introduction of new products is shortened considerably. The results include greater flexibility, shorter reply-times and a wider product range in workshops for disabled persons, so that they can become a reliable and more effective

supplier to other manufacturing enterprises (e.g. automotive industry). The documentation of production process sequences can feed forward to the ISO-9000 certification.

The instruments and procedures developed within the framework of the project are transformed into a prototype, which is tested and validated by the project partners and can be extended to a marketable product. The new forms of working plans and test plans using multimedia can stimulate the software market for planning systems. There is the possibility to participate in the European and international standards in the area of enterprise modelling.

Participants	**Country**	**Role**	**Type**
FhG IPA	D	C	I
Ergonbedrijven	NL	P	I
Lebenshilfe Werkstatt	D	P	I

Starting date
15 August 1994

Planned duration
24 months

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Signal conditioning communication aids for the hearing-impaired

Project 1090 – SICONA

Keywords: hearing aid (speech feature enhancing), FM microphone (multichannel), fricative transposer, tactile coding (of speech)

SICONA will deliver a technical aid that compensates for severe hearing losses better than conventional equipment, especially in noise-disturbed environments.

Project description: The target group for SICONA are hard-of-hearing people with severe sensory deficits (losses of around 70 to 90 dB compared to normal hearing) that often lead to major communication problems and even social isolation. Existing hearing aids are of little assistance to these persons especially in noise-disturbed everyday and business situations. The SICONA communication aid will close the gap in rehabilitation technology by delivering an aid of acceptable size equipped with processing that improves speech intelligibility. Improved speech intelligibility is achieved by special processing that emphasizes speech elements that are not clearly perceived by severely hearing-impaired persons and offers replacement sounds for the often inaudible 's' sounds.

Furthermore, the SICONA communication aid allows speech communication in noise-disturbed situations. SICONA's approach makes use of lip microphones combined with an enhanced voice-switching circuit to achieve a high degree of noise reduction. The microphones (worn by non-impaired conversation partners) are supplied with FM transmitters to establish wireless connections to the FM receiver which is worn by the hearing-impaired person and also contains the signal processing unit. The processed speech signal is transferred via wireless inductive coupling to small ASIC receivers that are mounted on conventional behind-the-ear aids for the hearing-impaired user.

The system allows up to three persons to be heard by the hearing-impaired user at the same time (via three different FM channels simultaneously), to meet the requirements of normal discussions. The number of discussion partners can be increased arbitrarily, with the restriction that only three speakers may talk at the same time.

The system will also help hearing-impaired persons to improve control of their articulation. First, by transforming the usually inaudible 's' sounds into an audible replacement sound; second, by providing the possibility to perceive context-related information from contrastive stress and pitch variations which are presented via tactile sensation.

The communication aid uniquely combines several validated technologies in a synergetic way. Despite its complexity, it will be integrated into small, wearable pocket devices. The wireless connections between the components make the system acceptable, reliable and suitable for everyday life.

Technical approach: The SICONA communication aid has the following characteristics:

1. Support of group-discussion situations by introducing FM-multichannel-parallel-speech-signal transmission from several speakers to the hearing-impaired. An improved reduction of environmental noise is achieved by lip microphones that can be adjusted to minimize the distance between mouth and microphone. Interferences that are often introduced by ill-switching voice circuits are avoided by an enhanced voice-switching method. Continuous high level load to the ears from continuous noise (traffic, office machinery, etc.) is reduced by a special noise-sensing circuit, which controls the level of the audio signal.
2. Increase of speech intelligibility by modular signal processing that provides for:
   (i) plosive enhancement,
   (ii) second formant enhancement,
   (iii) reduction of masking effects,
   (iv) transposition of 's' fricatives.
3. SICONA offers the possibility to use the tactile channel for transmitting suprasegmental speech information (pitch, contrastive stress) by the application of somatosensory stimulation on the forearm (wireless coupled to the pocket-unit).
4. Maximization of user-acceptance
   (a) by using wireless transmission between all components of the communication aid (i.e. BTE aids, external sources and tactile stimulator on the forearm); and
   (b) by minimizing size and weight of the components (pocket devices and ear receiver).

Impact and expected results: SICONA will deliver wearable pre-industrial prototypes of a new kind of communication aid that improves the conditions for speech communication for the severely hearing-impaired. The prototypes will be used in field trials with hearing-impaired subjects and serve as a basis for further developments of the communication aid and other related rehabilitation technologies.

It is expected that SICONA as a final product will have a major impact on the social integration of the severely hearing-impaired for whom conventional hearing aids do not restore speech intelligibility to an appropriate level. It will be an essential help in educational and business life and represents a non-invasive alternative to cochlear implants.

Participants	**Country**	**Role**	**Type**
Institut für Arbeitsphysiologie an der Universität Dortmund	D	C	R
Trippe Industrieelektronik GmbH	D	P	I
PHT-Mikroelektronik GmbH	D	P	I
Ludwig Maximilians-Universität München (IPSK)	D	P	U
University of Exeter	UK	P	U
Instituut voor Doven (IvD)	NL	P	R

Starting date
1 September 1994

Planned duration
36 months

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Focus on the central position of users in integrated systems

Project 1092 – FOCUS

Keywords: communication, advanced control technology, telematics, mobility, environmental control

FOCUS aims at standardization and realization of key elements of a general purpose interface for control and communication (M3S) in the rehabilitation field.

Project description: Usability of integrated systems for mobility, control of the environment and communication will be improved through choice of the communication backbone — M3S, the general purpose interface for rehabilitation technology — and the extension of its functionality. M3S was developed as a communication backbone to exchange information between different elements on a wheelchair during the TIDE Pilot phase (Project No 128).

The viability of the safe and easy-to-use M3S architecture will be improved in FOCUS through:

(a) activities to standardize the M3S bus, either as a formal standard or as an industry standard, or as a *de facto* standard;

(b) chip design for key elements;

(c) set-up of design rules for safety.

Technical approach: The application of existing integrated information technology for the control of the wheelchair and the home environment will be developed in the following ways:

(i) user participation in specification and evaluation;

(ii) new functionality for integrated systems:

- optimal input devices (sip and puff sensor, headrest control sensor, finger sensor and switches, etc.);
- navigation assistance;
- improved user interface;

(ii) communication from mobile bases (wheelchairs) to the structured environment:

- home systems;

- communication channels;

(iv) construction of two demonstration platforms;

(v) case-studies for user evaluations.

The systems developed above are intended to be used by disabled 'end-users', who are more concerned about the final result of an optimally adapted system which will meet their needs than with the way this was accomplished. The other users of the M3S system are RT professionals who, using the method and the tools developed to configure an individually adapted system for a disabled user, are eager to have an 'open' and adequate integration technique.

End-users and professional users are involved from the start of the project in order to establish realistic user requirements. Later on they will provide feedback on the usefulness of the technical approach by performing evaluations at several stages of the project.

Impact and expected results: Results of the project will be:

(a) revised and expanded M3S specification;

(b) concerted actions towards M3S standardization;

(c) low-cost specially designed chips for M3S interfaces;

(d) two fully-equipped demonstrator platforms;

(e) system for navigational safety zone;

(f) M3S extension with an infra-red link and a bridge to homebuses;

(g) software for human interfacing and control tasks;

(h) reports and video of evaluations.

Participants	Country	Role	Type
TPD-TNO	NL	C	R
Made Associates	UK	A	I
Exact Dynamics	NL	A	I
FST	CH	A	R
Permobil	S	A	I
Finnelpro	SF	S	I
IRV	NL	P	R
AFM	F	A	I
Indes	NL	P	I

Starting date
1 August 1994

Planned duration
18 months

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Hearing aid research with digital intelligent processing

Project 1094 – HEARDIP

Keywords: hearing aid, signal processing, speech perception in noise

The development of algorithms for digital hearing aids that compensate for impaired loudness perception and are selective in noisy situations.

Project description: Hearing-impaired persons (more than 5% of the population, most of them elderly) suffer from reduced capabilities in selective perception of speech in the noisy situations of everyday life. Although a number of underlying psychophysical causes are roughly known, there is lack of a complete understanding of their combined effect and of the possibilities to compensate reduced auditory functions with hearing aids. Modern hearing aids do not yet provide a real solution for compensation of the distorted perception of speech dynamics in most hearing-impaired listeners. In addition, selective listening (in reverberation and/or noise) is hampered by the problem that commercially available hearing aids cannot improve the signal-to-noise ratio.

The project HEARDIP focuses on the compensation of impaired hearing by optimal fitting, restoration of the auditory dynamics, and noise-reduction algorithms in order to optimize speech intelligibility. The objective is to develop fitting procedures and signal processing techniques which will introduce a new generation of intelligent digital hearing aids, that are selective. This means that there are three separate aspects to this project: fitting procedures, signal processing to deal with impaired auditory processing, and signal processing to deal with noise reduction.

Technical approach: The approach to improve speech perception and selective listening on the basis of loudness perception and frequency and time resolution is innovative. In the algorithms for the compensation of reduced auditory functions, specific advantages of digital technology will be applied. This will remove some of the limitations of signal processing that are dictated by the analogue techniques used in hearing aids until now. New processing techniques require adapted prescription rules, which will be provided by the study combining detailed audiological knowledge with technological innovations. The signal processing schemes will first be implemented and tested in laboratory situations. The most promising schemes will be transferred into a pocket-size wearable unit and will be evaluated in field tests.

The three components of this project are investigated by four different (university) laboratories in close cooperation with two leading hearing-aid manufacturers. Although the

research is carried out completely in the university laboratories, both industrial partners are fully involved in the project in order to guarantee the applicability of the results in future hearing-aid design. The objectives of the university partners are to assess the functionality of the presented signal processing algorithms. Speech scores obtained with processing will be compared with appropriate linear amplification, thus enabling comparison with the scores that would be obtained using conventional linear hearing aids.

The industrial objectives are to develop intelligent hearing aids that do not merely amplify sounds, but rather process sounds so as to enhance listening comfort and to improve the ability to understand speech both in quiet and in noise. Recently, the last technical obstacles for the application of digital technology in hearing aids have been removed: power consumption is within reasonable limits and the miniaturization allows powerful processing in wearable aids of reasonable size. So, major technical problems have been solved. But the remaining uncertainty is the lack of audiological knowledge about the type of processing needed to compensate for the defects of the pathological ear and to optimize speech intelligibility, especially in conditions with background noise. As a consequence, the way to fit advanced hearing aids also needs to be investigated in more detail, before the technological breakthrough in better hearing aids can be made profitable on the market.

Impact and expected results: This project will yield more knowledge about signal processing algorithms to compensate for reduced discrimination in perceptive hearing losses and methods to fit these hearing processors on the basis of advanced psychophysical tests on loudness perception, frequency resolution, and/or temporal resolution. The resulting hardware is a wearable device that needs to be miniaturized further for the application in behind-the-ear hearing aids. Non-technical aspects of hearing-aid design will not be taken into account at this stage; they are beyond the scope of this study.

Concrete achievements of the project are:

(a) model of aided and unaided speech perception in hearing-impaired listeners;

(b) software for prototype hearing aids;

(c) fitting procedures;

(d) assessment of hearing-aid algorithms in hearing-impaired listeners.

Participants	Country	Role	Type
Ac. Ziekenhuis at the University of Amsterdam	NL	C	U
University of Cambridge	UK	P	U
University of Oldenburg	D	P	U
Erasmus University Rotterdam	NL	P	U
Philips Hearing Instruments	NL	P	I
Siemens Audiologische Technik	D	P	I

Starting date
1 February 1994

Planned duration
36 months

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Office wheelchair with high manoeuvrability and navigational intelligence for people with severe handicaps

Project 1097 – OMNI

Keywords: advanced wheelchair, navigational sensoric and intelligence, configurable control system, uniform human-machine interface

In this project, a new generation of smart, sensor-assisted wheelchair systems for the vocational rehabilitation of people with severe and multiple (including mental) handicap will be developed and thoroughly tested with users.

Project description: The main objective is the development of an advanced wheelchair with high manoeuvrability and navigational intelligence, that is well-suited for vocational rehabilitation and provides an opportunity for natural wheelchair control to people with severe physical or multiple handicap. Cramped offices are made accessible by the small size and by the omnidirectional mobility with ergonomic control. The user's safety and driving accuracy are guaranteed by a novel sensor system and navigation modules. A wide range of control devices can be used with the adaptable human-machine interface which also controls environmental devices. Within the project, the user focused principle is strongly followed by the involvement of users from the preparatory work to the evaluation of the results.

Technical approach: A major step towards this goal is achieved by the omnidirectional mobility of the wheelchair. The system will have an all-round freedom of motion, which means it almost has the movability of a hovercraft. The user-control is so designed that the user can use it intuitively; the control system itself is based on modular control structures for omnidirectional vehicles. The control system is flexibly configurable and allows for wheelchair control on different levels of abstraction in accordance with the different user's needs. This is supported by ultrasonic/infrared sensors and by a sensor-fusion for real-time obstacle avoidance and backtracking. A modular human-machine interface, which is adaptable to meet the different user's abilities, provides an uniform control for wheelchair, communication and environment. These innovative aspects are supplemented by the mechanical design focused on small size and by the integration of a new elevating seat with posture support. The integration of these modules into a well-harmonized overall system is based on modern soft- and hardware concepts. It is strongly influenced by the various technological experiences of the partners (a major wheelchair manufacturer, three SMEs, three university institutes and a research institute as a part of a large rehabilitation centre) in the fields of wheelchair development, control, omnidirectional platforms, sensors, robotics, as well as in rehabilitation and testing with users.

Impact and expected results: The results consist of two smart omnidirectional wheelchair prototypes integrated with the subsystems described above. The software developed includes a modular basic human-machine interface, a flexible configurable control system, basic local navigation and user safety module adaptable to the special needs of the different users. The advanced wheelchair system makes the disabled user more independent and thereby improves performance at work and in vocational rehabilitation. Previous investigations and inquiries with users highlight these social and economic factors and guarantee user-demand-driven results.

Participants	Country	Role	Type
Fern Universität Hagen	D	C	U
CALL Centre, Edinburgh	UK	P	U
FTB, Volmarstein	D	P	R
Ortopedia, Kiel	D	P	I
Scienzia Machinale, Pisa	I	P	I
Scuola Superiore S Anna	I	A	U
AIP, Hagen	D	S	I
Odor, Edinburgh	UK	S	O
PMR, Edinburgh	UK	S	I

Starting date
1 December 1993

Planned duration
30 months

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Home systems — access of disabled and elderly people to this technology

Project 1102 – HS-ADEPT

Keywords: home systems control, interface

This project will develop integrated systems based on home systems technology that will offer improved access and control of the domestic environment for disabled and older people.

Project description: The objective of the HS-ADEPT project is to ensure that emerging home systems (HS) technology will be accessible to disabled and elderly people — this is achieved through the development of appropriate end-user interfaces. The project will develop and install fully operational and integrated systems that will be subjected to a full evaluation by end-users in their everyday lives.

Fundamental to the philosophy of the project is that it is driven by user needs and not technology. While the needs of the disabled and elderly population in general are considered, attention is focused on the needs of the people represented by the participating end-user groups, the Papworth Trust in the UK and the Portuguese Cerebral Palsy Association (APPC). To address these user groups, HS-ADEPT will be building innovative demonstration systems for both individual homes and rehabilitation centres with many users.

Technical approach: Design effort is to be centred on the production of the generic hardware and software necessary to implement a HS conformant system. Where possible a modular design approach has been adopted that facilitates easy integration of devices developed by different consortium members.

Impact and expected results: The main achievement of HS-ADEPT will be the production of a system conforming to the home systems specification which fully meets the requirements of end-users. The completed system will demonstrate the potential and power of an HS bus based smart home environment for disabled and elderly people.

All consortium members are keen to see prototype devices go forward onto the market; however the size of the market for devices resulting from HS-ADEPT is dependent upon the growth of the home systems market in general. The demonstration systems will provide a proof of concept for product manufacturers that will prompt development of commercial HS conformant products.

Participants	Country	Role	Type
University of Reading	UK	C	U
AJ Fonseca Lda	P	P	I
INESC	P	P	R
I&T Communication	F	P	I
Papworth Trust	UK	P	O
Possum Controls Ltd	UK	P	I
APPC	P	A	O
Kongsberg College of Engineering	N	A	U
EHSA	B	S	O

Starting date
3 January 1994

Planned duration
30 months

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Handicapped elderly lonely person's multimedia equipment

Project 1105 – HELP-ME

Keywords: multimedia PC, supervision of the environment, home care

The main objective of this project is to allow dependent people to stay at home in a medically safe environment through the assistance of a multimedia PC managing a bio-monitoring and an alarm system with remote response capability.

Project description: This project addresses the needs of disabled and elderly people. The aim is to maintain disabled and elderly people in their homes (instead of a retirement home), allowing them to have a normal life, even when they have a serious illness.

Two important aspects will be developed:

(i) A classical alarm system managed by the PC using sensors to detect non-activity, intrusion or any other kind of problem which, after a local enquiry by intercom system, will transmit the alarm to the relevant service (fire brigade, emergency care unit, etc.).

(ii) A bio-monitoring system managed by a PC allowing medical staff to have local access to the beneficiary's file.

The multimedia PC will supervise the home ensuring a safe and secure environment and will coordinate the home-delivered services such as doctors and nurses.

Technical approach: The HELP-ME project is based on an intelligent multimedia PC which:

(a) after reception of signals issued by the sensors located in the home, will inform the beneficiary by an audio and visual signal of the nature of the problem and inform the co-ordination centre through the public switch telephone network when necessary;

(b) will report all medical data issued by the bio-monitoring system (pulse, blood pressure, cardiac rhythm) and allow the specialized staff to keep the patient's file updated on a daily basis;

(c) will take into account the behaviour patterns and habits of disabled and elderly persons and will locate the sensors accordingly at strategic places (shower, kitchen, bed, etc.). The system will use the television screen and a speaker to inform them in case of alarm.

Impact and expected results: With the assistance of the computer, disabled or older people can have a normal life from a medical and a social point of view. Moreover, the system by virtue of its modularity will grow with the degree of dependence. The system can fit in any kind of housing.

Participants	Country	Role	Type
CWS Biotel	F	C	I
France Telecom	F	A	O
Conseil Général 92	F	A	O
Rheinmetall Mess-und Prüftechnick	D	P	I
Technologie Zentrum Nord GmbH	D	P	I
Deutsches Rotes Kreuz	D	A	O

Starting date
30 December 1993

Planned duration
36 months

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Definition of an environment to maximize the market for telecommunications-based rehabilitation technology

Project 1113 – MART

Keywords: applications, telecommunications, requirements, potential demand

MART is studying how developments in the European telecommunications environment may affect the take-up of rehabilitation technology applications.

Project description: The focus of the MART horizontal activity is on the requirements of those applications of rehabilitation technology (RT) which involve a telecommunications dimension, such as alarm services, interpersonal communication, remote care, teleshopping, distance working and distance learning.

The development and diffusion of these applications will depend on the extent to which the appropriate telecommunications facilities are available and on whether customers are willing or able to pay for them. Application developers, service providers, user organizations, industry and policy-makers all need up-to-date information about these issues. MART aims to provide this information by analysing the requirements of applications and mapping these to the realities of the telecommunications world.

Technical approach: The technical approach of MART is organized into four activities. First, the range of existing and emerging telecommunications-based RT applications in the EU and EFTA countries will be identified and their requirements for telecommunications facilities will be analysed. Second, the key characteristics of the mainstream telecommunications environment will be identified and described for each country. Third, the key aspects of social policy of relevance for these applications will be identified for each country. Finally, these three aspects of the work — requirements, telecommunications situation, and social policy — will be integrated into demand scenarios. These scenarios will estimate how the potential demand for applications can vary under different circumstances.

Impact and expected results: The main impact of the project will result from its demonstration of the ways in which telecommunications policy and practice can affect the take-up of telecommunications-based RT applications. This will provide a useful input to user organizations (understanding of telecommunications developments), application developers and service providers (what telecommunications facilities are likely to be available), telecommunications industry (requirements and potential demand in the RT sector) and policy-makers (how to facilitate the take-up of useful applications).

Participants	Country	Role	Type
Work Research Centre	IRL	C	O
IDATE	F	P	O
empirica	D	P	O

Starting date
1 December 1993

Planned duration
24 months

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Corporate marketing to overcome the barriers facing disabled teleworkers

Project 1135 – COMBAT

Keywords: teleworking, technical solutions, business structures

COMBAT is designed to put in place the business structures, methodologies and technical solutions that will give disabled persons, through teleworking, better access to the rapidly growing information processing labour market.

Project description: The aim of the project is to explore technological and business mechanisms which open up the information processing labour market for teleworkers. COMBAT will not seek to invent new devices, but will establish a solutions methodology designed to adapt available technology to the needs of individuals in relation to specified jobs and skills required in the market place.

COMBAT is a unique attempt to form professional networks of disabled workers and their community-based enterprises. The business model to be explored represents a novel way of overcoming the fragmentation and lack of resources at local level through a framework which provides the necessary corporate support required for long-term economic success. The key to success is the creation of a structure which combines central marketing with product development, quality control and technological support.

The COMBAT consortium will have a strong user focus; it has been designed to balance the skills of technology experts, business experts and disability experts. Solutions and systems will be tested in real-life situations by expert users — disabled employees in community enterprises. Three pilot sites are envisaged in Spain, Ireland and the UK.

Technical approach: The technical aspects of COMBAT will be principally related to the creation of the solutions methodology. This methodology will devise tailored solutions to individual needs. It will examine appropriate technologies in the following areas: work stations, applications software, local area networks, call processing, public data and voice networks. The technical work will be mainly concerned with the integration of technologies to individual needs within the overall COMBAT business model and market research.

Impact and expected results: The expected outcomes of the project are:

(a) the devising of a generic solutions methodology for use by project partners and associates and possibly by others interested in the field;

(b) the creation of a central business unit capable of supporting local businesses in each Member State;

(c) the creation of operational businesses in at least three Member States;

(d) the market testing of information processing services which could provide commercial opportunities to disabled teleworkers;

(e) the continuing and active involvement by a range of development partners in providing pump priming and long-term investment for the overall business structure;

(f) the long-term involvement on the part of telecommunications and technology-based companies in sustaining technical solutions for disabled teleworkers.

Participants	**Country**	**Role**	**Type**
Outset	UK	C	O
Home Office Partnership	UK	P	I
The National Microelectronics Application Centre (MAC)	IRL	P	I
Centre for European Social Research (University College Cork)	IRL	P	U
IMDB	E	P	O
GHIS	IRL	A	O
IGL	B	A	O
Network Personnel (Workspace)	IRL	A	O
AEPA	F	A	O
Ayuntamiento de Granada	E	A	O
OAED	GR	A	O
BBW	D	A	O
EEEPD	P	A	O

Starting date
3 January 1994

Planned duration
36 months

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Technology transfer in RT for SMEs

Project 1144 – TT-RT-SMEs

Keywords: market identification, technology and product search, opportunity screening

The project aims to pilot the transfer of rehabilitation technologies with established market potential to SMEs.

Project description: This horizontal activity involves four main activities:

(i) Market survey of end-user requirements in relation to RT (Belgium, the Netherlands, Germany).

(ii) Search for relevant technologies.

(iii) Presentation to SMEs in interactive workshops.

(iv) Involvement of SMEs in developing and producing RT products/services.

Market survey: A market survey based on a literature review and inquiries to organizations that assist specific groups of disabled and older people will be carried out. The aim is to determine priority end-user requirements in relation to RT, based on field information. The results of this exercise will be the subject of a practical report that for the purposes of this project will be the basis for further action.

Technology search: In conjunction with the market survey, relevant technologies will be sought and screened for their suitability for use as examples in the diffusion exercise, i.e. during the planned workshops. The technologies will be categorized according to their functional use and the different industrial sectors they appeal to. They will be evaluated on the merit they show for implementation by SMEs. The objective is to create additional and new business for SMEs which want to implement these technologies.

Interactive workshop: In order to promote the technologies as well as the basic background of RT and its applications, workshops are to be held in the three Member States involved in the project. The interactive workshops will use a methodology that was developed by TIV and which is specifically geared at assisting companies in defining new products and services. The approach is to make a morphological analysis of all industrial sectors in order to indicate all possible avenues that can lead to a real prospect for new products and services.

Implementing technologies in SMEs: The aim of the consortium is to achieve technology transfer beyond the mere commercial agreements whereby one company would just sell products and services coming from another.

Technical approach: The following work will be carried out:

(i) Market and customer requirements inventory.

(ii) Data collection on the basis of existing technological solutions versus the requirements inventory.

(iii) Structuring data and preparation of workshop script.

(iv) Contacting and inviting SMEs to the workshops.

(v) Organization of the workshops.

(vi) Implementation through technology transfer assistance and concluding partnership agreements between companies.

Impact and expected results: This horizontal activity aims to have some 30 companies per country attending the workshops. It is anticipated that two agreements per participating country involving RT will be established.

Participants	Country	Role	Type
TIV	B	C	ON
Innotek	B	P	ON
W&W	NL	P	CO
IRV	NL	P	R
FTB	D	P	R
BIC (Frankfurt Od)	D	P	ON

Starting date
1 January 1994

Planned duration
18 months

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Mobility of blind and elderly people interacting with computers

Project 1148 – MOBIC

Keywords: visually disabled, mobility, GPS, travel aid

The purpose of this project is to increase the independent mobility of visually disabled people travelling in an unfamiliar environment by developing an orientation and navigation aid. The project will concentrate on blind people, but will also address the needs of partially sighted and elderly people.

Project description: Mobility often depends on the possibility of getting access to information. The project aims at overcoming the problems of blind people not having this information. Blind people cannot plan their journeys because they have no information about the route to be taken and the location to which they wish to travel. Orientation problems can result from having insufficient information about the position and the direction of their goal. Sighted people have access to a variety of information sources to prepare a journey, such as maps and timetables. For people with visual disabilities, access to these information sources is restricted. The innovative aspect of this project is to make such materials available to blind people both before a journey for planning, and during a journey for immediate consultation.

One objective of this project is to develop a prototype of an electronic travel aid comprising two interrelated components. A pre-journey system will assist the user to plan journeys. An outdoor system will carry out the prepared plans and will provide the user with navigation assistance in unfamiliar outdoor environments. The system consists of a handheld computer with appropriate input and output devices and a trip-management system. It will be based on technology emerging for non-disabled travellers like positioning systems, compass and telecommunication services. Fixed interfaces have to be specified to prevent the system from being outdated by the rapidly changing technology in this field.

To ensure the usability of the resulting system an extensive part of the project will focus on user requirements. This includes the participation of users in the design and implementation phase of the project. One outcome of the project will be a detailed specification of user requirements which will be device independent. Two major field trials are carried out to evaluate the project results against this specification.

The project considers standardization activities to ensure that the systems for visually disabled people are compatible with the products for non-disabled consumers.

Participants	Country	Role	Type
University of Magdeburg	D	C	U
Free University of Berlin	D	A	U
F. H. Papenmeier GmbH & Co. KG	D	P	I
BT Laboratories	UK	P	I
Royal National Institute for the Blind	UK	P	O
University of Hertfordshire	UK	A	U
University of Birmingham	UK	P	U
University of Uppsala	S	A	U

Starting date
3 January 1994

Planned duration
36 months

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An integrated netsystem for infoservice to disabled and elderly people

Project 1150 – INSIDE

Keywords: integrated netsystem infoservice, distributed database, health care and social information

INSIDE is an intelligent system — to access health care and related social information (legal, insurance, tax, cultural, etc.) distributed among various structured and unstructured data banks — which aims to provide an integrated information delivery service to older people.

Project description: The general objective of INSIDE is to provide an integrated information delivery service to older people through the use of an intelligent system to access health care and social information (legal, insurance, tax, cultural, etc.) distributed among various structured and unstructured data banks. Specifically, the system focuses on the geriatric diseases and the rehabilitation problems of older people. It is intended to be used as a test-bed model which will be exported on a European scale.

INSIDE will result in the development of an infocentre consisting of a local area network connecting a local database server and application-oriented workstations; a relational database management system (RDBMS) for the retrieval of the information, conceived as an intelligent index to local and remote data banks; a number of operator terminals accepting and processing telephone requests from users.

User access will be provided through telephone calls to professional operators, responsible for receiving, identifying and processing the request. Users will be both older people and professionals looking for specific information.

The innovative aspect of INSIDE lies in the availability of a unique, user-oriented interface (access point) to a large range of 'sensitive' information but using a uniform and simple procedure.

Technical approach: The main technical development will be structuring the raw information available in RDBMS tables, developing procedures for fast and effective data acquisition and update from different sources (paper, electronic, etc.), developing RDBMS applications for user interface, remote access or remote query execution, integration of local/remote connections and procedures.

The work will be carried out according to the following steps: specification of user requirements, selection/design of services to be provided, design of the organizational framework, architectural design, including local and remote RDBMS definitions, local and geographical connections, interface to users, links to external professionals and institutions,

RDBMS tables design, systems implementation and software development, installation and test-bed running, technical evaluation of the prototype, social impact evaluation and dissemination activity.

Impact and expected results: The work to be carried out in INSIDE mainly consists of the design, development and evaluation of a telematic service provider centre. The INSIDE consortium is committed to following a dissemination policy starting from a regional level but with the possibility of wider dissemination across Europe. To this end, each participant in the project will contact local authorities and institutions, both public and private, in order to make them aware of the existence of the system, giving them the opportunity to use the system themselves. In a second phase, concertated actions will be carried out in order to present/advertise the system at a macro-regional level (more European countries involved).

The commitment to apply the results of the project to health care and social assistance authorities at regional and national level will afford the opportunity to survey not only the impact on users but also the costs.

Participants	Country	Role	Type
Associazione Progetto Europa Salute	I	C	O
Biotrast-UETP	GR	P	I
Genoa University Department of Informatics, Systems and Telematics	I	P	U
South and East Belfast Community Unit	UK	P	O
TSD-Projects Srl	I	P	I
Sosiaali-ja Terveysalan Tutkimus- ja Kehittamiskekus	SF	A	R
Polytechnic University of Madrid	S	A	U
Instituto de Engenharia de Sistemas e Computadoras	P	A	R

Starting date
1 September 1994

Planned duration
24 months

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Modular software for augmentative communication aids and access systems

Project 1169 – COMSPEC

Keywords: modularity, architecture, software, communication, access

The COMSPEC project aims to develop and evaluate a common modular software platform on industry standard hardware for the production of communication aids and access systems for disabled and older people.

Project description: Economics alone highlights the impossibility of using existing tools to create sufficient bespoke specialized systems to adequately cover the breadth and expanding range of individual needs. The COMSPEC project aims to produce powerful development tools for use by the rehabilitation technology (RT) industry and easy-to-use configuration tools for rehabilitation professionals to create or adapt devices. The COMSPEC system will help to prevent further fragmentation of the RT industry by providing an open software architecture to support future enhancements and functionality, including 'plug-in' modules from software houses, end-user applications from system integrators (e.g. therapists, teachers, and rehabilitation professionals), and configuration and development tools.

The COMSPEC project is scheduled to be completed in two phases. The first phase is the current TIDE project TP1169 which will result in system software for the Windows platform, two exemplar COMSPEC applications (an environmental control system and a symbol-based communication aid), an introductory course, a small-scale evaluation programme, and a study on options for future support and marketing.

For software developers, the COMSPEC software resulting from TP1169 will comprise a programming environment and tools, and an initial library of re-usable C++ modules for input and output functions, rate enhancement, mouse/keyboard emulation, symbolic and text manipulation, and environmental control.

For rehabilitation professionals, state-of-the-art user-friendly configuration tools will be available to create or adapt aids for personal communication, computer access, and control of a range of devices. For the first time, the non-technical rehabilitation professional will be able to directly manipulate and connect objects on the screen representing functional components, and thus create or adapt end-user communication aids. In addition, user parameters (e.g. scan time) can be readily set or adjusted to meet the needs of individual end-users.

The second phase, for which resources will be sought elsewhere (i.e. outside of the TP1169 funding), will focus on the completion of the pre-competitive COMSPEC system for a number of platforms (e.g. Windows, Macintosh, NextStep) and applications into full-featured marketable products, a comprehensive user-evaluation programme, training and support materials, training courses, and creating a structure to maintain and support the ongoing development and marketing of the COMSPEC system.

Technical approach: The proposed COMSPEC architecture is based on object-oriented design principles, reuse of software components, and the application of industry standard platforms and application framework generators. The architecture includes asynchronous inter-process communication to provide a general mechanism for accessing external software and hardware connected to the COMSPEC system. The COMSPEC system will implement the feedback and control mechanisms of the architecture and include essential modules for handling input (e.g. from switches, mouse, keyboard), scanning techniques, rate enhancement, speech output, and interaction with other software. Additional modules will be implemented for symbol-based communication and learning; interfacing to standard control systems, such as the M3S bus; wheelchair control; industry standard serial communication; and infra-red links to environmental control systems.

The COMSPEC project will transfer into the RT industry the principles of modular object-oriented design and development, and multi-platform portability. The current project will focus on developing and evaluating the COMSPEC system for the Windows platforms. In addition, a study will be undertaken to prepare for porting COMSPEC to the emerging new generation of system platforms, such as NextStep, Pink, and Taligent.

Impact and expected results: The COMSPEC project will create, for the first time, a common platform for RT software. COMSPEC's open software architecture will support the adaptation and creation of additional functionality (in the form of modules), and provide an advanced configuration tool for non-technical rehabilitation professionals to tailor the modular system to client needs. The project aims to achieve the following outcomes: specification documents; system software, modules and tools for developers; configuration tools for rehabilitation professionals; additional modules for environmental control and personal communication; end-user evaluation report; dissemination and marketing report.

Participants	Country	Role	Type
The ACE Centre	UK	C	O
DART, Sweden	S	P	O
Silema	NL	P	I
Sintef	N	P	R
Handicom	NL	P	I
APPC	P	P	O
IGEL	N	A	I
Rehacom	D	A	I

Starting date
15 September 1994

Planned duration
36 months

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Voices, attitudes and emotions in speech synthesis

Project 1174 – VAESS

Keywords: speech, synthesis, communication aid

The VAESS project involves the development of a communication aid, improved quality and range of synthetic voices in four languages, and automatic speech labelling.

Project description: This project will develop a fully portable (hand-held) communicator with versatile, high-quality speech output. By combining the latest advances in speech technology with state-of-the-art hardware, we will extend the capabilities of current speech prostheses.

Currently, the use of speech-synthesis-based communication aids is adversely affected by their inappropriate and artificial voices, and by limited ability to express emotion efficiently. Provision of a genuinely personalized voice would be a major advantage over current aids.

The methods developed will be tested by implementing male, female and, if time permits, children's voices. An attempt will be made to include a range of attitudes and emotions in the synthesized speech, and to provide efficient user-control of these features.

Although the initial aim of the project is to produce a flexible speech communication aid for disabled people, the techniques developed would also have significant potential for exploitation in devices for non-disabled users. In particular, multimedia and home entertainment systems would benefit from more varied vocal styles, or even ones which could be modified by the users.

Other potential aids for disabled people would include 'talking newspapers' and electronic message systems (e-mail) with voices customizable by the user to increase intelligibility and reduce 'listening fatigue'.

Overall, the structure of the project will include the following steps:

(i) Study and manual labelling of speech features for voices, attitudes and emotion.

(ii) Development of automatic or semi-automatic labelling of above and conversion into text-to-speech control parameters.

(iii) Hardware platform development for operation with and without DSP.

(iv) Development of the user interface.

(v) Integration of the systems.

(vi) User evaluation of the systems and completion of the user interface.

The present Infovox synthesis technology, available for some 10 European languages, will be augmented and generalized to enable use in a variety of present and future devices for elderly and disabled people.

All the deliverables from this project have the potential for commercial exploitation. The combination of the Infovox speech technology and the small portable PC-based BiDesign platform will offer very strong competition to current European and non-European systems alike. The availability of such systems for two of the most widely used languages world-wide (English and Spanish) should make subsequent exploitation highly profitable.

One area in which it is aimed to establish measurable improvements over existing technologies is in automatic speech labelling. The aim will be to at least halve the error rate in the automatic speech labelling process.

Participants	Country	Role	Type
University of Sheffield	UK	C	U
BiDesign Ltd	UK	P	I
Center for Personkommunikation	DK	P	U
Kungilga Teknisca Hogskolan	S	P	U
Telia Promotor Infovox AB	S	P	I
Universidad Politecnica de Madrid	E	P	U
Barnsley District General Hospital NHS Trust	UK	A	O

Starting date
1 July 1994

Planned duration
26 months

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Human resources and management product interface

Project 1175 – HYPIT

Keywords: telework, disability, training, assessment

The HYPIT project is concerned with increasing the employment prospects of disabled people as teleworkers by producing and demonstrating suitable assessment, training and management software tools which will support the employer and disabled teleworker.

Project description: The HYPIT project is concerned with increasing the employment prospects of people with disabilities through their integration into employment as teleworkers.

The objectives of the project are:

(a) to produce and demonstrate suitable management decision-making and training tools to increase the employment prospects of disabled people, in particular in employment as teleworkers;

(b) to develop processes, procedures and technologies for the integration of the disabled worker into the enterprise.

More specifically:

(a) to develop and test a computer software system to support the employer in assessing the suitability of a specific job for telework, and the suitability of a particular disabled worker for that job;

(b) to develop and test a computer system which bridges the gap between the organization and the teleworker, supports integration of the teleworker into the organizational work flow and supports the organization in the management of the telework employees and jobs;

(c) to develop and test training packages to support disabled teleworkers in learning to use various communication systems and techniques;

(d) to promote the employment of people with physical, visual and learning disabilities as teleworkers in enterprises.

Technical approach: Disabled people can gain considerable benefits from the application of new technologies to enhance their skills and to overcome obstacles to their gainful employment. While technology helps facilitate this type of working, organizational and social factors still hinder progress. It is widely thought that this kind of work can develop only in relation to specific needs and types of jobs.

New teleworking models for disabled people must take into account the user expectations; they are integration into society and not the exclusion of disabled people at home, and reor-

ganization of work and leisure time in order to improve the quality of life. The project is committed to meeting user needs. These are the needs of disabled people, the needs of employers from small and large organizations and people responsible for the training of disabled people for employment in the information technology and telework fields.

The aim of the project is to develop processes, procedures and technologies for the integration of disabled people into employment as teleworkers. This will include development of management and assessment software and training tools.

Impact and expected results: The HYPIT project is developing and testing products in an insurance company. These products are applicable to a wider range of organizations, and will provide significant support to human resources development departments, telework managers, placement and training agencies for disabled people in State, non-governmental and private sectors. The level of innovation of the application of technology to support the integration of the disabled person into employment as a teleworker will make a substantial impact on the rehabilitation of disabled people.

Participants	**Country**	**Role**	**Type**
Toucan	UK	C	I
Ability Enterprises	IRL	P	O
Diputaciòn Provincial de Sevilla	E	P	O
ICL (Ireland)	IRL	P	O
Interactive Multimedia Systems	IRL	P	I
Coyle Hamilton	IRL	A	I
Department of Psychology, University of Wales, Swansea	UK	A	U

Starting date
3 January 1994

Planned duration
30 months

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Orientation by personal electronic navigation

Project 1182 – OPEN

Keywords: blind or partially sighted, navigation, orientation, underground railway

A wayfinding system for blind or partially sighted people for use within the metropolitan undergrounds of Europe.

Project description: The objective of this TIDE project is to help blind or partially sighted people find their way in the metropolitan underground systems of London and Paris. A consortium involving organizations representing blind or partially sighted people, industry and universities will develop a wayfinding system that can be used by all blind or partially sighted travellers throughout Europe. The navigation system will be based on the development of existing technology to help users find specific features of the underground system such as ticket areas, barriers, stairs, escalators, platforms and other obstacles and will provide information to aid orientation. Highly contrasting tactile surfaces may be further developed and set up in designated areas.

Technical approach: Appropriate existing technology will be investigated and adopted for use within the project, whenever feasible, to suit the needs and requirements of the user. The system will serve to enhance the information available to the blind or partially sighted user only on personal demand. The system will consist of a series of beacons mounted at key points in each station and a receiver worn or carried by the blind or partially sighted person. Messages will be sent from the beacons to the receivers using modulated infra-red beams. The beacons will be interconnected by a discrete independent network for the prototype trials. Once developed, the free-standing system will be integrated with the communication network of the metropolitan railway system. The blind or partially sighted user will receive a message or information transmitted by the beacon in an appropriate European language. The message may either be fixed in time, that is to say simple messages such as the user's location within the station and how to proceed to another part of the station, or vary with time such as the destination and time of the next train arriving on that platform. The user can decide whether to access the information available.

Impact and expected results: The aim of the project is to raise the level of information available to the blind or partially sighted user towards that level of information available to the sighted user. This must be achieved in an unobtrusive manner acceptable to the blind or partially sighted user. Information must be given only when required and requested by the user, and in a form that does not interfere with the normal reception of audio data, which the blind or partially sighted user relies upon rather more than the sighted user.

The metropolitan railway systems of London and Paris have an interest and duty to provide improved facilities for blind or partially sighted users. Possum Controls, as a leading UK manufacturer of equipment for the disabled are ideally suited to oversee the engineering design and to manufacture elements of both prototype and final design equipment. SEAL in Italy have already developed guidance systems for blind or partially sighted people that can be refined and used within the project. The University of Portsmouth along with the partners expect to continue developing guidance systems in public areas and other transport systems used by blind or partially sighted people.

Participants	**Country**	**Role**	**Type**
University of Portsmouth Enterprise Ltd	UK	C	U
London Transport/London Underground Ltd	UK	P	I
Possum Controls Ltd	UK	P	I
Royal National Institute for the Blind	UK	P	O
Seal SA	I	P	I
Fédération des Aveugles et Handicapés Visuels de France	F	A	O
Infovisie vsw	B	A	O
Régie Autonome des Transports Parisiens	F	A	I

Starting date
3 January 1994

Planned duration
36 months

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Development of an interactive communication training system using interactive media

Project 1189 – DICTUM

Keywords: interactive learning, deafness and hearing-impairments, communication training

DICTUM will develop an interactive system which will allow hearing-impaired users to independently train their communicative hearing functions and sign language skills in their home environment.

Project description: Improving the possibilities for the social, economic and educational integration of hearing and hearing-impaired persons is the intrinsic objective of the project. It is felt that the way to reach this goal will be to create a flexible training system that will help improve communication skills of both hearing-impaired persons as well as hearing people. At present there is no tool with which people can individually and independently train (aspects of) communication skills. Therefore, this project aims at the technological development of an interactive communication training platform with which communication possibilities for the hearing-impaired people in Europe can be improved, and which can be used in the home environment as a supplement to clinical training sessions and sign language courses. This interactive training tool should be easy to use, preferably self-explanatory, and designed in such a way that clients can use it independently. The ultimate goal is to develop a prototype system that can be transferred onto compact disc interactive (CD-i). Innovative rehabilitation aspects are: realizing a home-based, user-friendly and cost-effective training system, extending aural rehabilitation (i.e. hearing-aid fitting) with training, and integrating speech and sign language training in one system.

Technical approach: Software will be developed in such a way that it will allow independent and individual training. The system will be modular (having a microworld as a general basis), each module addressing a different communication aspect or addressing the same aspect in different ways. The training tool will also be language independent, to guarantee widespread use throughout the European Union. This will be realized by designing the system in such a way that different European languages are considered as data; the user can determine which language (most likely his mother tongue) he would like to practise. The system will initially be developed on a PC platform which makes rapid prototyping possible. Technical innovation aspects include developing the conversion process from a flexible PC platform to CD-i end-product. During the course of the project other environments/carriers in addition to CD-i will be studied.

Impact and expected results: The incorporation of more than one language will set a standard for future interactive software technology for multilingual applications. Despite all technical innovations still in progress, the use of CD-i technology will ensure that the future product will conform to the appropriate international standards, which will make widespread dissemination throughout the European Union possible. Full motion video on CD-i has recently been accepted as the basis for future international standards.

Participants	Country	Role	Type
Instituut voor Doven – IVD	NL	C	O
Computer Technology Institute, Patras	GR	P	U
HADAR Foundation	S	P	O
Philips	NL	P	I
SPC/CODIM	NL	P	I
University College London	UK	P	U
Laryngograph Ltd	UK	A	I
Spraakgestoorden (KIDS), Hasselt	B	A	O
University of Bristol	UK	A	U
Universität Düsseldorf	D	A	U
Koninklijk Instituut voor Doven en Spraakgestoorden			
University Hospital Rotterdam	NL	A	U

Starting date
3 January 1994

Planned duration
30 months

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Transport utilizing rehabilitation technologies leads to economic efficiency

Project 1194 – TURTLE

Keywords: deregulated markets, design for all, public information, real-time, telematics, transport

TURTLE is developing a prototype real-time public information system (transport) which will work in all market situations, and which takes full account of the requirements of disabled and older people.

Project description: The main objective of TURTLE is to develop and give a trial to a real-time information system which has as its main focus the needs of disabled and older people. Many disabled and older people do not use public transport. The major reason for this is lack of access to the information needed to make use of services. A key difficulty facing disabled and older public transport users is a lack of certainty: not knowing when a service is due, not knowing if it has been delayed, not knowing the route of a particular service, or not knowing if the service is physically accessible.

Paper-based information services are not appropriate to deal with these problems. Alternative telematic solutions developed by public authorities to overcome these difficulties:

(a) are expensive;

(b) use dedicated transmission networks;

(c) require special adaptations of vehicle fleets;

(d) present problems where services are deregulated;

(e) are not designed for use by the entire community.

TURTLE has been initiated to overcome these difficulties. It will develop and give a trial to a public information system. Teletext has been selected as the main transmission media because of its low cost to individual users, and it is already available in many homes. Information will also be made available through public information terminals. The system will be capable of implementation throughout Europe.

Technical approach: Preliminary studies by partners indicate that the majority of telephone traffic in Europe is generated by local organizations supported by social spending. These

need to ensure that they are gaining value for money for the communities they serve. Lack of telematic systems designed for everybody means this is not possible. TURTLE will work with disabled and older people, cities, transport and telematic service providers to provide these services.

Impact and expected results: The consortium intends to demonstrate that developing telematic services around the functional requirements of disabled and older people makes commercial sense, provides services accessible to all, and has quantifiable social and economic benefits. Public transport services are the wide area information networks of local communities throughout Europe. These are of strategic importance in the development of 'electronic communities'. TURTLE will explore these issues fully, and make results available to all sector actors.

Participants	Country	Role	Type
Tyne and Wear Passenger Transport Authority	UK	C	O
Dublin Institute of Technology	IRL	P	U
Online PARK GmbH	D	P	I
SNRU, University of Northumbria	UK	P	U
Technology Applications Group	UK	P	I
Network Ticketing Ltd	UK	A	I
Equality City – City of Newcastle upon Tyne	UK	S	O
Central Remedial Clinic	IRL	S	O
Mediaport GmbH	D	P	I

Starting date
15 June 1994

Planned duration
18 months

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Vocational integration through computer assistance for intellectually disabled people

Project 1199 – VICAID

Keywords: severe intellectual disabilities, vocational integration, supported employment, palmtop microcomputers

VICAID will develop and evaluate a system, based on the use of palmtop microcomputers as prosthetic aids, to support people with severe intellectual disabilities to perform complex work routines in integrated work settings.

Project description: Severe intellectual disability is frequently associated with long-term unemployment. Supported competitive employment is an innovative service response in which staff assist disabled persons to find jobs and then provide individualized one-to-one training at the actual work site. Its development has, however, been limited by the substantial amount of staff time invested, not only in initial training, but in ongoing prompting and support.

The VICAID project will develop a system using palmtop microcomputers as job aids providing prompts and detailed instructions to assist people with severe learning disabilities to maintain performance of complex work routines without direct trainer support. The system will also have the capacity to fade prompts over time, thus increasing worker independence.

A comprehensive training package will teach agency staff and co-workers of disabled workers to programme the palmtop to deliver a series of prompts appropriate to a specific job, and to support the disabled worker in using the device.

Technical approach: The VICAID project will begin by defining and analysing the user needs and setting demands related to persons with severe intellectual disabilities in supported employment, reviewing existing educational technology and instructional procedures, and developing decision models for matching instructional approaches to user needs.

We shall develop input/output devices which enable persons with severe learning disabilities to use palmtop machines in real workplaces without compromising portability and robustness. Radically simplified key input and graphical display output will be complemented by facilities to connect alternative input/output devices tailored to individual needs. The software developed will function in two areas, the first allowing a co-worker to programme a complex sequence of job prompts into the palmtop, and the second enabling the disabled person to flexibly access prompts as necessary. The training materials will comprise documentation, video and software for co-workers and support staff.

Throughout the VICAID project, an interactive design and testing process will involve people with severe intellectual impairments in evaluating the effectiveness and acceptability of the devices in laboratory and real-world work settings and identifying areas for improvement.

Impact and expected results: It is expected by the end of the project to have developed and evaluated full working prototypes of the hardware, software, and training materials which together will comprise an integrated support package. The project will considerably improve access of persons with severe intellectual disabilities to real work opportunities by enabling a significant reduction in the costs of supported employment services.

The project developments will also facilitate access of persons with a range of cognitive and sensory disabilities to palmtop computers, opening up possibilities for using IT much more flexibly to solve problems of everyday living.

Participants	**Country**	**Role**	**Type**
Work-Place of Leicester Ltd	UK	C	0
Department of Psychology, University College Dublin	IRL	P	U
Arden European	UK	P	R
Instituto de Engenharia de Sistemas e Computadores	P	P	R
Behaviour Analysis Unit, University of Leiden	NL	P	U
Department of Psychology (Clinical Section), University of Leicester	UK	P	U
Faculdade de Motricidade Humana, Universidade Tecnica de Lisboa	P	P	U

Starting date
9 January 1995

Planned duration
36 months

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The development of a printing system for sign languages

Project 1202 – SIGN-PS

Keywords: sign language, automatic sign recognition, sign writing

Sign language and signed information are usually recorded using video, photographs, or line drawings. The SIGN printing system will allow users to record signs and signed texts efficiently in a standardized and highly readable format, using the computer.

Project description: In 1988, the European Parliament passed a resolution stating that the sign languages of the European Community be officially recognized by the Community as well as by those Member States which did not already do so, and that any remaining obstacles to the use of sign languages be abolished. The SIGN-PS project intends to remove one of the remaining obstacles: the absence of a writing system for sign languages.

Technical approach: The SIGN printing system will consist of a sign font that can be used to represent signs on paper, a sign and document editor, and special purpose sign input devices. A prediction system with ready-to-use sign representations will be included in the system for easy use. At the same time, it will be possible for the user to edit or create sign representations at will, making the system flexible and sign language independent.

Two low-risk input devices (mouse/keyboard and datatablet) will allow the user to input signs by sequentially specifying sign parameters: the handshape, location and orientation of the hand, and the movement of the hand. For fast and more natural input of signs, prototypes for two 3-D sign input devices will be developed: a glove-based system and a video-based system. These 3-D input devices will allow the user to present complete signs to the system for real-time automatic recognition.

Impact and expected results: The SIGN printing system will facilitate the production of documents in sign language, ranging from sign dictionaries and sign language grammar books, to sign poetry and computer manuals translated into sign language. These documents can be used by anyone who wants to learn or use sign language; more important, however, will be the use by prelingually deaf children and adults. Research has shown over and over again that the majority of prelingually deaf persons have only a limited command of the spoken language of the hearing community – whether in spoken or in written form. As a consequence, most of them are functionally illiterate. As stated above, the European Community has recognized that sign languages allow prelingually deaf people equal access to communication; a sign printing system will also allow them equal access to printed information.

Participants	Country	Role	Type
IRV	NL	C	R
Lehrstuhl für Technische Informatik der RWTH-Aachen	D	P	R
MicroCentre	UK	P	U
RNR	NL	P	I
Handicom	NL	P	I

Starting date
1 July 1994

Planned duration
36 months

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Portable optoelectronic vision enhancement system for visually impaired persons

Project 1211 – POVES

Keywords: vision enhancement, optoelectronic spectacles, visual impairment, image enhancement

POVES aims at the development of optoelectronic spectacles which make use of image enhancement and image manipulation techniques in order to improve mobility of visually impaired persons, in particular individuals with night and colour blindness, decrease of visual field and disturbance of contrast vision.

Project description: About 80% of all information processed by an individual in everyday life is of visual origin. However, more than three million Europeans cannot make full use of this information due to various kinds of visual impairments. As a consequence, mobility, reading capability, professional and leisure activities of this group of handicapped people are severely restricted. Traditional aids for the visually impaired mainly aim at the improvement of stationary reading ability (e.g. closed circuit TV), but only a few aids with limited stationary scope aim at improving orientation (e.g. conventional monoculars).

By contrast, POVES makes use of modern optoelectronic technology in order to develop a small-size head-worn device to improve everyday mobility and ambulant perception of the environment for the visually impaired.

POVES will be a modular system to be used by persons with the following types of visual handicap:

(i) night blindness;

(ii) decrease of visual field in the centre;

(iii) decrease of visual field in the periphery;

(iv) colour blindness;

(v) disturbance of contrast vision and of acuity.

Technical approach: The project will be carried out in five phases.

In the preparatory phase an in-depth study of eye disorders and their effect of vision as well as a quick market study of potential POVES users will be made. The phase will also include a description of the state of the art and an investigation of test and learning methods for users. During the simulation phase, component simulators will be developed to test image transformation software and to define system specifications.

In the third phase, integrated functional systems will be designed (on bread board) for the different classes of visual impairment. Also extensive field trials with well-selected samples of visually impaired persons will take place in order to evaluate and optimize the system and to define learning strategies.

The fourth phase serves to develop the prototype of a night vision system and to design POVES for other classes of visual impairment.

Finally, documentation and production preparation of the night vision aid will be completed.

POVES will consist of two main components:

The spectacle part with the reception function (e.g. CCD camera) and the image display function (e.g. LCD) as well as the pocket part with the processing function and the energy function.

Impact and expected results: By the end of the Bridge phase of TIDE, the POVES project will have developed the prototype of a night vision aid for ambulant use by persons suffering from night blindness and disturbed contrast vision. Also, the design of POVES for other classes of visual impairments (e.g. tunnel vision) will be completed.

Once on the market, this device will substantially increase independent mobility of night-blind persons after sunset and contribute to the improvement of access to the workplace, in particular during the winter season. Results of R&D as well as components of POVES will have a much wider market than the visually impaired and the people working during the night: miniaturized hardware components as well as software functions may be transferred to other industrial applications.

Acceptance of POVES by users will not only depend on its final price and user-friendliness but also on its uptake by rehabilitation teachers, health insurance systems and State support agencies.

Participants	Country	Role	Type
Jurca Optoelectronik GmbH, Rodgau	D	C	I
UCL/ Neural Rehabilitation Engineering Laboratory, Brussels	B	P	U
UCL/Microelectronics Laboratory, Brussels	B	P	U
TUW/fortec, Vienna	A	P	U
CAE Electronics GmbH, Stolberg	D	P	I
empirica Delasasse GmbH, Cologne	D	P	I
University, Eye-clinic, Torino	I	A	U
University, Cognitive Systems Laboratory, Hamburg	D	A	U

Starting date
3 January 1994

Planned duration
28 months

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Multilingual speech to face-movements transformation for use as a training system in lip-reading and language acquisition and as a basis for a new telecommunication service

Project 1215 – SPLIT

Keywords: telecommunication, speech conversion, synthetic animation, lip-reading

The objective is to develop a telecommunication service for hearing-impaired persons which converts the speech, issued from a telephone, into a synthetic animation of a face to allow lip-reading

Project description: Interpersonal communication between a hearing person and a hard of hearing person is only possible if the speech is converted into visual information which can be understood by the disabled person. The concept of SPLIT is to convert the speech signal provided by telephone lines into a synthetic animation of a face.

The aims are to design, develop and test two applications:

(a) a prototype service of conversion (relay mediation service) and the terminal;

(b) a PC station prototype for lip-reading training and language acquisition with Cued Speech (Cued Speech is a coding system adapted to 42 languages which facilitates lip-reading).

Both systems are based on conversion of speech analogue signal into lip readable animation of a mouth image on the terminal screen. The SPLIT terminal represents a significant aid for multilingual training, and enhanced telephone communications.

Technical approach: Since the analogue speech signal reaching the SPLIT terminal is corrupted, suitable filtering algorithms are to be devised to restore acceptable quality speech digital conversion. The algorithms for speech processing and lip movements will be defined, implemented, tested and tuned in the context of a constant interaction with the end-user associations which will provide the necessary expertise and the specific know-how. Moreover, these conversion algorithms will be designed in such a way that they are able to work in the telephone environment (telephone speech signal). That ensures the possibility of integration and testing in the mediation relay service (Italian language).

The main project outcomes will consist of software packages to perform the following speech-to-face movement transformation. This software package will be integrated on a PC architecture for training application and prototype relay mediation service.

Impact and expected results: Multimedia approaches to interpersonal communication represent a formidable means of overcoming most of the impairments affecting communication with older and disabled people. The medium goal of this project is the deployment of the existing telephone network for new services oriented to hearing-impaired persons, by means of low cost acoustic-to-visual conversion.

This innovative conversion will be experimented during this project in training application to show the applicability of such transformation for language acquisition and the training of lip-reading.

Participants	Country	Role	Type
Anpeda	F	C	O
CESI	F	P	O
CSC	B	P	I
CSELT	I	P	I
DIST	I	P	U
TUB	D	P	U
UCD	IRL	P	U
Fiadda	I	A	O

Starting date
1 July 1994

Planned duration
24 months

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Virtual environment technologies in rehabilitation: a new approach to motor dexterity disabilities

Project 1216 – VETIR

Keywords: motor dexterity disabilities, virtual environments, man-machine interfaces, force feedback

Utilization of virtual environment (VE) technologies, including head-mounted displays, force feedback systems and high rendering computer graphics, to address the care of motor dexterity disabilities of the upper limb and of the hand.

Project description: The VETIR project addresses a new approach, based on the exploitation of VE technologies, to the assessment of motor dexterity disabilities as well as to the restoration and enhancement of motor dexterity functions for people with disabilities.

The objective of the project is to evaluate and confirm the possibilities that VE technologies can be applied to the field of rehabilitation and, in particular, to the care of motor dexterity disabilities for patients with brain vascular lesions and consequent motor dysfunctions.

VE technologies consist of interface systems allowing the user (the patient) to interact with a virtual environment or scenario simulated into a computer (usually a graphical work-station). The interface systems comprehend all the components capable of representing the virtual scenario as well as all those systems devoted to recording the user's movements. The systems also replicate sensory stimuli such that the user is provided with a realistic sense of presence in the simulated environment. The user, wearing the different interface systems, is able to perform movements of his/her limbs (hands, arms) and head and see them reproduced in the simulated environment. At the same time, due to the action of the different afferent interface systems, he/she can grasp and move objects by receiving adequate sensory feedback stimuli in terms of visual representation, sounds and contact forces.

The basic idea of the VETIR project is that of generating a simulated rehabilitation environment with which the patient can directly interact with the same means and procedures he/she performs in a real rehabilitative gymnasium. The unique features of VE systems, particularly in terms of sensory feedback modalities for the user and behavioural components of the simulated entities, are purposely exploited in order to optimize the rehabilitation procedure both in terms of time related to the completion of the whole therapeutic approach and also in terms of enrichment of rehabilitation methods which are intrinsically not feasible in a real environment.

The chosen approach will be limited to the diagnosis and treatment of disabled people with motor dexterity disability of the upper limb and of the hand. Recovering human hand motor capabilities represents one of the most interesting aims in rehabilitation, due to the positive implications on social, psychological and operative recovery of the patient. The fundamental point of the rehabilitative approach of the VETIR project is that the user is directly involved in the control of the operations to be performed in the virtual environment. The whole therapeutic process will be extended to the three main aspects of the rehabilitation procedure: (a) assessment, (b) restoration and (c) enhancement of the specific patient's motor dexterity function.

Technical approach: The utilization of virtual environment techniques for the assessment and restoration of motor dexterity disabilities (one of the most critical branches of rehabilitation) is innovative *per se.* The development of the appropriate VE system will be protocol and user driven. VETIR as a first step will design and plan the rehabilitation protocols to be carried out in the virtual environments together with the analysis and definition of the hardware and software requirements. Based on these specifications, the design and realization of a prototypical VE system will be performed. In particular, the design of the required user-computer interface systems and of the software for the modelling and graphical representation of the VE will be addressed. Iterative user trials and hardware-software components refinement will then be done. Each step of the activity will be verified by experts in the field of rehabilitation in order to assess the match between the adopted technical solutions and the user's requirements and safety.

Impact and expected results: Mid-term results can be obtained in terms of specific interface and feedback systems for the user: their commercialization will be planned before the end of the project. Results of the VETIR project can be described as (a) advanced interface systems and associated control methodologies, and (b) software packages for graphical representations and modelling of the VE entities. Results of clinical tests based on the designed rehabilitation protocols performed by a specific group of disabled users will be provided.

The impact of the expected results of the project in the field of rehabilitation can be remarkable. Today's methods for functional recovery are mainly characterized by the usage of therapeutic exercises which are suggested by physicians and are under their clinical control with little help from technology. VE technologies, on the contrary, introduce a more rigorous clinical documentation methodology offering a very interesting tool to accelerate the recovery process. Recent worldwide interest shown in VE technologies witnesses their promising development possibilities in rehabilitation.

Participants	Country	Role	Type
Scuola Superiore S Anna	I	C	U
Ferrari Engineering SpA	I	P	I
Head Acoustics GmbH	D	P	I
USL Conca Ternana	I	P	O
Medialab	F	A	I
Ruhr-Universität Bochum	D	A	U

Starting date
1 July 1994

Planned duration
36 months

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Optimal speech communication assistance for residual abilities

Project 1217 – OSCAR

Keywords: speech analysing hearing aid, noise resistance, adaptability, acoustic and vibrotactile stimulation, multi-language assessment workstation

The OSCAR project aims to develop and evaluate a novel acoustic and vibrotactile speech analysing hearing aid that is adaptable to the needs and sensory abilities of a wide range of the severely, profoundly and totally hearing disabled population.

Project description: Modern technological support will be provided for the severely, profoundly and totally hearing disabled population in Europe in three vital areas. First, by the development of a family of innovative wearable DSP-based (digital signal processing) demonstrator prostheses which optimally meet the communication needs of the disabled individual by the best use of uni- or bi-modal stimulation of the auditory and tactile senses. Second, in building on the progress of the TIDE project STRIDE, by the utilization of new speech selective analysis methods to extract essential speech information in noisy and reverberant environments combined with psychophysically determined methods for the matching of information to residual sensory ability. Third, by the introduction of an integrated set of poly-language and language independent tools for assessment and training designed to be implemented via a common workstation.

Technical approach: The main technical elements relate to a process of selective information reduction and the matching of key speech elements to residual auditory and tactile sensory ability. The OSCAR demonstrator comprises a speech processor using state-of-the-art digital signal processing technology, with interfaces to both acoustic and multiple tactile transducers. The inherent flexibility of the demonstrator allows the choice of analysis and matching approaches according to the individual needs and abilities of a range of hearing disabled users

Impact and expected results: The work addresses a core population of 200 000 severely and profoundly deaf people in Europe who do not benefit substantially from current aids. Worldwide, the potential size of the market is disproportionately greater since more than half of the globe's inhabitants are tone language speakers who in the case of extreme deafness are even more difficult to understand. This inherently heterogeneous population is currently served by a diversity of specialized aids. The OSCAR demonstrator is planned as the forerunner of a truly versatile product which can meet the needs of many, and so allow economies of scale in both manufacture and individual fitting. The availability of common

tools for quantitative assessment which can be used across languages is also important in the development of a single market for the severely and profoundly hearing disabled. Such tools will lead to a reduction of the present fragmentation and support for a more unified approach to aid provision.

Participants	Country	Role	Type
University College London	UK	C	U
CNRS Parole et language (Aix)	FR	P	U
Instituut voor Doven, St Michielsgestel	NL	P	O
KTH	S	P	U
Oticon A/S	DK	P	I
University Hospital Utrecht	NL	P	U
CCA	FR	A	I
Laryngograph Ltd	UK	A	I

Starting date
1 June 1994

Planned duration
30 months

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Disabled and elderly people flexible integrated environment

Project 1221 – DEFIE

Keywords: generic model, multimedia, speech technology, external service and application integration, home system, APIs

DEFIE develops an intelligent integrated system which, through the exploitation of current multimedia and speech technologies, makes available services and applications through a flexible and adaptable user interface.

Project description: Some stand-alone solutions which aim to support independent living are currently available on the market. However, these systems provide limited or poor solutions that can solve only a limited subset of user needs – a multitude of isolated solutions. In contrast, the DEFIE project extends and integrates, within a common framework, existing technology, components, interfaces, control devices, home appliances, single-solution packages, telecommunications and external services and new developments. New sensory-motor interface styles based on properly combined devices (e.g. voice) permit an increase in user perception and interaction capabilities. Taking into account slight configuration differences, the system will also be practical for non-disabled persons.

Technical approach: The goal of this project is to develop a generic model and an intelligent integrated system with a friendly and safety-critical user interaction. Different types of I/O and control devices will be integrated to allow the use of the same system by a larger group of users including different categories of disabled, older people and persons with degenerative diseases. DEFIE will provide the basis for the development of a multimedia and multifunction system that integrates existing hardware and software solutions. Hardware and software subsystem mutual dependencies and interoperability will be provided in a transparent manner to the user. Conventional and specially designed I/O and control devices will also be supported by the system. Definition, implementation, and standardization of a small set of universal 'hooks' (i.e. libraries) will facilitate the integration and development of new external applications and services. Particular attention will be focused on speech technology through the integration of multi-lingual voice recognition and synthesis. Following the DEFIE model and its architecture, alternative and redundant I/O capabilities will be integrated to provide easy access and control of home appliances, applications, telecommunications and external services.

Impact and expected results: The importance of providing user-friendly access to home/office equipment and services/applications is universally recognized (e.g. The Americans with Disabilities Act 1990, relevant European Commission directives). The demand for open and multifunctional systems (with I/O and control device redundancy) which are able to interface existing applications, services and external equipment, represents an important market. 'Design for special needs' in environment control equipment, telecommunication and computer multimedia systems is cost-effective and leads to beneficial innovations and products for non-disabled users. In addition, DEFIE intends to provide an efficient autonomous control and monitoring of the external world. The system can partially or completely eliminate assistance provided by relatives or external personnel with important implications for cost reduction. At medium term (about one and a half years) the first installation of the DEFIE system will be installed and provided to a sample of users. The subsequent industrialization and commercialization will be based on the production of low-priced software packages.

Participants	Country	Role	Type
Rigel Engineering	B	C	I
ARTEC	I	P	I
CIG	NL	P	O
CNR	I	P	R
AISM	I	A	O
Cettico	S	A	O

Starting date
1 December 1993

Planned duration
27 months

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Horizontal action for the harmonization of accessible structured documents

Project 1226 – HARMONY

Keywords: standardization, structured documents, print disabled

HARMONY aims to promote the use of structured documents within the publishing community in order to increase the quality and quantity of accessible documents.

Project description: The HARMONY horizontal action is a follow-up to the two previous CAPS projects (TP 136 and TP 218). Within HARMONY the consortium will try to increase the quantity and quality of documents accessible to the print disabled. To accomplish this goal, the publishing community will be stimulated by means of involvement and lobbying with standardization being a key issue.

The use of the ISO standard SGML (standard generalized markup language, ISO 8879) will be encouraged. The HARMONY consortium expects to stimulate an increase in accessible newspapers through the use of the European interchange format (EIF) developed in CAPS, and other SGML-based techniques. Publishers will be urged to introduce and incorporate these techniques within their organizations.

By using the CAPS information access model, the creation of new entry-points to the rehabilitation market will be facilitated. Through standardization HARMONY wishes to increase the participation of the information suppliers in the resulting increased market.

Technical approach: Actions towards newspaper publishers and editors, and service providers will be initiated to increase the accessibility of their information. A platform for discussion and cooperation will be created on a European and worldwide scale. By this means, the HARMONY consortium will try to remove the obstacles inhibiting availability of information to the print disabled user, thereby enabling a dramatic growth of accessible information.

Technical support will be provided for the promotion strategy. The EIF will be further maintained and updated – the breakthrough of the EIF is closely related to the support that can be provided to new users. New developments in the SGML field will be closely followed.

By keeping in close contact with organizations such as ICADD (International Committee on Accessible Document Design) and standardization organizations, the consortium will promote the needs of people with print disabilities by putting forward its ideas for the incorporation of new standards.

A workshop on accessibility of documents will be organized in 1996 and will be a focal point for the dissemination of the results of the HARMONY action.

Impact and expected results: The consortium's concern that there is still little written information available to people with print disabilities compared to the non-impaired population is one of the main problems to be tackled.

Through the HARMONY information dissemination plan, the consortium hopes to reach as many involved and interested persons and organizations as possible in the promotion of the use of structured texts, particularly newspapers.

HARMONY intends to convince publishers and suppliers to use and provide documents in an accessible format for the print disabled.

Participants	Country	Role	Type
Katholieke Universiteit Leuven	B	C	U
Royal National Institute for the Blind, London	UK	P	O
University of Bradford	UK	P	U
Sensotec NV, Brugges	B	P	I
Vlaamse Uitgeversmaatschappij, Groot-Bijgaarden	B	P	I
Handicap Institute, Vällingby	S	P	O

Starting date
1 October 1994

Planned duration
24 months

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Autonomous system for mobility orientation, navigation and communication

Project 1228 – ASMONC

Keywords: blind, elderly, mobility, orientation, navigation

The autonomous system for mobility, orientation, navigation and communication is an easy-to-use portable aid for blind, low-vision and older people which enables them to find their way in unknown (e.g. city) environments.

Project description: Currently there are no versatile mobility aids available which allow blind or elderly people to travel independently in unknown environments. One of the most commonly used aids is the long cane which allows a blind person to avoid obstacles (mobility). Orientation and navigation, however, have to be handled by the blind person himself/herself, and as a consequence he/she can only be autonomous in a familiar environment. The other very common mobility aid is the guide dog which provides a blind person with some help with orientation since the dog can be told to find stairs or doors. None of these aids will help a person to find their way in a totally unknown environment.

The objectives of the ASMONC project are:

(a) mobility and orientation: to provide a system which will give local guidance to blind people so that they can walk confidently in areas with, for example, street and office furniture, and handle kerbs and steps;

(b) navigation: to provide blind or partially sighted persons with accurate information regarding location (in towns and in the countryside) to allow them to find locations even in unknown environments;

(c) communication: to provide partially sighted or older people with communication services like help requests, guidance to bus stops, etc.

Technical approach: The software and hardware resulting from the project will include a demonstrator hardware, probably in the form of a rucksack with sensor attachments and a special 'guidance and interface-handle', including high processing power and systems software to coordinate and manage internal functions and the interface.

Developments needed include:

(a) close-range sensing (ultrasound, infra-red and video sensors with associated evaluation processing);

(b) a navigation component (small receivers for satellite navigation systems plus simple inertial sensors and dead reckoning);

(c) an extremely simple-to-handle interface which needs to be combined with a mobile cellular-phone module (GSM, speech and digital system information).

Impact and expected results: Innovative aspects of the project include: the combination of the system features with a special ergonomic and easy-to-use guidance and communication interface using mechanical forces, vibrators, reliable speech recognition (about 20 words only), a synthetic speech output plus a normal phone. The system cannot only be used by blind people, but also, through use of the automatic help requests, by mentally disabled or older people.

It is estimated that about one to two million blind, low-vision and/or older persons, as well as other groups of disabled in Europe, could potentially benefit from this system. It is clear that the need for such a system exists – a need which is not addressed, for example, by guide dogs, in particular the positioning aspect of the system.

Participants	**Country**	**Role**	**Type**
Audiodata Medichip GmbH	D	C	I
University of Oxford	UK	P	R
Avionik Zentrum Braunschweig	D	P	I
Thomson CSF LCR	F	P	I
Irish Guide Dogs Association	IRL	A	O

Starting date
1 October 1994

Planned duration
36 months

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Tactile acoustic computer interaction system

Project 1229 – TACIS

Keywords: blind, computer, interaction, tactile graphics, training

The tactile acoustic computer interaction system is an innovative computer I/O device which enables blind and low-vision people to create tactile graphics output interactively and to explore them using a PC.

Project description: Tactile access to information for blind people nowadays is still based more on textual information than on graphics. One reason is that education of blind persons lacks graphical examples and materials and the possibility for automatic creation of such graphics from visual graphics and pictures. The main medium to present tactile graphics is still paper, since different developments on electronic/electro-mechanical tactile arrays for graphic displays have not been very successful, i.e. very expensive or unreliable.

TACIS can act as an access device for about 100 000 visually impaired white-collar workers in Europe. TACIS is a computer-based tool with an interface having unique, two-dimensional multimedia properties as well as tactile hardcopy. This unique approach results in ideal systems for widespread use in education and training. TACIS makes a broad spectrum of information available to over one million people. The cost of the system will be reasonable which is a very important consideration for blind users. No tactile graphic interactive device on the market meets that condition.

Applications are:

(a) workstations running educational or tutoring programmes;

(b) training device and additional interface to make graphic user interfaces accessible to blind users. The blind user will be able to understand what Windows looks like and will be able to interact with the system via the touch pad;

(c) access to graphics and diagrams on black print source, by scanning and processing;

(d) electronic maps for blind people who need not be PC users. A good example will be our evaluation program 'Dublin by touch' where blind users are able to examine tactile (street-) maps, getting information and guidance from 'tonescapes' and synthetic speech;

(e) in addition, other graphic printout material can be examined using TACIS.

TACIS will also be particularly suitable for training visually impaired persons in schools or job programmes. The system will be inexpensive particularly in the context of the benefits derived from its use.

Technical approach: The work will involve research into noiseless printing methods, related multimedia perceptual studies, tones (tonescapes), synthetic speech, systems software, graphics simplification for tactile display, software integration of synthetic speech and two-dimensional 'tonescapes' and software tools for the generation of application programmes.

Impact and expected results: The aim of the project is the creation of a new type of interactive tactile graphic display for a broad spectrum of tactile applications and works. An evaluation of the course in city orientation – 'Dublin by touch' – will provide an overview of system properties and pointers to improvements for the future.

Participants	Country	Role	Type
Audiodata Medichip GmbH	D	C	I
National Council for the Blind of Ireland	IRL	P	O
Index Braille Printer Company AB	S	A	I
Du Pont de Nemours SA	L	A	I

Starting date
1 February 1994

Planned duration
36 months

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Profound deaf people rehabilitation with new speech/sound processing systems

Project 1230 – PROSOUND

Keywords: miniaturization, selectivity in stimulation, sound and speech perception, new sound algorithms

PROSOUND aims to improve the performance and the ergonomics of present cochlear implants by developing a new interface with new speech/sound processing algorithms and by integrating the sound processor in a miniaturized module for profoundly deaf people.

Project description: Partly due to limitations of existing cochlear implant systems such as size, stimulation, impedance problems, selectivity and sound discrimination, only 30 to 50% of profoundly deaf persons can benefit from such systems at present. The aim is to develop a better and more selective cochlear implant system which can be implanted in children aged two and older. The new system can also be an alternative for people with more than 70 or 80% hearing loss.

The project will focus on a new electrode design with low voltage-use, new electronics using submicro technologies, miniaturization of the implant and user-friendly and safe fitting software. The system is aimed at restoration and enhancement of auditory function. The final aim of this TIDE project is the functional assessment and training of people with communication disorders.

Problems which shall be addressed include supply voltage, power, volume, data-communication and system partitioning.

Technical approach: The number of electrode channels needs to be increased, together with the level of integration of the global system. This will be achieved by:

(a) development of a new interface between the stimulation electrode and the nerve fibres;

(b) development of new speech/sound processing algorithms;

(c) integration of the sound processor.

Size reduction is of course mandatory for children.

Impact and expected results: The project should lead to better cochlear implant systems with full sound perception which can be implanted in children. The proposed system involves a new approach which will lead to a new generation of cochlear implants. It is expected that the project will form a basis for more applied research. The project will generate unique know-how which will lead to more projects in the health care sector and in EU countries, in the field of active implantable neurostimuli.

Participants	Country	Role	Type
Antwerp Bionic Systems (ABS)	B	C	I
Centre Suisse d'Electronique et de Microtechnique SA (CSEM)	CH	P	I
IMEC	B	P	U
TCSF Thomson CSF	F	P	I
University of Antwerp (UIA)	B	P	U
Techno-Synthetic SA (TES)	CH	A	I
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Starting date
1 June 1994

Planned duration
36 months

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European sign language interactive

Project 1242 – ESLI

Keywords: CD-i , multimedia, sign language, deaf

This project will develop three interactive multimedia sign language tutors on compact disc interactive (CD-i) in three European signed and spoken languages.

Project description: The aim of the project is to improve communication between hearing and deaf people, by developing an innovative method of teaching sign language to hearing and deaf people. The teaching matter will be developed on compact disc interactive (CD-i).

The discs will address the problem of the communication barriers between hearing and deaf people, which prevent deaf people accessing information, education and services. Greater awareness of the needs of deaf people will bring down these barriers. The project will produce, by the end of Year 2, three prototype discs and the accompanying evaluatory reports which will provide a model for interactive multimedia sign language teaching.

The project aims to introduce a non-sign-language user or beginner to a number of signs and sign sentences which would enable them to communicate at basic level with a deaf sign language user. Background information about deaf culture will be given in order, to place sign language in context.

The discs will allow the user to approach learning from two different angles – either from the spoken/written language phrase or from the sign language 'phrase'. A 'phrase', for this purpose, is defined as a sign or collection of signs or word or sentence which conveys a complete sentiment – such as 'Can I help you?' The sign language 'phrases', and their English equivalent, will be decided upon by a working group of deaf people and sign language experts as those used by and understood by deaf sign language users.

The project is innovative as it can be used for reference as well as a teaching programme. Users can learn either by watching the sign language and interpreting the 'phrase' or by choosing a written phrase and seeing the sign language equivalent. The digital video will enable users to study the construction of signs in slow motion, with greater clarity than currently available in analogue video.

Technical approach: The discs will be developed on Apple Macintosh computers and a Philips CD-i development workstation. The assets – the video, audio and graphics – will be created independently, digitized on the Apple Macs and integrated into an interactive package using the CD-i authoring program Media Mogul. The discs will feature full-screen, full-motion MPEG video.

Impact and expected results: As well as three prototype models in three Member States, the project will establish a model for the subsequent development of interactive phrase books in other States. It will also heighten the profile of sign language in the respective States by emphasizing the need for two-way communication. The products are equally intended for hearing people with a need to communicate with deaf people such as those employed in service industries and deaf people needing a reference source.

Participants	Country	Role	Type
Gateshead MBC	UK	C	O
Philips IMS	UK	P	I
RCS Etas	I	P	I
University of Patras	GR	P	U

Starting date
1 September 1994

Planned duration
24 months

Contact point
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Laser mouse

Project 1249 – LAMP

Keywords: augmentative and alternative communication, gesture recognition, man-machine interaction, M3S, mouse pointing device

The project aims to develop a new self-adapting interface device – a laser mouse – for use by severely mobility impaired persons.

Project description: The principal aim of this project is to study a new, self-adapting interface device for use by disabled persons. The laser mouse can be used in place of the standard PC mouse or as an interface with communication aids and environmental control systems. An M3S interface is also included to allow interface compatibility with other aids and devices.

The project is concerned with the analysis of the diffraction pattern (speckle) of coherent light falling on a mobile surface. The displacement of this surface can be evaluated to a high level of accuracy. In this way the movement of the head or limb can be tracked and converted into the movement of a PC mouse. The interesting features of this approach to the interface problem is that the motion-detection system is adaptive, preserving the natural posture of the user, and is fully configurable for those with limited or low amplitude movement.

The device will be of interest to motor disabled persons, suffering from quadriplegia and motor-cerebral injuries. It could offer this group 'mouse-like' access to computers and be very beneficial in the field of education, in addition to the areas of communication, environmental control and occupational therapy.

Although a small number of low-cost, non-contact pointing devices are available on the market, all require that an accessory be worn by the user. Also, none are suitable for patients who possess only low amplitude movement. Speckle analysis of a laser beam has been used previously in industrial applications for accurate measurements (constraints and deformation in materials, optical positioning, rotary encoding, etc.); however, this application forms a radical new usage for this technology.

Technical approach: Developments required include: definition of user needs; development of a high sensitivity optoelectronic laser motion detector based on the use of speckle signals; associated signal processing algorithms; motion interpretation (filtering, user parameters) and validation ('click') strategies; standard interface (PC, M3S); hardware and software.

Impact and expected results: The project will result in an easy-to-use laser mouse for use by persons with severe mobility impairment. The project will develop a laser mouse for use in a PC environment, a M3S system employing the laser mouse as the input device, a report detailing the needs of users, reports on performance and field testing, and a report on other potential applications.

Participants	Country	Role	Type
Thomson CSF LCR (CSF)	F	C	I
Connaught Electronics (CEL)	IRL	P	I
University College Dublin (UCD)	IRL	P	U
CNFLRH	F	P	ON
Fondation Suisse pour les Télèthèses (FST)	CH	P	ON

Starting date
3 January 1994

Planned duration
18 months

Contact point
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Functional electrical stimulation to improve value and lifestyle

Project 1250 – FESTIVAL

Keywords: muscle stimulation, EMG, active electrodes, isokinetics, goniometers

Development of EMG-based real-time control of muscle stimulators for the enhancement of human function.

Project description: The project aims to increase the performance, application and success of neuromuscular stimulation in aiding the rehabilitation of disabled people in the community. The programme of work will initially involve a detailed survey of clinicians and end-users of functional electrical stimulation across Europe, leading to a comprehensive technical programme bringing the latest technologies and signal processing techniques to bear on stimulator and transducer design and application.

Technical approach: Technical deliverables from the project will include: self-optimizing stimulation electrode arrays, miniature composite stimulation/electrode units, more efficient stimulator power stages, real-time processing and feature extraction of EMG artefacts, active EMG measurement electrodes and multi-function re-configurable portable stimulators. A main goal is to realize true interactive control of stimulator parameters to match required function. In order for intermittent 'listening' to EMG signals from muscles to be activated, their coactive synergists or antagonists will be employed to establish the best sources for feedback signals, in addition to input from position or pressure devices.

In addition, the project will undertake full mapping of stimulation and EMG measurement sites for the human body, together with an analysis of the effects of stimulation wave form shape, level and duration on the induced muscle response. A major clinical trial of devices developed will be undertaken in Europe.

Impact and expected results: In the first instance the project will produce: improved designs for miniature power-efficient programmable electrical stimulators for body worn use; active electrode EMG measurement devices for highly sensitive EMG recording; improved force and position sensors for the measurement and subsequent control of joint and limb movement; optimized stimulation wave form parameters for more selective, less-tiring external stimulation.

The longer-term goal is a stimulation system driven by EMG and transducer-based sensors to provide more natural, more sustainable movement and function for the user. The work

could provide benefit in terms of rehabilitation to over 16% of the population of the European Union (simple single limb prosthetics, approximately 4% of the European population; chronic disabling conditions, MS, stroke etc., around a further 10%; those with complex and multiple handicaps, estimated at 2%).

Participants	**Country**	**Role**	**Type**
Medical Electronics Group, University of Bristol	UK	C	U
BEAC	I	P	I
BMR	IRL	P	I
National Centre for Multiple Sclerosis	B	P	O

Starting date
1 July 1994

Planned duration
36 months

Contact point
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Travail à distance: telework and people with disabilities

Project 1251 – AVISE

Keywords: telework, disabilities, feasibility

The project will analyse the situation of disabled persons in relation to telework in three Member States and will identify viable solutions and factors which can promote employment of people with disabilities as teleworkers.

Project description: The objectives of this horizontal activity are both theoretical and practical. On the one hand, the study shall describe the general context of telework for people with disabilities, while on the other hand, it shall provide concrete conclusions and recommendations regarding telework facilities.

General demand for telework, either home-based, centre-based or combined, whether for one or more clients/companies, has been stimulated in the last decade by technological progress and factors such as commuting distance between home and workplace. People with disabilities could greatly benefit from the use of technologies from remote workstations or telecentres. AVISE aims to investigate the demand and supply for such telework services as well as the associated user and technological requirements.

Technical approach: AVISE will call on a multidisciplinary set of skills (social, sociological, legal, technological and economic) in order to draw a comprehensive picture of the telework situation and its potential for future development. AVISE shall involve three main areas of investigation:

(i) investigation on the current situation regarding telework in Europe in general and more thoroughly in Germany, France and Spain: legal context, sectors of activities concerned, attitudes of key actors towards telework, user expectations and skills, job profiles, training requirements, etc.;

(ii) investigation of technological solutions for telework stations: advantages and drawbacks of existing technological devices, communication networks required and possible improvements provided by the planned evolution of technologies;

(iii) investigation of implementation conditions and prospects relating to telework in specific sectors: feasibility assessments of telework facilities.

The viewpoints of key actors involved/interested shall be taken into account, including employers of teleworkers and/or selected potential employers, teleworkers, concerned public authorities, people with disabilities and their representative associations.

The methodological approach will include a census of existing studies at national and European level, the identification of relevant key actors, questionnaire and interview studies, a technical analysis of the existing and future technologies for telework stations, an analysis of the training requirements, and finally some case and feasibility studies will be included. AVISE shall also involve the organization of a workshop.

Impact and expected results: The study is oriented towards understanding the potential market for telework, examining advantages and drawbacks and proposing ways to overcome current difficulties. Through making comparisons between national experiences, AVISE will encourage innovation and technology transfer in the use of rehabilitation technologies required for work at a distance. The European dimension of the study will bring added-value to the current national experiences in telework and to potential developments. The contribution of an information technology industrial partner should ensure the development of new rehabilitation technology devices adapted to employers' and users' requirements.

The promotion of employment of people with disabilities using new forms of work organization is one of the aims of the AVISE study. End-users shall be involved throughout the study so that the human aspects of telework remain a central concern for all consortium partners.

The organization of a workshop is planned in the context of the second TIDE congress (April 1995). This shall provide a good opportunity to disseminate the information collected and to demonstrate to potential employers the expectations of people with disabilities. The feasibility studies carried out during the study should contribute to stimulating the setting-up of new telework facilities.

Participants	Country	Role	Type
Centre de Réadaptation Professionnelle et Fonctionnelle de Nanteau-sur-Lunain (CRPF)	F	C	O
Asociación Telefónica de Asistencia a Minusválidos (ATAM)	E	P	O
Forschungsinstitut Technologie Behindertenhilfe (FTB)	D	P	R
International Business Machines – IBM France	F	P	I
Association pour la Réadaptation et la Formation Professionnelle – Inter Espace	F	P	O
Association pour le Développement des Compétences du Val de Moder (ADEC)	F	P	O

Starting date
1 July 1994

Planned duration
13 months

Contact point
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Cost-effective rehabilitation technology through appropriate indicators

Project 1264 – CERTAIN

Keywords: cost-effectiveness, rehabilitation technology, evaluation method

The project will provide a methodology for evaluation of cost-effectiveness and cost-utility of rehabilitation technologies and will then validate the methodology.

Project description: The objective of this horizontal activity is to develop a methodology for evaluation of rehabilitation technologies with regard to costs for society and benefits to the consumer/end-user. The concepts of impairment, disability and handicap are key issues.

Sub-goals of the study are to create a common reference and increased awareness of the potential of socioeconomic evaluation of rehabilitation technology, to gather information from TIDE consortia and use this expertise to refine and propose a tool, and to test and validate the tool by implementation in TIDE and possibly other programmes.

National authorities need information to show that rehabilitation technology is cost-effective. For the different actors on the demand and supply side there is a need for information not only on productivity but also on efficiency, i.e. utility generated for the end-user versus resource use. Key issues regarding efficiency are independent living, satisfaction and quality of life (utility).

Technical approach: The development of the evaluation method consists of four steps:

(i) definition of critical factors related to general outcomes of rehabilitation technology: the main focus is on outcomes integrating consumer benefits and disadvantages – utility analyses and the concept of quality of life are therefore central issues;

(ii) development of an evaluation method: cost, function – physical, mental, emotional and social performance, quality of life, satisfaction, activity patterns, degree of self determination, and access to community services are key issues;

(iii) retrospective testing of the evaluation method: a retrospective study on cost, effectiveness and utility of implementation of rehabilitation technology will be carried out involving a sample group of disabled persons who adopted rehabilitation technology before the start of the project;

(iv) validation of the evaluation method: the method will be tested and validated by implementation in suitable TIDE projects and possibly in other technology projects not involved in the development to date.

Impact and expected results: The expected outcomes include:

(i) a report identifying critical factors involved in global outcomes relating to rehabilitation technology and services;

(ii) a prototype evaluation tool for monitoring cost-utility ratios related to rehabilitation technology in Europe;

(iii) an overview of the quality, sensitivity and the practical usability of the evaluation method;

(iv) validation of the evaluation method itself;

(v) results of evaluation of ongoing projects;

(vi) awareness of cost-effectiveness of rehabilitation technology.

The study will contribute to the development of a unified single market in Europe through the development of a generic methodology. The method will form a basis for efficient use of scarce resources.

Participants	**Country**	**Role**	**Type**
CMT	S	C	U
SIVA	I	P	O
Sintef SI	N	P	R
TNO	NL	P	R

Starting date
1 September 1994

Planned duration
24 months

Contact point
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Mobility and activity assistance systems for the disabled

Project 1270 – MOVAID

Keywords: domotics, mobile robots, appliance interfaces

MOVAID involves the development of a multi-functional robotic assistance system for residential care.

Project description: MOVAID seeks to offer all users, but especially the disabled and older user, greater comfort and enjoyment in accessing non-specialized, consumer products. This will be achieved by taking two different (but related) approaches: severely disabled or bedridden users will be catered for by the development of a multi-purpose, modular robotic assistance system, which will give users access to consumer products via activity workstations; the majority of users will be catered for by the development of dedicated interfaces for consumer products. The MOVAID philosophy starts from the premise that, when facing technology, all users are disabled.

During the lifetime of the project, a variety of software and hardware will be delivered, including: design and technical guidelines for robotic systems and for interfaces for kitchen appliances; a mobile unit equipped with a robot arm; a vision system and an automatic navigation system; two activity workstations; and a range of friendly, modular, and expandable user interfaces (possibly M3S-based) suitable for all users of kitchen appliances or robotic systems.

Technical approach: There are four main innovative aspects of the project. The first is that MOVAID will take a dual approach to the needs of all potential users (the robotic system and the dedicated interfaces). The second is that the robotic system will be modular and mobile, allowing it to combine with activity workstations (this will reduce costs for users). The third is that the focus of the project will be on the satisfaction and pleasure of interaction, not only on efficiency and effectiveness. And the fourth is that MOVAID technology will make new appliances (i.e. new products already under development which will appear on the market in the next two to five years) more accessible to all users.

The project will start from a deep analysis of user requirements and from the development of possible scenarios regarding household use. The outcome of this initial stage will be the basis for the definition of the preliminary technical specifications of MOVAID. A critical design review with users will lead to final design requirements and to the implementation of the various sub-systems and components. Then the whole MOVAID system will be

integrated and tested. Finally, user trials will take place in Italy, France and Switzerland with a variety of potential end-users, ranging from elderly and moderately disabled users to severely disabled users.

Impact and expected results: The main results from the MOVAID project can be summarized as follows:

(a) to produce an integrated system for residential care, which includes activities related to food preparation, which cannot only increase the level of independence of a disabled or elderly user but also optimize their interaction with technical aids by maximizing ease and satisfaction of use;

(b) to provide the large and small enterprises participating in the project with accurate information regarding user needs;

(c) to help the partners of the consortium involved in robotics to learn how to transfer some of the fundamental qualities of consumer products into robotic systems. This will be achieved by including satisfaction, comfort and aesthetic considerations in system design, and in interaction and interface design;

(d) to exploit the growing market in food preparation products by developing interfaces for new kitchen appliances;

(e) to exploit the industrial opportunity of reducing the cost of robotics. This will be achieved through the creation of distributed systems, in which light (reduced function) robots can be combined with 'smart'appliances.

Participants	Country	Role	Type
Scuola Superiore S Anna – ARTS Lab	I	C	U
Biomedical Transeuropean Association for Training	GR	P	O
Commissariat a l'Energie Atomique – Unité Robotique	F	P	R
Domus Academy	I	P	R
Fondation Suisse pour les Téléthèses	CH	P	O
Inserm Unite 103	F	P	R
Philips CID	NL	P	I
Scienzia Machinale Srl	I	P	I
Dipartimento di Elettronica ed Automatica Università di Ancona	I	A	U
Dipartimento di Informatica e Sistemistica Università di Genova	I	A	U

Starting date
1 February 1994

Planned duration
36 months

Contact point
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Development of multimedia signed language databases

Project 1282 – SIGNBASE

Keywords: multimedia, signed language, databases

The SIGNBASE project will develop and produce multimedia signed language databases.

Project description: The project seeks to demonstrate how multimedia technology, incorporating the use of signed languages, can contribute to the lives of deaf adults and children for whom a signed language is their first or preferred language. A signed language database will be produced which will be used to develop teaching materials and corpora of the signs of natural signed languages. In order to illustrate the capability of the database, two CD-ROM end-user applications will also be produced: a British sign language/English dictionary and bilingual teaching materials in the sign language of the Netherlands and written Dutch. The first will provide British deaf adults with a reference work on their own language which is directly accessible in their own language(s). The second application will provide deaf children, their parents and teachers with bilingual educational material in the signed and written languages of the Netherlands. A major innovative aspect of the project is that it takes as its starting point the signed languages of the deaf communities within the United Kingdom and the Netherlands.

Technical approach: Signed languages are visual-gestural languages which do not have conventional written forms. It is therefore not possible to convey adequately the nature and form of signed languages through text and still-image-based publications. Multimedia technology provides the means of capturing and conveying the complexity of such languages. It also allows deaf people to access the information in their preferred language.

The technological basis for the project is a unique computer image archiving system (Visage TM) developed by BSL Computer Consultancy for large-scale image storage and retrieval. For the TIDE project this software will be further developed in order to store and retrieve movie sequences. This enables signed language to be presented, selected and stored as still images and movie sequences (as well as in written languages, and notation systems). Movies and still images can be decompressed in real time during retrieval for viewing and/or printing. This will enable playback of the information from CD-ROM or over networks. Image data will be compressed and stored in accordance with internationally defined compression standards (JPEG, MPEG) and can, where appropriate, be output on any postscript level 1 or 2 printing device.

Impact and expected results: The project will produce fast, flexible, easily accessible signed language resources for deaf adults, deaf children and their parents, deaf organizations, teachers of deaf children, training organizations, research centres and third party software developers. The products will demonstrate how multimedia technology, incorporating signed languages, can improve deaf people's access to information. It is anticipated that the products will contribute to establishing a European market for multimedia signed language products.

Participants	Country	Role	Type
Deaf Studies Research Unit (DSRU)	UK	C	U
Dutch Foundation for the Deaf and Hard of Hearing Child (NSDSK)	NL	P	O
Bright Side of Life Computer Consultancy (BSL)	NL	P	I
Pin Drop Productions (Pin Drop)	UK	P	I

Starting date
1 March 1994

Planned duration
27 months

Contact point
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APPENDICES

Appendix 1. Index of project participants

Organization	Project acronym	Project number
AJ Fonseca Lda	HS-ADEPT	1102
AT&T Global Information Solutions	SATURN	1040
Aalborg University – Center for Personkommunikation (CPK)	VAESS	1174
Ability Enterprises	HYPIT	1175
Academisch Ziekenhuis bij de Universiteit van Amsterdam	HEARDIP	1094
ACE Centre	COMSPEC	1169
Advanced Medical Technology Ltd (AMT) Department of Orthopaedic Surgery	AMBLE	1064
AEPA – Association Nationale pour Formation Professionnelle des Adultes	COMBAT	1135
AFM – French Muscular Dystrophy Association	FOCUS	1092
Agora Conseil	HARP	1060
AMPER-Electrónica Aragonesa SA	CASA	1068
Anpeda	SPLIT	1215
Antwerp Bionic Systems nv (ABS)	PROSOUND	1230
Arden Computing	VICAID	1199
Armstrong Projects Ltd	EPI-RAID	1024

ARTEC Srl	DEFIE	1221
ASAH Medico AS	EPCES	1083
Asociación Telefónica de Asistencia a Minusválidos	AVISE	1251
Associação Portuguesa de Paralisia Cerebral (APPC) – Núcleo Regional do Sul	HS-ADEPT	1102
" " " " "	COMSPEC	1169
Associazione Italiana Sclerosi Multipla (AISM)	DEFIE	1221
Associazione Oasi Maria Sanctissima (OASI)	AURORA	1027
Associazione Opera Immacolata Concezione (OIC)	AURORA	1027
Associazione Progetto Europa Salute (ASPES)	INSIDE	1150
Audiodata Medichip GmbH	ASMONC	1228
" " " "	TACIS	1229
Audiological Centre of University Hospital Rotterdam	DICTUM	1189
Avionik Zentrum Braunschweig	ASMONC	1228
Ayuntamiento de Barcelona (Instituto Municipal de Disminuidos de Barcelona – IMDB)	COMBAT	1135
BSL Computer Consultancy	SIGNBASE	1282
Barnsley District General Hospital NHS Trust	VAESS	1174
BEAC Di Bozzarelli Pier Luigi	FESTIVAL	1250
Berufsbildungswerk im Oberlinhaus GmbH (BBW)	COMBAT	1135
BIC (FO)	TT-RT-SMEs	1144

BiDesign Ltd	VAESS	1174
Bioingenieria Aragonesa SL	SCALP	1002
" " "	CASA	1068
Biomedical Transeuropean Association for Training SA (Biotrast)	INSIDE	1150
" " " " " "	MOVAID	1270
BMR Ltd	FESTIVAL	1250
British Telecommunications Plc (BT)	MOBIC	1148
CAE Electronics GmbH	POVES	1211
CALL Centre	OMNI	1097
Cambridge University Engineering Department	EPI-RAID	1024
Cardiff Institute of Higher Education (CIHE)	IMSAS	1078
Casbah Films	MARTEL	1058
Centre de Correction Auditive Wagram (CCA)	OSCAR	1217
Centre de Réadaptation Professionnelle et Fonctionnelle de Nanteau-sur-Lunain (CRPF)	AVISE	1251
Centre for European Social Research (CESR)	COMBAT	1135
Centre for Medical Technology Assessment (CMT), Linköping University	CERTAIN	1264
Centre Suisse d'Electronique et de Microtechnique SA (CSEM)	PROSOUND	1230
Centro de Estudos de Telecomunicacoes (CET)	CASA	1068

Centro Studi e Laboratory Telecommunicazioni SPA (CSELT)	SPLIT	1215
Centrum Informatica voor Gehandicapten (CIG)	DEFIE	1221
Cettico	DEFIE	1221
Ciberveu SA	ETRE	1021
Clinica Oculista di Torino	POVES	1211
CNRS-URA 261	OSCAR	1217
CODIM Interactive Media CV	DICTUM	1189
Comité National Français de Liaison pour la Réadaptation des Handicapés (CNFLRH)	LAMP	1249
Commissariat de l'Energie Atomique (CEA)	EPI-RAID	1024
Compagnie IBM France	AVISE	1251
Connaught Electronics Limited (CEL)	LAMP	1249
Conseil Général des Hauts de Seine	HELP-ME	1105
Consiglio Nazionale delle Ricerche (CNR)	ACCESS	1001
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Consorcio Hospitalario de Catalunya (CHC)	SCALP	1002
Consort Engineering Ltd	EPCES	1083
Consorzio AURORA	AURORA	1027
COO SS Marche SCRL	USER	1062
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Coyle Hamilton Group Ltd	HYPIT	1175
CSC Europe	SPLIT	1215
CWS Biotel Sarl	HELP-ME	1105
Danish Centre for Medical Technology – Centre for Spinal Cord Injured	EPCES	1083
Danish Paraplegic Association	EPCES	1083
DART	COMSPEC	1169
Deutsches Rotes Kreuz e.V.	HELP-ME	1105
Diputatiòn Provincial de Sevilla	HYPIT	1175
Domus Academy	MOVAID	1270
Dr Robin Platts	MULOS	1057
Du Pont de Nemours SA	TACIS	1229
Dublin Institute of Technology (DIT)	DIT	1194
Dublin National Medical Rehabilitation Centre (DNMRC)	LAMP	1249
Dundee Institute of Technology (DIT), University of Abertay	MULOS	1057
Dutch Foundation for the Deaf and Hard of Hearing Child (NSDSK)	SIGNBASE	1282
Electric Brain Company Ltd (EBC)	MATHS	1033
Empirica Gesellschaft für Kommunikations- und Technologieforschung GmbH	MARTEL	1058
Empirica Delabasse GmbH, Köln	POVES	1211

Ente Nazionale per la Protezione e l'Assistenza dei Sordomuti (ENS)	IBIDEM	1038
Erasmus Universiteit Rotterdam	HEARDIP	1094
Ergonbedrijven	WANTED	1088
Escola de Educacao Especial de Ponta Delgada	COMBAT	1135
Eurolink Age	MARTEL	1058
Exact Dynamics BV	FOCUS	1092
FH Papenmeier GmbH & Co. KG	MATHS	1033
" "	MOBIC	1148
Faculdade de Motricidade Humana	MARTEL	1058
Faculdade de Motricidade Humana (FMH)	VICAID	1199
Universidade Tecnica de Lisboa (UTL)	VICAID	1199
Fern Universität Hagen	OMNI	1097
Ferrari Engineering SA (FE)	VETIR	1216
Fiadda	SPLIT	1215
Finnelpro Ltd	FOCUS	1092
Fondazione pro Juventute Don Carlo Gnocchi IRCCS/SIVA	CERTAIN	1264
Forbairt	IMSAS	1078
Forschungsinstitut Technologie Behindertenhilfe (FTB)	OMNI	1097
" " " "	TT-RT-SMEs	1144

Foundation of Research and Technology (FORTH)	ACCESS	1001
France Telecom	HELP-ME	1105
Fraunhofer Institute for Manufacturing, Engineering and Automation (IPA-FHG)	WANTED	1088
Free University of Berlin (FUB)	MULOS	1057
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Fundesco	CASA	1068
Future Speech Systems Ltd (FSS)	HARP	1060
G&K SA	MOVAID	1270
Gateshead Metropolitan Borough Council (MBC)	ESLI	1242
Gemplus Card International	SATURN	1040
(GHIS) – Eastern Health Board	COMBAT	1135
GRIF SA	MATHS	1033
Groupe CESI	SPLIT	1215
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Handikappinstitutet	HARMONY	1226
Head Acoustics GmbH	VETIR	1216

Helgeco SA	HEPHAISTOS	1004
Hereward College	ACCESS	1001
Home Office Partnership	COMBAT	1135
Hopital Cantonal – Universite de Genève (HCUG) – Laboratoire de Cinesiologie	AMBLE	1064
HT - Mikroelektronic GmbH	SICONA	1090
Human Factors Solutions (HFS)	SATURN	1040
HUSAT Research Institute	ACCESS	1001
" " "	SCALP	1002
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I&T COM	CASA	1068
ICL Computers (Ireland) Ltd	HYPIT	1175
ICL Financial Terminals AB	SATURN	1040
IDATE – Institut de l'Audiovisuel et des Telecommunications en Europe	MART	1113
IGEL	COMSPEC	1169
IGL	COMBAT	1135
IMEC VZW	PROSOUND	1230
Indes bv	FOCUS	1092
Index Braille Printer CY	TACIS	1229

INESC - Instituto de Engenharia de Sistemas e Computadores	HS-ADEPT	1102
" " " "	VICAID	1199
Infovisie VZW	OPEN	1182
Infovox AB	VAESS	1174
Innotek	TT-RT-SMEs	1144
Innovation and Technology in Communication	HS-ADEPT	1102
INRIA	ACCESS	1001
Inserm – Institut National de la Santé et de la Recherche Médicale – Unité 103	SENARIO	1045
	MOVAID	1270
Inserm – Institut National de la Santé et de la Recherche Médicale – Unité 279	ETRE	1021
Institut für Automation, Informations- und Produktionsmanagement GmbH (AIP)	OMNI	1097
Institute for Rehabilitation Research – IRV	ALADIN	1035
" " "	FOCUS	1092
" " "	SIGN PS	1202
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" " "	HYPIT	1175
Instituut voor Doven (IVD)	IBIDEM	1038
" " "	SICONA	1090

Instituut voor Doven (IVD)	DICTUM	1189
" " "	OSCAR	1217
Interacoustics AS	SICONA	1090
Interactive Multimedia Systems Ltd (IMS)	AMBLE	1064
" " " "	HYPIT	1175
Interuniversity Microelectronics Center VZW – IMEC	IBIDEM	1038
Irish Guide Dogs Association	ASMONC	1228
J. Phil Odor and Associates	OMNI	1097
Jurca Optoelectronik	POVES	1211
Katholieke Universiteit Leuven (KUL)	MATHS	1033
" "	HARMONY	1226
Department Electrotechniek (ESAT)	HARMONY	1226
Katholieke Universiteit Nijmegen (KUN)	AMBLE	1064
Occupational Biomechanics and Ergonomics	AMBLE	1064
Katholieke Universiteit Nijmegen (KUN)	PROSOUND	1230
Knossos Technologies	IBIDEM	1038
Kompagne VOF	ALADIN	1035
Kongsberg College of Engineering	HS-ADEPT	1102
Koninklijk Instituut voor Doven en Spraakgestoorden (KIDS)	DICTUM	1189
Kungliga Teknisk Hogskolan (KTH)	OSCAR	1217

Department of Speech Communication	OSCAR	1217
Kungliga Teknisk Hogskolan (KTH)	VAESS	1174
Speech Communication & Music Acoustics	VAESS	1174
Laryngograph Ltd	DICTUM	1189
" "	OSCAR	1217
Lebenshilfe Werkstatt GmbH	WANTED	1088
Lehrstuhl für Technische Informatik (LTI) der Rheinwestfählischen Technischen Hochschule Aachen (RWTH)	SIGN-PS	1202
London Regional Transport and Underground Ltd (LT/LU)	OPEN	1182
Ludwig Maximilians-Universität München – Institut für Phonetik und Sprachliche Kommunikation (IPSK)	SICONA	1090
Lund University	EPI-RAID	1024
MIW	ETRE	1021
MA Systems and Control	ACCESS	1001
Made Associates	FOCUS	1092
Media Port Berlin GmbH	TURTLE	1194
Medialab	VETIR	1216
MICRO Suisse	FOCUS	1092
Microcentre – University of Dundee	SIGN-PS	1202
Microsonic; Gesellschaft für Mikroelektronik und Ultraschalltechnik mbH	SENARIO	1045
National Centre for Multiple Sclerosis	FESTIVAL	1250

National Council for the Blind of Ireland (NCBI)	TACIS	1229
National Microelectronics Application Centre Ltd (MAC)	COMBAT	1135
National Research and Development Centre	AURORA	1027
Welfare and Health – NAWH	MARTEL	1058
National Technical University of Athens (MD & CS/NTUA)	HEPHAISTOS	1004
Network Personnel Ltd	COMBAT	1135
Northwold Systems & Services Ltd (NSSL)	MARTEL	1058
Office d'Emploi de la Main d'Oeuvre	COMBAT	1135
Organizacion Nacional de Ciegos (ONCE)	ETRE	1021
" " "	AURORA	1027
Ortopedia GmbH	OMNI	1097
Oticon A/S	OSCAR	1217
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Oxford Intelligent Machines Ltd (OXIM)	EPI-RAID	1024
Permobil AB	FOCUS	1092
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Philips Hearing Instruments	DICTUM	1189
Philips Electronics – Media	ESLI	1242
Philips International BV	MOVAID	1270
Pikomed	ACCESS	1001

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Possum Controls Ltd	ALADIN	1035
" "	HS-ADEPT	1102
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Rehacom	COMSPEC	1169
Research and Development Centre for Welfare and Health (NAWH)	ACCESS	1001
Rigel Engineering SA	IMSAS	1078
" "	DEFIE	1221
Rijksuniversiteit Leiden	VICAID	1199
Behaviour Analysis Unit, Department of Psychology	VICAID	1199
RMP Rheinmetall Mess-und Prüftechnik GmbH	HELP-ME	1105
RNR	SIGN-PS	1202
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" " " "	OPEN	1182
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" " "	MULOS	1057
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Scuola Superiore di Studi Universitari e di Perfezionamento S Anna (SSSA)	IBIDEM	1038
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Thiel GmbH & Co. KG	ETRE	1021
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Thomson CSF DCH	SCALP	1002
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" " Outils Informatiques	PROSOUND	1230
" " LCR	LAMP	1249
Thomson CSF	IBIDEM	1038
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Universidade de Aveiro	CASA	1068
Universita di Genova – Dipartamento Informatica Sistemistica e Telematica (Ugdist)	IBIDEM	1038
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Universität Hamburg, Labor KI	POVES	1211
Universitäts-Augenklinik Tübingen	POVES	1211
Universität Stuttgart, Institut für Arbeitswissenschaft und Technologie-management (IAT)	HEPHAISTOS	1004
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University College Dublin (UCD) – Department of Psychology	VICAID	1199
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University College London (UCL) – Department of Phonetics	OSCAR	1217
University Hospital Utrecht	OSCAR	1217
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University of Athens (UOA)	ACCESS	1001
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University of Bristol – Department of Electrical and Electronic Engineering	FESTIVAL	1250
University of Cambridge	HEARDIP	1094
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University of Durham/Deaf Studies Research Unit (DSRU)	SIGNBASE	1282
University of Düsseldorf, Heinrich Heine-Universität Düsseldorf, Medizinische Einrichtungen, HNO-Forschungslabor Akustik	DICTUM	1189
University of Exeter – Department of Physics	SICONA	1090

University of Genova – Department of Informatics, Systems, Telecommunications (DIST)	MOVAID	1270
University of Genova – Department of Telecommunication, Computer and System Science	SPLIT	1215
University of Edinburgh (CSTR)	HARP	1060
University of Hertfordshire	MOBIC	1148
University of Kent	ACCESS	1001
University of Leicester	VICAID	1199
University of Magdeburg (UM)	MOBIC	1148
University of Newscastle upon Tyne	MULOS	1057
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University of Patras (UP)	ESLI	1242
University of Patras – The Computer Technology Institute	DICTUM	1189
University of Portsmouth Enterprise Limited (UPEL)	OPEN	1182
University of Reading – Department of Cybernetics	SENARIO	1045
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University of Sheffield – Electronic and Electrical Engineering	VAESS	1174
University of Wales, University College of Swansea	HYPIT	1175
University of York	MATHS	1033
University of Zaragoza – Electric Engineering and Computer Science Department	SCALP	1002

University of Zaragoza	CASA	1068
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WS Atkins Consultants Ltd (WSACL)	IMSAS	1078
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Zenon – Industrial Automation	SENARIO	1045

Appendix 2. COPERNICUS projects

The TIDE DIGIBOOK projects and LEARN-ED are being carried out under the COPERNICUS (Cooperation in science and technology with Central and East European countries) programme. This programme aims to strengthen the research capacity of Central and East European countries and reorientate research to their socioeconomic needs.

The projects are joint research and development activities under the industrial technologies (Telematics) research sector heading. They involve multidisciplinary collaboration and cooperation between researchers from Member States of the European Union and from the Central/East European countries – Estonia, Hungary, Lithuania, Russia and Slovakia.

These projects funded under the COPERNICUS programme are being monitored by the TIDE office.

DIGIBOOK: Digitized speech processing for efficient distribution of texts

COPERNICUS Project 806 – DIGIBOOK

Keywords: visually impaired, digital sound processing, talking books, SGML, CD-ROM technology

The project aims at improving the production of talking books and structured electronic texts for use by reading-impaired persons, through application of digital speech processing and SGML-based document structuring.

Project description: The main objective of the DIGIBOOK consortium is the improvement of access to text information for a group of persons with a reading handicap (visually impaired persons, dyslexics, some motor impaired persons).
DIGIBOOK intends to:

(i) decrease the cost of current talking-book production technology that is human labour-intensive;

(ii) prove the feasibility of computerized digital recording and duplication in this specialized but rapidly growing domain;

(iii) open a new market segment: accessible digital books produced from publishers' electronic data, taking into account copyright issues.

Technical approach: The DIGIBOOK products will be related to the provision of books to reading impaired persons, through:

(i) a fully computerized audio processing studio, replacing traditional recording techniques (large tape recorders and bulky, difficult to handle master tapes);

(ii) the production of talking books based on text-to-speech conversion of sufficient quality;

(iii) the introduction of new carriers for talking books: DAT tapes, CD-ROM, CD-i, specialized diskettes;

(iv) distribution of electronic texts in SGML and appropriate reading systems for rapid, structured access to the documents.

Impact and expected results:

(i) The pilot production centre for computerized talking-book production is of immediate benefit to the target user group and is a prototype/example whose experience can be shared by other production centres. It will also provide technical know-how to the company involved that will commercialize it later on.

(ii) The use of new carriers reduces drastically the complexity of talking-book production centres which will lead to an increase on a European (and probably wider) scale of these service centres.

(iii) The production of talking books based on text-to-speech systems is the only viable alternative when service centres have to increase their production. Knowledge in this field provides a head start in this expanding market to the consortium partners and especially to the industrial company involved.

(iv) DIGIBOOK builds on the results of the CAPS projects (TIDE 136 and 218) as it intends to produce and evaluate large amounts of structured texts on computer readable formats.

Participants	Country	Role	Type
Kath. Univ. Leuven (J. Engelen)	B	C	U
KFKI – Budapest (A. Arato)	H	P	O
Vilnius University (A. Bagdonas)	LITH	P	O
Consig. Naz. Ricerche-Firenze (P. Graziani)	I	P	O
IPTK Logos-Moscow (V. Stepanov)	RUS	P	I
Estonian Languages Inst. (Talinn, M. Mihcla)	EST	SC	U

Starting date
1 December

Planned duration
24 months

Contact point
Prof. dr. ir. Jan J. Engelen
Katholieke Universiteit Leuven
Departement Elektrotechniek – ESAT
Kard. Mercierlaan 94
B-3001 Leuven-Heverlee
Tel. +32 16 32 11 23 or +32 16 29 04 20
Fax +32 16 32 19 86 or +32 16 23 74 31
e-mail Jan.Engelen@esat.kuleuven.ac.be

Learning and educational access using remote networks – enabling the disabled

COPERNICUS Project 1358 – LEARN-ED

Keywords: higher education, telecommunications services, adapted terminals, remote education

This project will deploy telecommunications and local area network technology and services in higher education establishments to enable students with disabilities to participate in the life of these institutions.

Project description: The principal objective of the project is to demonstrate that telecommunications technologies can assist students with disabilities to participate in the life of a university or higher education establishment. This primary objective has the following subgoals:

(i) to test new advanced multimedia network and telecommunications services for usability and usefulness, and to demonstrate the most important ones on local and wide area networks that are available to higher education establishments;

(ii) to develop and deploy new services and network technologies in the partner sites in Central Europe that take into account the research and experience that has been achieved in Western Europe;

(iii) to encourage investment in new technologies and services that reflects the needs of students with disabilities.

Technical approach: The project will develop and test remote-access techniques that can be used by students with disabilities. These will be based on the technologies most appropriate to the individual country. This will involve the installation of suitable pilot network infrastructures where these are not available, the adaptation of terminals so that they can be used with disabled students, and the development or deployment of multimedia services. The specific techniques developed within the project will be tested for their value to the students and compared with the possibilities currently available to them.

The services that will be of most interest to the project are those that:

(a) allow students and prospective students to access information about the higher education establishment;

(b) allow students to access research and reference material;

(c) allow students to participate in the academic activities of the higher education establishment, including lectures and interacting in tutorial sessions.

Impact and expected results: The impact of the project is expected to be:

(a) cross fertilization of knowledge between Western and Eastern Europe;

(b) improvement in the access to the life of higher education establishments for students with disabilities;

(c) subsequent exploitation of the techniques by the higher education establishments;

(d) subsequent exploitation of the techniques by the industrial partners;

(e) subsequent exploitation by other higher education establishments and industrial companies to whom the work of the project will be disseminated.

Participants:	**Country**	**Role**	**Type**
University Of Dundee MicroCentre	UK	C	U
Institute of Informatics, Comenius University	SL	P	U
Slovak Telecommunications	SL	P	I
KFKI Research Institute for Measurement and Computing Techniques (MSZKI)	H	P	R
Zoltan Meszaros	H	P	I

Starting date
1 January 1995

Planned duration
24 months

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Fax +44 1382 345509
e-mail nhine@mic.dundee.ac.uk

Appendix 3. Listing of TIDE pilot phase projects

Acronym	Number	Title
ACT-IT	113	Application of computer-based systems to training in IT
ASHORED	101	Adaptable smarter homes for residents who are elderly or disabled people
AUDETEL	169/212	Audio description of television for the visually disabled and elderly
CAPS	136/218	Communication and access to information for persons with special needs
CHEF	161	A kitchen management system for people with mental handicaps
CORE	126/213	Consensus creation and awareness for R&D activities in technology for disabled and elderly people
FASDE	141/219	Future alarm and awareness services for the disabled and elderly
GPPC	142	General purpose portable communicator
GUIB	103/215	Textual and graphical user interfaces for blind people
HEART	309	Horizontal European activities in rehabilitation technology
INDICES	166	Interfacing disabled people with industry-standard computing environments
INSCAD	152/210	Development of a CADCAM system for manufacturing customized insoles for shoes
KOMBE	158	Communication aids for the handicapped

M3S	128	An intelligent interface for the rehabilitation environment
MARCUS	150	Manipulative automatic reaction control and user supervision
MECCS	112/205	Modular environmental control and communications system
MODEMA	123	Modelling for the disabled in working environments: a multiperspective approach
MUSA	118/201	Multilingual multimedial speech aid for hearing and language disabilities
RAID	120	Robot for assisting the integration of the disabled
STRIDE	133/206	Speech-analytic hearing aids for the profoundly deaf in Europe
SYMBOL	134/214	Multilingual and multiple lexical learning on CD-i environment
VISA	135	Universal access to WIMP software for partially sighted and blind users

Reference: European Commission (1993), 'Technology initiative for disabled and elderly people – Pilot action synopses', DG XIII, EUR 15023EN, Office for Official Publications of the European Communities, Luxembourg.

European Commission

Technology initiative for disabled and elderly people (TIDE)
Bridge phase — Synopses

Luxembourg: Office for Official Publications of the European Communities

1995 — II, 191 pp. — 21 × 27 cm

Scientific and technical research series

ISBN 92-826-9595-6

Price (excluding VAT) in Luxembourg: ECU 35

The publication contains synopses of 55 projects funded under the European Commission's TIDE (Technology initiative for disabled and elderly people) programme during its Bridge phase (1993-97). An introduction to the TIDE programme is provided which outlines its objectives and scope. The background to the programme is described and the response of sector actors to the Bridge phase 'call for proposals' is summarized.

The 55 projects are grouped into six domains: access to technology and related services, life at home and remote care, mobility and transport, control and manipulation, restoration and enhancement of function and user and market issues. An introduction to each grouping of projects is provided.

Each project is described under the following headings: Project description, Technical approach, Impact and expected results. For each, a one-sentence description is provided along with keywords and a listing of the participants involved. Contact information for each project is included.

Synopses of two projects funded under the COPERNICUS (Cooperation in science and technology with Central and East European countries) programme of the European Commission are included. These projects are being monitored by the TIDE office.

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Price (excluding VAT) in Luxembourg: ECU 35

ISBN 92-826-9595-6

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