Development and Demonstration of Training and Support for ECS and AAC systems using Telematic Links

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Abstract. High-end environmental control systems, AAC devices and devices used for therapy and training are gaining an increasing importance in the daily life of disabled and old persons and their care persons. In this areas the crucial point for user satisfaction is not only the price for purchasing the equipment but to an even greater extent the costs of personal adaptation and continuous service and updating according to changing user needs. This paper describes the efforts which are currently being undertaken by the European Union R&D project RESORT in order to overcome existing problems in supporting RT systems. To keep the costs for service and adaptation low RESORT aims at developing a multimedia link between the RT-user and a service provider. Updating the user software, carrying out adjustments, answering questions of the user and troubleshooting will no longer require the personal presence of a specialist but will be achieved via telematics. Available technologies as existing Remote-PC-Control packages, video conference systems, network access etc. are outlined and examined in order to check their potential use for supporting disabled users and their care persons. Bottlenecks are pointed out and some strategies to overcome them are described. A strategy to overcome the bandwidth problem is introduced. An outlook to the setting of the field test which will be carried out during the second half of year 1999 in order to verify the functional prototype of the RESORT system will be given.

1. Providing support for environmental control and AAC devices

Augmentative and Alternative Communication (AAC) devices and ECS (Environmental Control Systems) are changing the lives of disabled and old persons. They help non-speaking persons communicating, they assist motor and multiple impaired persons in controlling the environment, ease accessibility of standard PCs and support security and safety issues. The increasing usage of such assistive systems is demonstrating the high potential of up to date technologies contributing to the autonomy and self determination of human beings.

The crucial point for user satisfaction often not only is the price for purchasing the equipment but to an even greater extent the costs of personal adaptation and continuous service and updating according to changing user needs. After having installed an RT (Rehabilitation Technology) system the process of tailoring the system to the user's needs and

wants has to start. Installation of the RT system is not the end but actually the starting point of an on-going process of service delivery. Step by step the system will be changed to meet the user's needs as close as possible. We can state and emphasise that providing an RT system to a user is much more than delivering a device, connect it to the mains and switch it on.

There is the need for tailoring the system to the actual needs of the disabled user, there also is the need for training the user and the care givers (family members, professionals) in the use of the equipment, there also is the need of coaching all of them when they are walking their first steps in using the equipment and there is the need for supporting them in all technical, pedagogic and therapeutic issues concerning the RT system and all the areas affected by the introduction of the RT system.

2. Whom to support?

Analysing the interactions which actually are taking place between human beings and an RT system it can be found that generally there are three different groups of persons [1]:

- The end-user: The disabled person with special abilities, needs and wants who is the primary user of the RT System.
- The facilitator: E.g. a therapist, a pedagogue or a family member who is the most capable person to create the most suitable configuration and adaptation of the user-interface.
- The integrator: A person skilled in technology who is carrying out the technical set-up of the system especially when it has to be installed and connected to the user's environment for the first time.

The facilitator on the one hand will support the disabled user, but on the other hand will be supported by the integrator. Or, maybe, by another experienced facilitator, who is willing to share his/her own knowledge with a newcomer. In case of technical problems, system upgrades etc. the integrator will need support to be provided by the manufacturer or by the reseller.

3. Current situation

Currently this support is given locally, via conventional telephone hotlines, or is lacking at all. This leads to an unsatisfying situation: In-place support generally leads to a high financial burden, as a lot of time has to be spent and financed for ineffective travel time of the supporters. Telephone hotlines suffer from severe difficulties in analysing a complex situation having only oral description and no direct network contact with the RT system. And lack of support at all causes frustration and lowers over-all acceptance.

Most of these problems shall be overcome with the help of the RESORT system, which currently is being developed in an EU funded project. RESORT stands for "**Re**mote **S**ervice **o**f **R**ehabilitation **T**echnology" and aims at creating a multimedia telematic link between the end-user's PC-based RT system and a service provider.

4. Goals and scenarios to be realised

The RESORT system will leave the hard- and software applications of the end-user more or less unchanged, but will add a remote control interface offering the following features:

(a) In the telecommunication mode, RESORT will provide hands-free communication between the user and the service provider. If the available bandwidth is large enough a videophone-link can be established.

(b) In the pupil-teacher mode an additional data-link is established. The service provider will load exactly the same RT application as the user is running. The two applications – at the user's site and at the provider's site – will be synchronised via the data link.

(c) In the tele-service-mode the service provider will have the possibility to down/upload files from and to the user's PC, modify configurations and test the changes he or she has made.

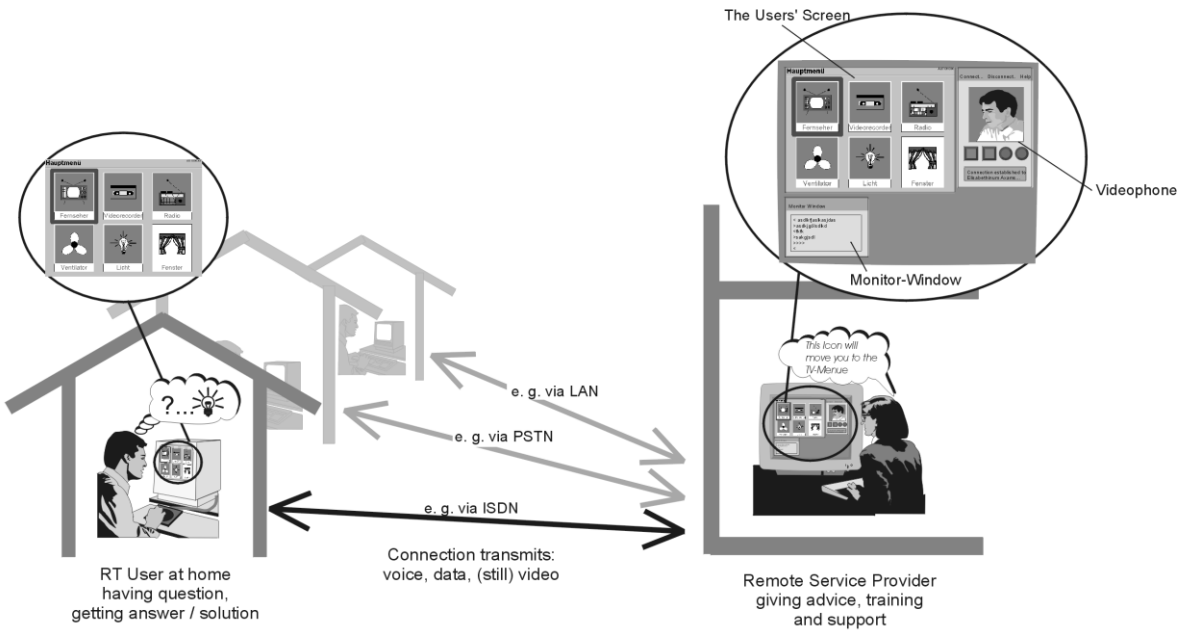

Fig. 1: Remote service provision for PC based RT systems

The overall system structure (see Fig 1) shows a Service Centre, which can be connect to RT users at home or in institutions via different types of networks: modem, ISDN, cable, LAN etc.

5. Technical System Structure

There are various technologies available which can be used to implement essential parts of the RESORT system. Video conferencing systems, file transfer and synchronising modules, Remote PC control packages will be used as part of the demonstrator system. Nevertheless the general system structure must be aware of some important facts:

The whole system must be very easy and intuitive to use. This can be derived from the interviews we conducted with potential future users of the system in order to analyse the user needs in detail. The future system should be able to provide very simple and easy to use user interfaces making the process of communication similar to the use of a conventional telephone. Fig. 2 demonstrates this. It shows a very simple, easy-to-use interface on the remote user's PC.

The RESORT system also must take into acccount the bandwidth situation. As a continuous audio connection is necessary in nearly every case, one bottleneck to be overcome is the

lack of available bandwidth. If the remote system is localised at home, we can assume an ISDN connection (64 /128 kbps), in some cases we also will have to cope with a modem connection (33,6 kbps). There is a very time critical point in remote controlling an RT system. Consider a single switch user working with a relatively high scan rate (1 second). To support this person remotely the system must ensure to transfer each scan step. The Catch-Net project run by the ACE Centre reports that using standard available remote PC control software was found to cause difficulties in such cases [4].

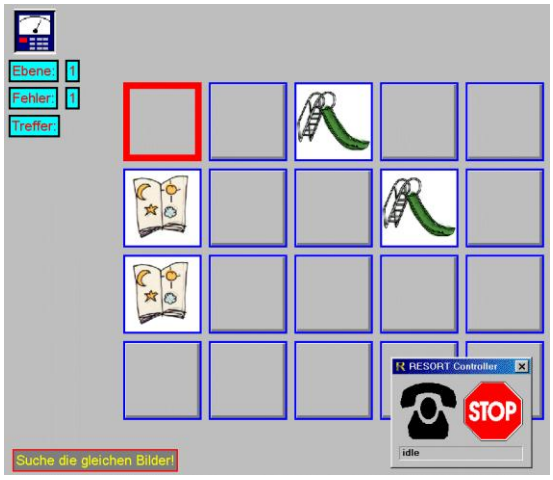

Fig. 2: Easy to use user interface for the Resort controller on the disabled user's PC. In the background the RT system, in this case a software for therapy and training called "Step by Step" is displayed. In the lower left corner a floating window provides only two functions: Connect and Disconnect to/from the Service Provider.

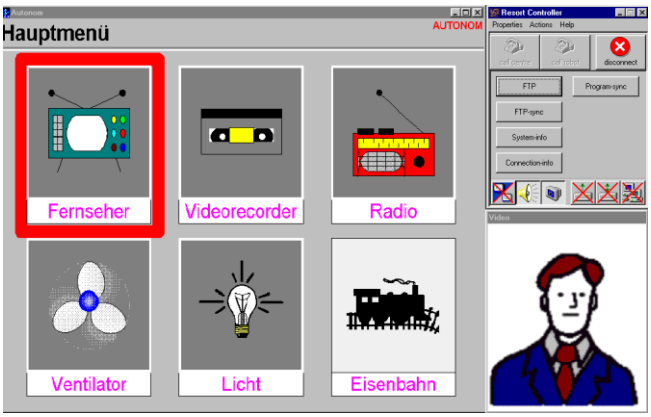

Fig. 3: Prototype of a more complex ECS user interface. On the left hand side the screen displays the RT system, in this case a Technical Assistive System for motor and multiple impaired persons called "Autonomy". In the upper right hand corner the Resort Controller, in the lower right hand corner the video channel.

To avoid this problem the Resort prototype will implement a remote control interface (RCI) to the RT system in order to enable the RT system to exchange only short messages concerning user events (e.g. key strokes) via the network instead of transferring the new screen output. This method will decrease the network load significantly and ensures synchronisation even in case of a modem connection. The trade-off is the need of integrating an RCI to the RT system. In contrary to a standard remote PC software package RESORT also assumes that the RT system is running on both sides of the network, on the user's PC and at the Service Centre.

Fig. 4 shows the general structure of the Resort demonstrator. Service Centre and User PC both are running the same type of RT software. Additionally a so called Resort Control-

ler runs on both platforms. The Resort controller communicates with the RT system, the audio, video and chat module and the Bandwidth and connectivity manager which is responsible for network connections and the priorities which are given to different types of data in order to transmit most important data (generally audio and RCI messages) with shortest possible delays.

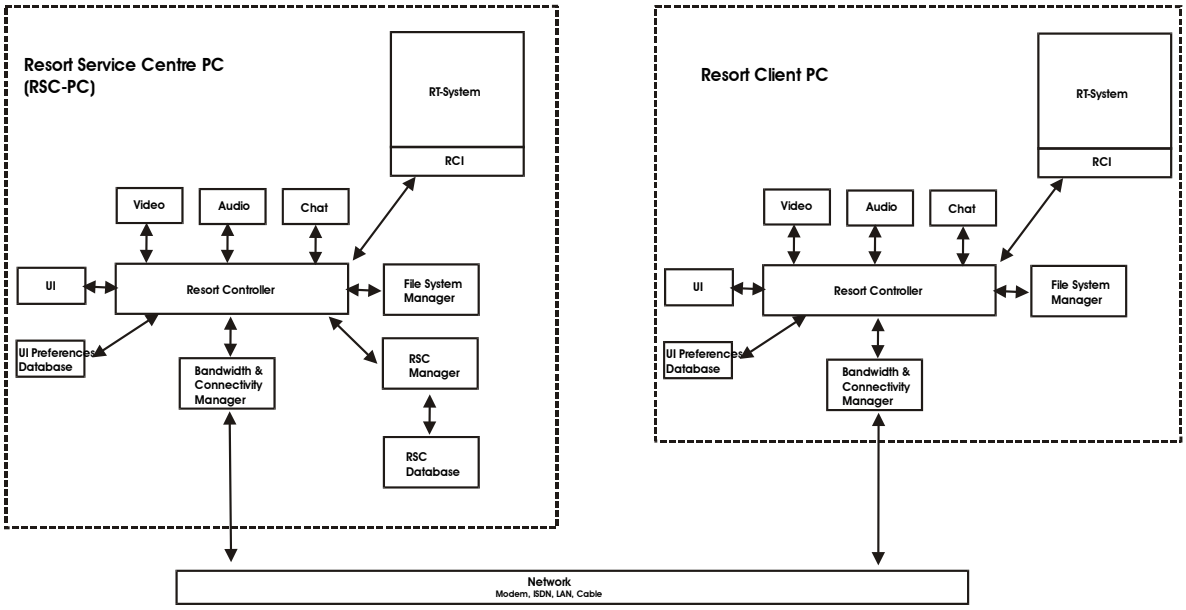

Fig. 4: System structure of the Resort system. On the left hand side the Service Centre PC, on the right side the Client PC. Both are running same type and version of an RT software which are linked via a network channel.

The user interface of the Resort controller can be tailored according to the needs of the users. Although the full functionality is always available, the degree of complexity of functions and information shown to the individual user can be varied within a wide range. (compare Fig. 2 with Fig. 3).

6. Prototypes and trials for verification

The prototypes of the demonstrator will be available in autumn 1999 and will be verified by different user groups in Austria, Germany, The Netherlands and Scotland. The main goal of this verification phase is to run indoor trials in order to verify the main functionality of the system, to train the first users and to gain valuable input for redesigning the system.

7. Outlook

RESORT not only aims at technical service delivery but also at pedagogic and therapeutic support via the telematic channel. At the end of the project in mid 2000 it is envisaged to invite manufacturers of assistive technology systems to adopt the RESORT protocol for their products in order to strengthen their position in the RT market. Interested parties are invited to watch the progress of RESORT by visiting the RESORT home page [5].

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