Giving Wings to the Service Delivery Process – New Possibilities by the RESORT Tele-Service Approach

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Abstract. This paper describes the current activities of our research group in evaluating and continuously improving an innovative tele-service system for PC-based Assistive Technology (AT) products. Based on the outcome of the EU-funded project DE-4208 RESORT this tele-service system provides means for technical, therapeutic and pedagogical remote support for (a) the disabled users of PC-based AT and (b) for their care persons. The tele support is delivered via IP based network connections (ISDN, xDSL, cable, LAN, wireless LAN, etc) and is delivered from a service centre which is currently running at the Vienna University of Technology. An API is available which enables other AT software systems to access the functionality of the tele-service system and in this way to become "RESORTable". Additionally, the advantages of the RESORT approach in comparison to off-the-shelf solutions are outlined, as well as the economic potential and results from the ongoing evaluation in daily life usage while supporting severely disabled users of AT systems and their care persons.

1. Introduction and Aim

Today, a number of PC-based Assistive Technology (AT) products are on the European market and are bringing significant benefits to disabled persons. Some examples might be communication devices for non-speaking persons, systems which provide environmental control functionality for profoundly motor impaired users, on screen keyboards, or learning and training systems. Experiences from daily use indicate a lack of adequate and innovative facilities able to support the service delivery process in this area of PC-based AT.

This was our reason for developing a remote service system dedicated to PC-based AT products. The initial prototype systems and the interface specifications were developed in the framework of the partially EU-funded RESORT project (1998-2001). "RESORT" stands for "Remote Service of Rehabilitation Technology (RT)". In the following discussion, the terms "RT" and "AT" are used interchangeably. After the completion of the EU project, a Special Interest Group was established as an umbrella for ongoing research, development and evaluation activities. In the interim, the RESORT prototype system has been completely redesigned, but the interface definition is still valid, even for the most recent version (April 2003). The RESORT system provides a set of tools which enable delivery of remote support via the internet to disabled users of AT products and, primarily, to care persons. The aim of RESORT is to provide not only support at the technical, but also at the therapeutic and educational levels. Already existing technology such as video conferencing and application sharing is used but tailored into an intuitive and scaleable HCI, dedicated to the specific needs of AT users. Additionally, certain techniques for specific use cases in AT, such as synchronisation of single switch devices in scanning mode have been specified and integrated into the proposed RESORT interface standard [15].

2. Concept and Functionality

The RESORT system architecture contains a service centre and one or more clients which can be linked via various IP network connections (Fig. 1). Three different modes of operation are available: (1) In the telephone mode, RESORT provides hands free communication between the user and service provider. If the bandwidth is large enough an additional video link can be established. (2) In the student-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. (3) In tele-service-mode the service provider has the possibility to download from, and upload files to the user's PC, modify configurations and test the changes he/she has made.
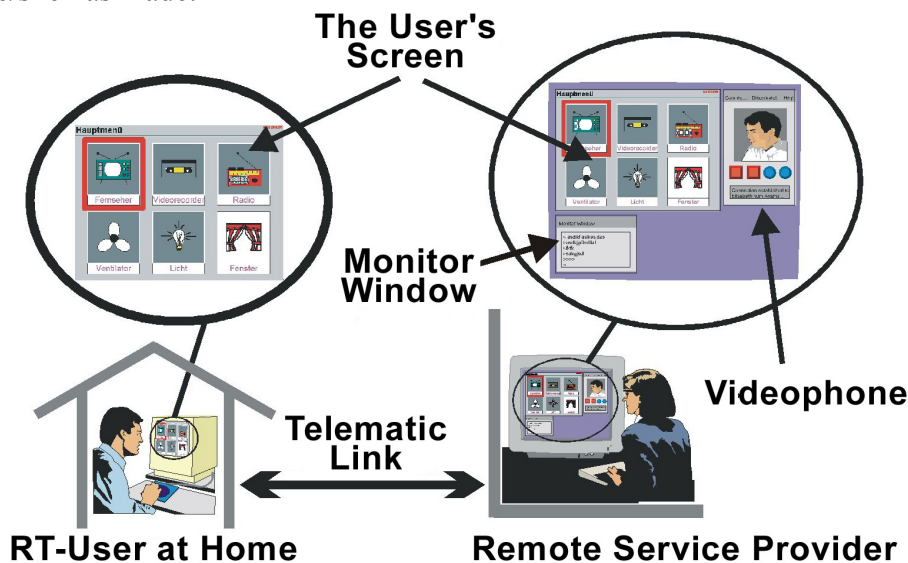

Fig. 1: Remote service provision for PC based RT systems: On the left side the RESORT Client PC, on the right side the RESORT Service Centre.

RESORT provides the following functionality [14, 15]: (a) RCI (Remote Control Interface) for "real time synchronisation" of two RT systems, one with the disabled user and one at the location of the service provider, (b) easy-to-use scaleable User Interface, (c) real time communication and interaction: audio, video and text, (d) database access, (e) file transfer, (f) platform independency and (g) security.

The RESORT system uses existing technologies for tasks such as video/audio transmission according to the H.323 specification and desktop/application sharing according to T.120. The RCI (Remote Control Interface) and the RESORT protocol allow synchronisation in real time. This is possible since only small data messages are transferred instead of changed screen contents. This method dramatically reduces the required bandwidth [3] and enables the RESORT system to provide real time monitoring of single switch users. The RESORT controller module (RC) is linked to (a) communication modules for video, audio and text-chat, (b) to the database, (c) to the RT system and (d) via network interface to the remote RC (Fig. 2). IP serves as the network protocol. The RESORT system is a highly modular system which allows specific parts to be exchanged without the need of adapting other parts. This increases the independence from 3rd party products for audio, video, application sharing, etc. [14,15]. Two different but compliant RESORT prototypes were implemented. The first one was written in Sun Java 1.3 and was released in 2000. In 2001, a second prototype line was started which is written in Delphi and which currently is downloadable as evaluation version 0.7.2.1 (April 2003) from RESORT web site [8].

3. RESORT API and SDK

The RESORT system provides an Application Program Interface (API) which enables 3rd parties to access the functionality of the RESORT system via simple function calls according to the documentation of the API (to be found in RESORT SDK [8]). This allows one to hide the remote service system and the network in a "black box". In this way, it makes it easy for any existing AT software to benefit from the RESORT functionality without having to cope with all the underlying issues (Fig. 2).
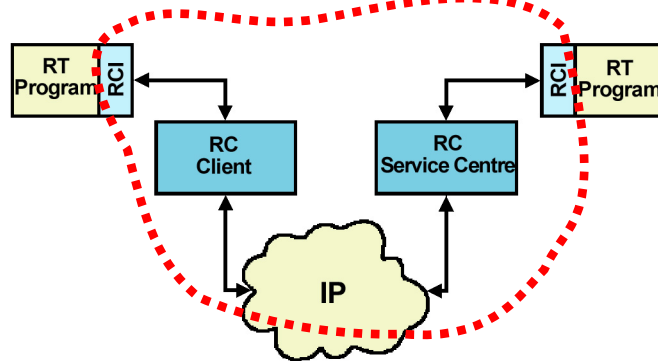

Fig. 2: Remote Control Interface (RCI) between RT software application and RESORT Controller (RC) software running on client side and on Service Centre side. Dotted line contains RESORT remote service system which can be seen as a black-box using RESORT API from point of view of a RESORTable RT program.
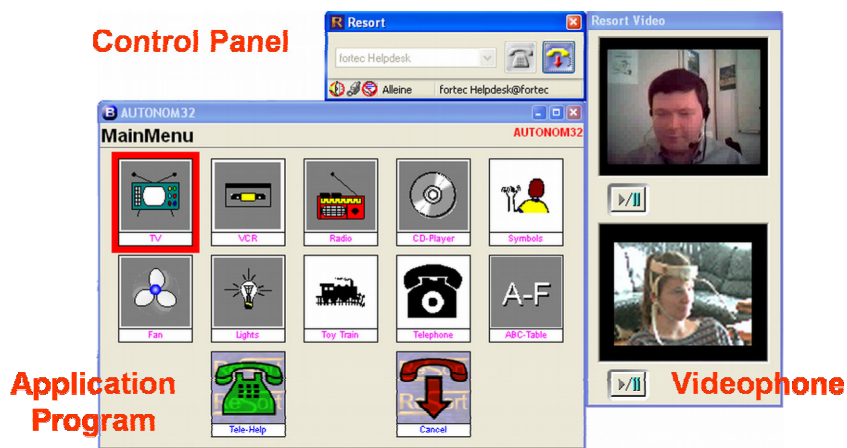

Fig. 3: Screen Shot from a RESORT Client during a Tele-Service session in Vienna. A non-speaking person using a head stick runs an environmental control and communication system called AUTONOMY [5] which is equipped with a RESORT Interface.

RESORT offers three levels of compatibility, meaning that producers of an RT system which would be extended by a RESORT interface could decide what depth of access to RESORT features are needed, and how much effort in adapting the existing RT system could be invested. The depth of access corresponds to the amount of effort needed for modification of the source code of the RT system. RESORT compatibility level I offers basic access (video, application sharing, remote launching) without any changes needing to be made to the source code. Only a text-based profile file (INI file) needs to be defined and installed in order to provide basic static information about the new RESORTable AT product to be read by the RESORT system. Level II compatibility allows one to establish and end a RESORT call from within the RESORTable application by employing simple to use function calls of the RESORT API. This means changes in the source code but can be undertaken with a minimum amount of effort, due to the easy-to-use function calls. Level III then gives full access to RESORT functionality including e.g. synchronisation of devices in

single switch, automatic scanning mode. This necessitates a significant amount of effort in source code changes of the RESORTable application. More information about RESORT SDK including API and demo applications can be found on web page [8].

4. Integration of RESORT into Existing Products

In order to test and demonstrate the benefits, two already existing RT systems [5,10] have been equipped with RESORT interfaces. The user interface of the RESORT controller can be tailored according to the needs of users (Fig. 3, Fig. 4). Although the full functionality is always available, the degree of complexity of functions and interactions can be varied within a wide range.
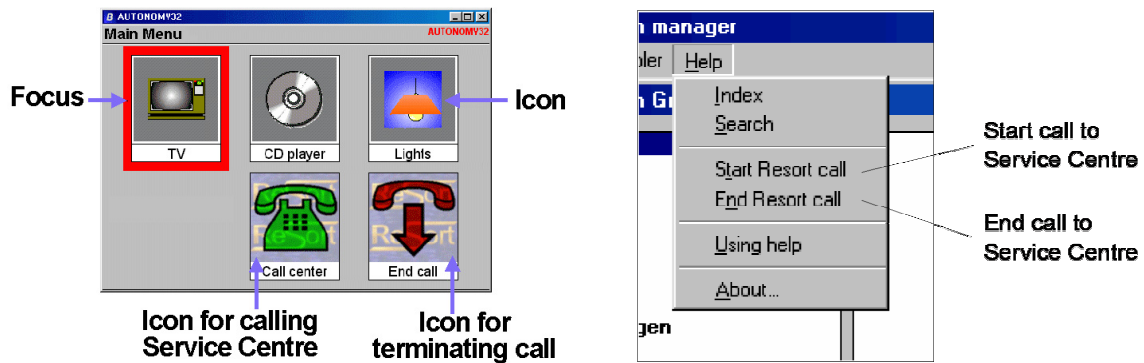

Fig. 4: The service centre can be called by using the RESORT API from inside the RESORTable RT application [5]. Left: HCI for the disabled person, right: standard Microsoft Windows GUI [5] for the care person.
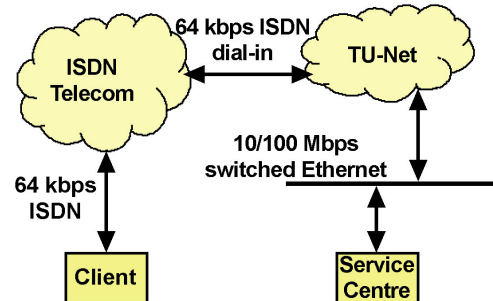

Fig. 5: Non-speaking user of AAC and ECS system [5] using the remote service provision system RESORT over a 64 kbps ISDN link to the university network. This real-life test started at the end of year 2000 and is still on-going using the latest RESORT software version which can be downloaded from [8].

5. Field Trials

In general, it has been proven that the RESORT system now has reached a level of maturity and stability, and it is able to perform its tasks from a technical point of view. User feedback indicates that the video link gave most users a feeling of security, that the application sharing feature was not only useful for fixing problems but also for training the user and care persons in order to empower them to learn more about the AT system which receives the remote support. The settings and results of the real-life tests (Fig. 3, Fig. 5) were published in greater detail in [13, 14].

6. Discussion and RESORT Interest Group (RIG)

There are commercial products on the market for application sharing, video conferencing and remote desktop support which are used in some AT service delivery projects [3,4,9]. In contrast, the approach of RESORT uses these technologies but packs them into a very easy to handle HCI and adds new features to create a system specifically designed for the AT market. RESORT uses IP which provides a high degree of flexibility in network structure. Economically speaking, the implementation of RESORT results in reduced costs of service, minimised delays between service request and service delivery, a higher learning effect, the possibility to virtually visit more users in a shorter period of time, due to saved travel time. The corresponding saved costs are expected to provide a realistic market to commercialise such remote service provisions systems such as RESORT in the future.

The RESORT Interest Group (RIG) provides a framework for disabled users, care persons, manufacturers, service providers, and researchers to continue dialogue and activities in the area of remote service provision. Interested parties are invited to visit the RESORT home page [8]. Among other things, one can find download facilities for a RESORT evaluation kit, links to available RESORTable products and more detailed information.

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