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Down-scaling of a tourist assistance system to fulfil the needs of economical poor regions and providers of tourist offers

STEFAN LUTHERDT[1], ROBERT FETTER[1], ULRIKE FRÖBER[1], PETER KURTZ[2], HARTMUT WITTE[1]
[1]Dep. of Biomechatronics, Technische Universität Ilmenau, PF 100565, 98684 Ilmenau, Germany
[2]Dep. of Working Sciences, Technische Universität Ilmenau, PF 100565, 98684 Ilmenau, Germany

Corresponding author: Stefan Lutherdt. Email: stefan.lutherdt@tu-ilmenau.de

Abstract: Derived from a complex tourist assistance system for users with special needs (e.g. disabled users with physical impairments) a down-scaled system was successful tested. It consists of a handheld device like the whole system but disclaims to a permanent online server access. The reducing of components was determined by a user-centred design process with an intense requirement analysis.

Keywords: tourist assistance system, user adaptation, simplification by reduction

1 Background and project aim

Our society and with this the public opinion finally had changed in the last few years towards an integration of all kind of people into societal activities. And within this process also the German legislation had changed and it followed with this the prevalent opinion of the WHO and its associations like is reflected in the new International Classification of Functioning, Disability and Health (ICF, Hüller & Schuntermann 2005).
By this point it was self-evident resulted to start a project to support people with disabilities also in vacational or tourist environments and activities. The project which was built up called “TAS - Tourist Assistance System” was funded within the InnoRegio-initiative “Development of a barrier-free model region for integrative tourism in Thuringia” of the German Federal Ministry of Education and Research.
The aim of the TAS project was the development and exemplary assembly of an assistance system for people with impairments as an access support to previously bad accessible tourist offers and regions.
Because it was visible during the project that the whole system only seldom would be installed it was a declared aim making available the most important components. Otherwise the inherent concepts and knowledge for design of accessible user interfaces should be transferred and used in other projects. By the use of this knowledge also a benefit for poor or less developed regions should be achieved.

2 Concept and system design

The framework of TAS which is shown in Fig. 1 (page 2) was first created for visually impaired users. It consists of stationary components like terminals, a communication and control centre and mobile components. These are mainly handhelds with specific add-ons resulting from the special needs of the users. The system was established in a small model region to demonstrate the functionality and various possibilities for the different user groups.
The unique selling point of this system is the principle, that everyone who use this system get only but all the information he needs over a well-adapted interface. During the development of this assistance system the “TAS concept” was defined as an individual aid for all potential users of an assistance system in that amount and manner the individuals need. This aid is esp. pointed to access regions or information or take part at activities and events in this regions or areas. With these main goals the TAS concept is portable to all problems

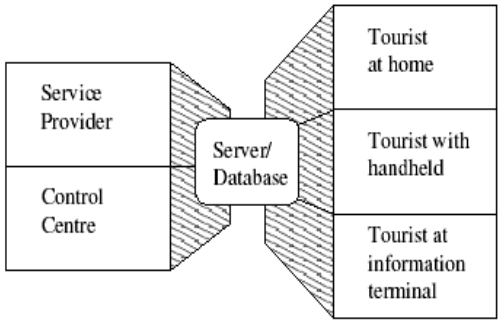

Figure 1: General components of TAS (Stiller et al. 2006)

around accessibility.
At the beginning the project focus was set on people with visual impairments because this group was identified as the group with the strongest requirements to such an assistance system. In the course of work (and after a successful test stage within a model region) components for hearing and motor impaired persons were integrated.

The deficit of not existing iterative stages (like proposed by Mayhew 1999) during the design process was moderated by an early involvement of the potential users into the design process to test and experiment with the dedicated components and operational strategies intensively. The extracted results directly flew back into the design process.

2.1 System components

The whole TAS consists of various technical components. Most of them are borrowed from the IT-market. The new aspect is the combination to a system which is permanently linked with a large data base. This general structure is shown in fig. 2. Because the special aspect of the system is the individual adaptation of the user front-end (especially interfaces but also information) it is essential to get the needed information about the capabilities and interests of the current user. These data are stored into an individual user profile at the server.

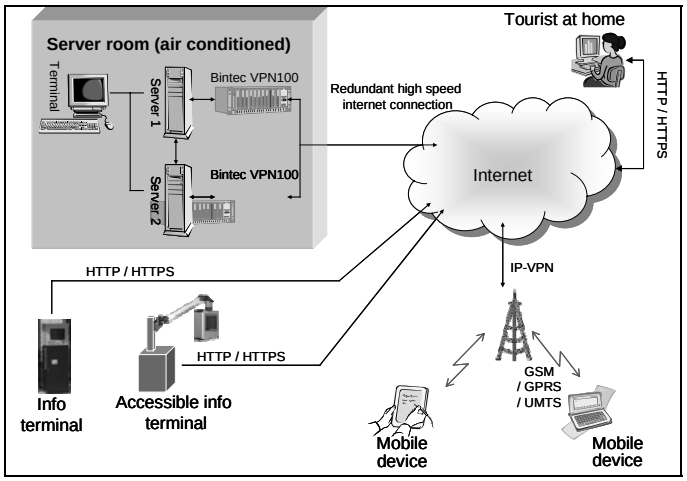

Figure 2: Schematic of the whole TAS-structure (Roß & Lutherdt 2006)

The necessary information are retrieved by two ways: first indirectly by an analysis of all potential user groups and assigning the user to one of these identified and described groups. Second way is by direct questioning of the current user to enhance the profile with individual aspects. With these profiles individual routes for every user will be planned in dependency to the personal capabilities and requirements. It is also possible to change the routes during the walk. These functionalities cause a permanent link of the user's mobile device to the server and a couple of additional components (e.g. cardio-monitoring or other medical devices. To pro-

vide a maximum of data safety also a great investment to securing the server access and information connections has to be implemented. This is also one reason for doubling the server components.
It is obvious that this large economical effort is only to cope in some well-structured tourist regions or with a public funding or private sponsoring. Additional it is necessary to keep the system up-to-date to permanently involve the community of disabled people into this business.

3 Down-scaling of the tourist assistance system

Because the fully developed system is large, expensive and time-consuming to install and operate it is a matter of course making the system scalable. Another way is to unhinge some of the components and the proven concept of individual (or group related) adaptation which is used in TAS.
With this new approach it is capable to provide the system (or parts of it) to small or structural poor regions or even to single tourist service providers like hotels and resorts.
During the last stage of the project this approach was followed in different ways. One was to develop additional services and applications which can be combined with the system to make it more rewarding to commercial users. The other was to derive “low-cost” and “low effort” versions of the system. But these versions of course have to fulfil the needs and expectations of the specific user groups.
To down-scale the system it is necessary to determine the systems properties and compare it with the user’s needs, wishes and expectance, and then looking for a new representation of these properties. Afterwards the found components have to be analysed concerning to the user’s requirements.
Like derived from the user tests it is necessary to support the users during the hike or other vacational activities additional to their commonly used aids. So every aid which is given in accessible way would be welcomed. To make this support available some general user profiles were set up from which the needed components and information depending on the abilities and interests of the users are given. These user groups are shown in table 1. All these groups are different in the needed information as well as in the amount and availability of sensual modalities and motor degrees of freedom. In table 1 are listed some of the determinant properties of each user group and the resulting system requirements which was derived.

Table 1: Abstract of user groups determinant properties and resulting requirements for a down-scaled TAS

User group	Determinant properties	Essential requirements	
		Information	Components
Visually impaired	Low vision, reduced orientation abilities	Possible hazards, track information on demand, only text on displays	Head set, adjustable mobile display devices, visual and optical aids (e.g. in fig. 4 at page 4)
Blinds	No vision, reduced orientation abilities, one or two hands bound to common aids (cane, guide dog), many track obstacles to include in navigation	Existence of obstacles on the track, relative position, possible hazards, all information have to be repeatable and detachable	Head set, vibro-tactile interfaces, devices with speech command systems or intuitive controls
Hearing loss	Disability is non-visible to others, reduced communicational abilities, less restrictions on path properties	all information have to be repeatable and detachable, text and images, adjustable speech velocity, frequency and volume	Induction loops, hearing amplifier, connection interface to hearing aids,
Deaf people	Reduced communicational and orientation abilities, less restrictions on path properties, reduced vocabulary	Simple sentences, text and images, sign language sequences, as much information as possible	Mobile devices with big screens, vibro-tactile interfaces

Wheelchair-bound people	Need of more moving space, impossibility of input actions during the motion, aids could be mounted on the chair, no routes with stairs are possible	Track conditions, the way to avoid of invincible obstacles, space limitations, degree of inclination	Device holder or sockets, ear phones or head sets, additional power supply, force feedback or vibro-tactile interfaces, outdoor wheel-chairs
Walking handicapped	Short routes with less obstacles needed, no stairs, no free hands for input actions	Available resting places, track conditions,	Head sets, outdoor wheel-chairs
Others with the need of assistance	Depends on the group specialties	Depends on interests and group specialties	Possible: heart rate monitor, outdoor tracing systems, vital monitor, head sets and much more

Figure 4: Visual aid system BIELORIS (Parthier2005) helps to increase the edge detection ability of high-grade visual impaired based on Sobel-algorithms

With deploying this knowledge into marketing concepts or regional developing projects it is possible to address and acquire new potential user groups for previously not accessible tourist offers. It is also the chance to make a first step into accessibility for poor regions or countries. Of course it is also interesting for companies which want to promote the spreading of new developed devices in the market.

4 Results and conclusions

To realise the TAS concept in a down-scaled manner it is also essential to guide a disabled person through a further not accessible region like with the fully developed TAS system. This guidance ever will be given by a well-adapted handheld device with the needed information and additional components. But it is not important for all users and all scenarios to have a permanent link to a server or to a control centre. It is sufficient to get initial information (e.g. map data, route specifics and initial profiles) and the additional components. Then the most of the users are able to find their ways without bigger problems, and always better then before. To evaluate this concept some tests with cheap available hard- and software components were executed. They allow import and link several data and output formats, especially the integration of geo-referenced bitmaps in jpg-file-format and audio files (wave-format) to give additional information or audio feedback to point the user's attention to the handheld. Fig. 5 (next page) shows an example of such a device with a running shareware program during a hike. Fig. 6 (next page) shows the belonging software for preparation of hiking routes. Both programs are freely available, cheap and easy to install and to use.
With this setup it is possible to create routes, set different waypoints and link them with audio files (and additional images) to describe the route and the special items. It is easily to transfer one or all routes to the handheld device. There are also no restrictions on the models of those handhelds; they only must have an interface to couple a GPS-receiver and an audio output. For demonstration we successful used the cheapest no name device with an integrated GPS antenna. The only requirement coming from the navigation software is the compatibility with the GPS NMEA-standard data protocol.

Figure 5: Mobile device with an active route

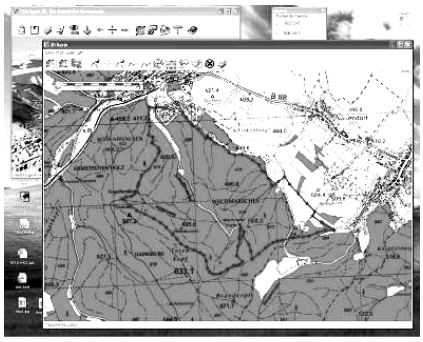

Figure 6: Planning and preparing the route for the handheld device

With the aid of this map-based navigation system the users were fully satisfied. In addition to the above showed handheld device the experimentees got induction loops. This is the necessary adaptation interface to the needs of the user group with hearing loss. The loops linked with audio output jack could transfer the speech and audio feedback of the mobile device into the experimentees hearing aids. Additional to this interface the mobile device gives a vibrational output at important stages of the hiking. This haptic feedback can be enhanced by vibro-belts or -wristbands. Such an additional interface to set the user's attention on the mobile device and possible violent situations is currently in development at the first test stage.
The first tests with other disabled user groups in the same model region had shown that it is possible and successful executed to down-scale a complex system by extracting the inner principles and transfer them to only a few but user focused devices. It was astonishing how much the benefit of these "low-cost" versions by the asked experimentees was assessed.

References

HÜLLER, E. and SCHUNTERMANN, M. F. (2005): *Behinderung/Chronische Krankheit und Internationale Klassifikation der Funktionsfähigkeit, Behinderung und Gesundheit (ICF).* In: Bundesarbeitsgemeinschaft für Rehabilitation (Hrsg.): Rehabilitation und Teilhabe, Wegweiser für Ärzte und andere Fachkräfte der Rehabilitation. 3. völlig neu bearbeitete Auflage. Deutscher Ärzte-Verlag Köln.

MAYHEW, D. (1999): *The usability engineering lifecycle. A practitioner's handbook for user interface design.* Morgan Kaufmann Publishers, Inc. San Francisco.

PARTHIER, R. and SCHUSSER, B. (2005): *BIELORIS – Beispiel für eine erfolgreiche Kooperation zwischen Hochschule und einem KMU.* In: Wissenschaftliche Berichte der 17th International Scientific Conference Mittweida „Information and Communication Technologies", Nr. 3 Biokinetische Medizintechnik. Hochschule Mittweida. ISSN 1437-7624

ROß, F. and LUTHERDT, S. (2006): *Abschlussbericht „TAS - Touristisches AssistenzSystem für barrierefreien Zugang zu Urlaubs-, Freizeit- und Bildungsaktivitäten", Förderkennzeichen 03I2808.* Technische Universität Ilmenau.

STILLER, C, ROß, F., WITTE, H. (2006): *A Handheld/Server Based Assistance System for Tourists with Special Needs.* In: Proc. of the IASTED International Conference on Advances in Computer Science and Technology (ACST2006), Mexico.