Real Life Test with a Friendly Rest Room (FRR) Toilet Prototype in a Day Care Centre in Vienna - An Interim Report

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Introduction and Aims

Today's toilets in Europe often are not suitable for citizens with functional limitations. The Friendly Rest Rooms (FRR) project, partly funded by the EU 2002-2005, has carried out several research, design, engineering and evaluation activities in order to develop new knowledge and innovative prototypes in the area of toileting [1,2,5]. In particular, the project aimed at improving the quality of life of older persons and people with disabilities by providing semi public toilet systems which can adapt to different user needs. A field test in a day care centre for patients with multiple sclerosis (MS) was set up and carried out between December 2004 and February 2005 in order to validate the toilet prototype in day to day usage. The objective was to investigate if and to what extend the quality of life of has been improved by the introduction of the new toilet system.

Setting the Scene

The MS day care centre welcomes approximately 50 persons a week between 8.30 am and 3.30 pm. The guests of the day care centre are patients of different ages with MS, who are coming regularly on one or more days a week. A part of the users is able to walk alone a part needs aids like walkers and walking sticks, some are using a wheelchair. Some need support from nurses when using the toilet others can use it independently. The day care centre is providing occupation therapy, physiotherapy and basic hygienic services like taking a bath or a shower.

Methods

The FRR consortium has developed several iterative laboratory toilet prototypes with a number of new features as has been reported in [2,8]. For the field test a limited number of FRR components were selected:

- Toilet module based on LiftWC 700 [9] with: two actuators to change height of toilet bowl between 44.6 cm and 76.8 cm, and of toilet tilt between 0 and 6.5 degrees, two horizontal support bars which can be folded up, hand held remote control (6 buttons for: height up/down, tilt up/down, flush and emergency call = call for nurse)
- New type of a door handle (designed by Landmark [10]) for entrance door (Fig. 1)
- PC based hardware unit with FRR software for monitoring (one data sample each 100 ms) and remote maintenance software module
- Position sensors for measuring tilt and height, binary sensors for reading status of buttons, of door, of emergency call system
- User identification module and FRR smart cards based on RFID (Radio Frequency Identification) mid range technology

Figure 1: Toilet room at day care centre for MS patients for the FRR real life test Dec 2004 - Feb 2005: door with door handle (left), height and tilt adjustable toilet system (middle and right).

In the toilet room a place was created where the hardware of the monitoring unit (a PC running WinXP) and the hardware of the RFID device were installed. Cables were installed behind a separate wall between this space and the back side of the LiftWC for the data and measurement devices. An antenna for the FRR smart cards (RFID tags) worn by the users was installed under the plastic cover of the toilet. A sensor for reading the status of the entrance door (open / closed) was mounted, and several sensors inside the LiftWC were connected to the monitoring unit. All parts of this monitoring equipment are invisible for the users. The monitoring unit is running a dedicated version of the FRR control software [2] and is connected to the LAN. Via the local firewall and the internet the unit can be accessed remotely. Among others, the log files contain information about current height and tilt of toilet, status of buttons on the remote control, status of emergency call system, status of door and the identification numbers of the recognised FRR smart cards.

Participative observation activities at the day care centre were started even before the new system had been installed and were continued until the completion of the test in February 2005. ADL (Activities of Daily Life) scores from participants of the field test were collected. Additionally, formal and informal interviews were conducted by the sociologists. In the final phase of the field test the QUEST 2.0 tool [11,12] was used to measure the changes in quality of life. The data from the different sources have been brought into relationship in order to

draw an in-depth picture of the actual usage and to understand better the details of how users are interacting with the system [4].

Based on the ethical guidelines [7] developed and used in the FRR consortium an informed consent procedure has been used for primary and secondary users.

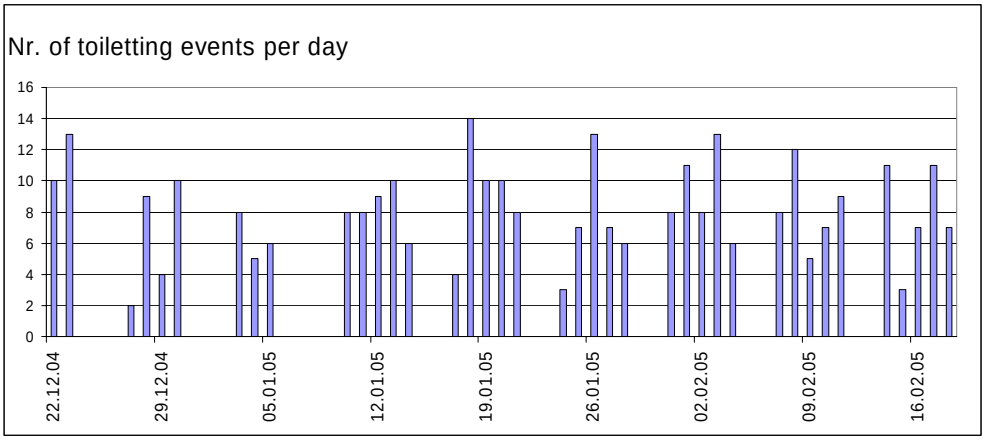

Figure 2: Number of toilet usage per day between 22.12.2004 and 18.02.2005, average: 8.1 sessions per day.

Figure 3: Closing the door as wheelchair user requires a lot of efforts (left); A Secondary User accompanied a Daily Guest in the FRR (right).

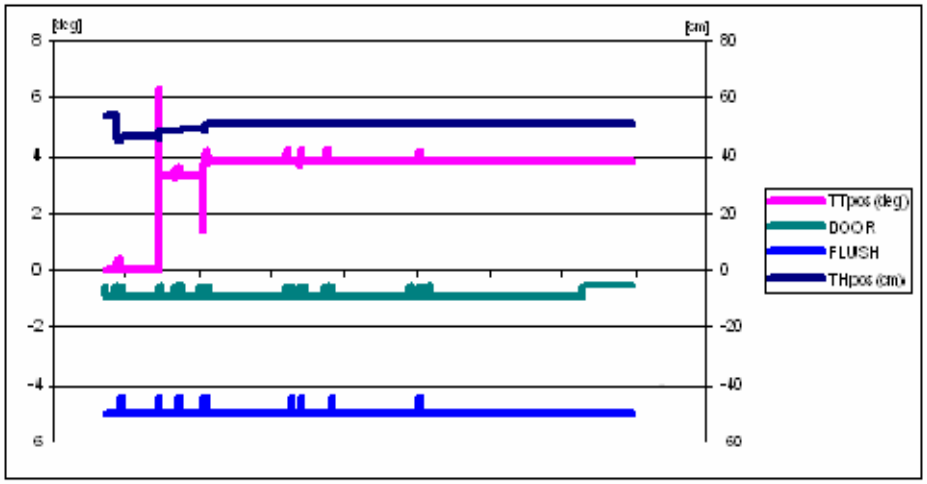

Figure 4: Example of data gathered during a day (subset of available data). Toilet height, tilt, opening/closing of door and flushing is shown between approx. 8 and 17 o'clock.

Results

The field test was carried out from December 2004 to February 2005 with a total duration of 59 days, thereof (due to holidays and weekends) 39 days with usage of the toilet (see Fig.2). 29 primary users (MS patients) and 12 secondary users (nurses) participated. 316 toilet sessions took place, whereof 149 (47.2%) could be identified via RFID cards. Number of toileting events per day: min 2, max 14, average 8.1. The toilet tilt was moved between 0 degrees and 6.5 degrees, the height of the toilet between 43.6 cm and 67.9 cm. Outcome measurement based on QUEST 2.0 delivered satisfaction rate of approx. 80%. The MS patients experienced increased autonomy and a higher level of dignity (e.g. being able to autonomously call the nurse via held remote control), and increased safety (e.g. better contact between feet and floor due to adjustable height) [6].

Discussion

In contrast to the FRR laboratory prototypes [2,5] which are able to adapt themselves autonomously when a user is entering a room, e.g. moving the toilet bowl to the preferred height, the real life test system does not autonomously – without direct button presses of the users - steer the toilet module, but only reads the current status of the toilet each 100 ms. The field test in real life (a) required a high level of safety and hygiene and (b) should focus on gaining in-depth data from day to day usage of the new components. Therefore, it seemed reasonable to concentrate on only a few components being aware that several other innovative features and components which already had been tested successfully in the laboratory environments of the FRR consortium were not part of the real life test. Data are for a sample of MS patients in a MS day care centre and therefore not representative for all intended user groups of the FRR toilet system, but the data are coming from real life usage and therefore can be seen as confirmation for some of the findings from previous laboratory testing of the FRR consortium partners.

Conclusion

A field test in a day care centre for MS patients was carried out over a period of 2 months. It could be proven that an intelligent toilet system able to adjust tilt and height of the toilet bowl actually can contribute to an enhanced autonomy and independence of persons with functional limitations and thus does increase the quality of life [2,4,6].

More information: http://www.frr-consortium.org and http://www.fortec.tuwien.ac.at/frr

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