Yearly Technical Recommendation Report July 10-July 11

ExCITE evaluates user requirements of social interaction that enables embodiment through robotic telepresence. This evaluation is performed in situ, on a Pan European scale and with a longitudinal perspective. An existing prototype is deployed to the targeted end-users, and is refined by tightly involving the users in the development cycles of the prototype throughout the project. ExCITE involves partners in three partner countries: Italy, Spain and Sweden.

The information in this document has been provided by:

Part. no.*	**Participant organization name**	**Participant short name**	**Organization type**	**Country**
1	Örebro University	ORU	Academic	Sweden
2	Giraff Technologies AB	GRF	SME	Sweden
3	Consiglio Nazionale delle Ricerche - ISTC	CNR	Academic	Italy
4	RatioConsulta SpA	ROC	SME	Italy
5	University of Malaga	UMA	Academic	Spain
6	Örebro City Council	OCC	End-User	Sweden

The objective of this work package is to provide the technical support needed to deploy the prototypes to the test sites and the expertise to interpret the data obtained during the user evaluation in order to match the user needs to the technology. The objectives of the workpackages are:

- Ensure technical readiness of end user sites for deployment
- Maintain technical support during evaluation period
- Provide user requirement report that match technology to user needs

The document reports on activities and accomplishments during July 2010 – June 2011.

➢ Task 2.1 Technical Infrastructure for Prototype Deployment

Description: Getting test sites ready for deployment of prototype e.g. ensure wireless networks are available and that the prototypes work correctly. (ORU,UMA,CNR)

Giraff units are to be deployed at a number of test sites in Italy, Spain and Sweden. Responsible for finding test sites in each country and deployment of the Giraff units are the participating universities respectively. In other words Consiglio Nazionale delle Ricerche – ISTC (Partner no 3) is responsible for the technical infrastructure and findning test sites in Italy and University of Malaga (Partner no 5) in Spain. In Sweden, Örebro University (Partner no 1) is responsible for the technical infrastructure while finding the test sites is done in cooperation with Örebro City Council (Partner no 6). Giraff Technologies AB (Partner no 2) is assisting the other partners in case of problems regardining setting up wireless networks and in the case of prototypes not working correctly. The organization to perform this task is working properly.

➢ Task 2.2 Support Hotline for Troubleshooting

Description: Soon after the first deployment of the Giraff, a support hotline is available to all end-users. This hotline is maintained by the prototype manufacturer. (GRF)

There is no current direct support hotline to Giraff for the end users and the ExCITE testsites. The partners 1,3 and 5 are currently supporting the end users at the test sites and keep the contact with Partner 2.

Task 2.3 Training Sessions for First Time Test Sites

Description: Prior to first deployment at a new end-user site, a training session is given to the end-users. Different varieties of the training session is available depending on whether it is a private person, or a care facility receiving the prototype.

Partners 1, 3 and 5 are responsible for the training of end users prior to first deployment at a new end user site. To aid the training, instructional guides and movies have been created and been published on the project's website. Also oral Italian and Spanish translations of the User's guide, currently available in English and Swedish have been ordered and are expected to be published autumn 2011.

Task 2.4 Matching User Needs to Technology

Description: This task involves the essential step of analyzing the user evaluations (questionnaires) and providing a set of recommendations for changes to the prototype. This task is done by researchers with insight in extrapolating the user requirement from

qualitative response and researchers with deep insight into the technical operations of the prototype. Follow up actions will be planned according to the results. (ORU,CNR)

Due to the complexity of this task, the recommendations for further matching the user needs of technology are grouped into different topics and follow below.

Privacy and end-user control

Early encounters with potential end-users revealed needs to protect their privacy. Issues were raised such as the need to be able to answer or decline contact via the Giraff.

- Partner 2 has introduced a new remote control for local use by the elderly. This remote control is equipped with green and red buttons enabling the elderly to answer/decline a call.

RECOMMENDATION to manufacturer

- Reproduce a sound in the Giraff when a pilot disconnects from it so that the user knows nobody is still there.

The elderly at the first Swedish test site also wanted to be able to initiate the calls via the Giraff.

- The remote control implemented by Partner 2 during the first year of ExCITE allows the elderly to call a beforehand decided client user (call out user). This means that the elderly can also initiate a call. The call out user is set in the Sentry database, recently implemented by Partner 2.
- The remote further allows the elderly to adjust the volume of the Giraff speakers.

The new remote has not been given bad criticism so far. It is met by appreciation. Some users express their concern with data traffic because previously the relay server was placed in the U.S

- The relay server has been moved from U.S to a hosting site in the EU (UK). This may also decrease delays in data traffic.
- Partner 2 has implemented a Sentry database system handling user permissions to different robots. The elderly may decide who has access to their robot and under what premises (normal access or emergency access). The system is further used to name robots, setting their languages and so on. The system also logs all connections to a robot allowing for control of misuse.

Robustness

It is likely that the Giraff will be placed in both narrow areas (as is the case in e.g. apartments in Italy) and also be used by people using wheelchairs. This in combination with the Giraff being steered by remote users who may be new to driving early indicated a need for a robust cover of the Giraff. In Sweden, an earlier prototype was used at the first test site, this prototype came with a cover with a round shape mainly consisting of two plastic peaces held together with rubber gaskets. The shape caused trouble during transportation. The Giraff was difficult to fixate and the rubber gaskets didn't started to fall off the Giraff. It also happened that the Giraff expressed an error with the tilt movement (E16) after transportation. The Giraff then needed help with the tilt movement when booting.

- Partner 2 has Redesigned plastics and added plastic façade to hardware box. They have further replaced rubber gaskets with "pure plastic" design with rivet fasteners. The new cover is further of a harder plastic quality allowing for more

collisions.

- The shape of the Giraff cover is no longer round. Two sides are now flat enabling a more safe transportation of the unit. This should decrease the frequency of errors with tilt movement.
- The display tilt design has been improved display tilt for better reliability.
- The Giraff height can now be adjusted manually. The Giraff can be transported in smaller vehicles.
- The shipping container has been redesigned for safer transportation.

Advanced Operational Guide

Partner no 3 has pointed out several issues with the operational guide. In a software update some commands were changed which need to be updated in the guide. The command to start the Giraff application at the end user side changed from runServerP2P to runGiraffP2P

- Partner 2 has updated the guide with the new command.

The name of the present wireless router changed from BIKT2 to BIKT1.

- Partner 2 has updated the guide with the new settings for the router.

Partner 1 and 3 also points out that docking the Giraff manually into the docking station does not work. It seems to tap into the charging base but in reality the resistance of the engine makes Giraff disengage from the base. This was brought up to partner 2 by partner no 1 and there is a solution to this problem which works in most cased but it is not shown in the manuals.

RECOMMENDATION to manufacturer.

- Specify the solution of the problem in the Giraff guidelines. This needs to be clear in both the Advanced Operational Guides and guidelines for end users.

It appears that some antivirus programs seem to block traffic to the server containing the database of Giraffs. Partner 3 has experienced problems with McAfee and Kaspersky while Partner 1 experienced problems with Officescan while at university network. Officescan can have different profiles depending on the network thus fool the user it is a normal firewall problem.

RECOMMENDATION to manufacturer

- Include information about the issue in the Operational Guide. Currently only firewall information is given.

Video quality

Issues with the quality of video are raised. The resolution need to improve.

- The newest Giraffs are equipped with a new camera and lens that will support higher video resolution and smart zoom in the future

Giraff unit design

In the white prototype version of the Giraff, the USB-ports were placed underneath the round cover causing the users to lay the Giraff down when wanting to remove or connect new devices. This may harm the Giraff's cover.

- The Giraff has been redesigned so that keyboard, remote and network hardware are "outboard" USBs instead of underneath the Giraff which simplifies user handling.

Upon receiving an emergency call from a client user, the Giraff units makes a strange noise sounding a bit like a door. This is a weird sound while telling nobody has to answer. The robot also sometimes produces a sighing sound, according to Partner 3 this is when the battery gets close to depletion state but Partner 6 has also reported hearing the sound before the robot turning itself off all of a sudden.

RECOMMENDATION to manufacturer

- Rethink the sound upon receiving an Emergency call.
- The meaning of the sighing sound is unclear. It is not the elderly's responsibility to manually put the Giraff in the docking station so telling it will soon run out of battery is not necessary. It should be possible to turn such sounds on "mute".

The ones seeing Giraff and living with them comment on the height of the Giraff, although it is possible in the current version of the Giraff to manually change the height this cannot be done by the people having them at home.

RECOMMENDATION to manufacturer

- Add a motor so that the height can be adjusted by pushing buttons or moving a slider in the client interface. This would accommodate both sitting and standing height of the elderly.

Keyboard

Currently the Giraff unit is preset to take an English keyboard as input. However the keyboards installed at the Giraff units do not have the English keyboard layout.

RECOMMENDATION to manufacturer

- The Giraff units must take the correct type of keyboard as input. It is assumed that a Swedish keyboards are shipped with the delivered Giraffs so the keyboard language in the Giraff software needs to be Swedish. If not possible, include an image of the layout of an English keyboard in the Advanced Operational Guide.

Docking station

During training sessions as well as during use at early test sites client users have difficulties docking the Giraff properly into the docking station. The reasons are several; not driving straight ahead or too slow into the docking station as well as the docking station not placed properly against a wall. Being able to dock the Giraff is essential or the Giraff will discharge. Further, staff visiting the elderly at the first Swedish test site did not understand how to place the docking station, one time it was found laying down with the Giraff placed on top.

RECOMMENDATIONS to manufacturer

- Test the docking station so that it stands properly against more types of walls and baseboards. For example at the first Swedish test site, the shape of the baseboard caused the problem.
- The manufacturer also have "cheats" in placing it properly. How to position the docking station must be in the guides.
- Overlook the design (colour and shape) of the docking station and the Giraff to clarify the docking process.
- Consider putting symbols explaining positioning of the docking station similar

to the ones for on and off on the current Giraff cover.

Where am I? What is around me?

The potential users of the Giraff unit may be seldom users, while some of them may have visited the location of the Giraff some haven't. This was the case at the first test site in Sweden, here many of the intended users were working as alarm operators at a security alarm company which the elderly could get in contact with via telephone upon pushing an alarm button. Around 40 different operators could respond to alarms from the elderly. Upon request from the elderly or if an alarm came in from the elderly without anybody talking, the alarm operators would visit the elderly with the Giraff. Naturally, not all 40 operators could visit the elderly and they all needed to know the layout of the house and the position of the docking station. The alarm company themselves drew a simple blueprint of the house in which they included the position of the docking station. This location was also pointed out in written instructions to be below a calendar. Currently the Giraff has only one sensor, a camera. However the operators experienced difficulties trying to navigate in narrow passages as well as when trying to dock the Giraff.

- Partner 5 is investigating obstacle detection capabilities and robot localization. A comparison has been made between Hokuyo (ref) and Kinect (ref). Results show that Kinect has too many limitations and reliability for use with the Giraff. The Hokuyo laser scanner has been chosen for localization and obstacle detection problems.
- A map can be built by driving a robot in a desired environment saving information from robot wheel encoders (odometry) and range data from the laser scanner. The map building process is done offline with ICP technique (Iterative Closest Point). Thus it is supervised by a user who can adjust important parameters to achieve a close to reality map. Posterior localization of the robot is continuously performed at runtime, which requires a significant computational effort. It has been investigating whether the current computer onboard Giraff is able to cope with mapping and localization algorithms
- An algorithm to help the user to navigate within the environment is also being implemented. It aims to provide the Giraff with the ability to traverse short distances, i.e. crossing doors, without the human help.

RECOMMENDATION to manufacturer

- Support to Partner 5 to incorporate the Navigation Assistant into the system. It is suggested to include into the Client Interface the needed components to command the Navigation Assistant algorithm, like for instance a schematic map of the environment with indications about where is the dock-station and the current position of the Giraff.

It is acknowledged that objects in a house may change locations over time, or even new objects such as wheelchairs or rollators may be placed in the home of an elderly. This may case outdated maps.

The envisaged techique for localization is robust enough to cope with slight changes in the environment, i.e. moving chairs, open/close doors, etc., however it can turned unstable if major changes occurs. In that case, a map update is needed. A process for detecting such problems will be studied and a convenient way to adjust the map to the

new situations will be investigated.

RECOMMENDATION to Partner 5

- Investigate if it is possible to detect that a new map is needed. If so, provice an easy and convenient way of adjusting the map.

Client interface

The alarm operators being client end users at the first Swedish test site had difficulties knowing what was forward. At this point the white prototype with the round cover was used. To solve the problem a line made of blue paper was pasted vertically at the front of the Giraff's cover.

RECOMMENDATION to manufacturer

- Implement an indicator of what is straight forward into the software.

Several client users have been observed having trouble docking and in some cases because of the current speed being too low.

RECOMMENDATION to manufacturer

- Implement a button that docks the Giraff with necessary speed that the user can push when positioned towards the docking station.

Different comments and issues exist with the current user interface. These will follow in a list to the manufacturer.

RECOMMENDATIONS to manufacturer

- The arrow for turning around is turning in the opposite way compared to the actual turn.
- Camera tilt is commanded by moving the mouse over the screen. At occasions this causes involuntary movements. The system could give the user the option to instead use buttons to activate the tilt.
- Add keyboard shortcuts for "Turn" and "Back up" for a more fluid navigation.
- To increase visibility, consider indicating the battery level percentage in another color. At the moment it is written in white on a gray slide.
- After the Giraff dies due to lack of battery power it goes quickly to charge it again to 41 %. However the truth in this 41 % is questionable because the Giraffs at both Swedish test site 1b and 2 have sighed and died quickly after having left the docking station with the 41 % shown in the pilot. Also the Giraff dies very fast after the sigh, it is suggested to warn a bit in advance at both user-ends.
- The pilot needs to recognize a headset is inserted after the program has been started.

WIFI

The Giraff unit software is installed in such a way that it seeks for a router named BIKT1 which need to have a specific protocol and password. At some locations, for example at demos or at test sites, there are other strong wifis at hand. In order to choose that wifi today, the Giraff's write protection has to be disabled, the Giraff rebooted by pushing the Windows start button on the screen instead of by pushing/pulling the normal turn on/off button on the cover. An advanced user then needs to add the wifi to the Giraff settings, enabling the write protection again, and restart via the Windows start button. About one page in the Advanced Operational Guide is used to explain the

process of switching to another wifi. When again wanting to use the BIKT1, all these steps need to redone. The process is both time consuming and dangerous as not using the Windows start button may cause memory corruption and factory servicing.

RECOMMENDATION to manufacturer

- The process of switching between different wifis need to be simplified. This task should be done with write protection enabled but yet save the specified wifi until the next reboot.

The amount of wifis around us are increasing over time. At many locations there are many wifis running on the same channels, particularly on the 2.4 GHz band, which may confuse the Giraff and cause a bad wifi connection.

- The Giraff software now has a automated frequency selection (2.4 vs. 5 GHz) for 802.11.

Especially in Italy, the feeling is that working with internet could be a problem. In Italy the internet connections are not notoriously robust. For example, the signals may vary within different rooms and the Giraff may be driven into shadowed zones causing a disconnection.

- Partner 5 has performed functional testing of connection robustness between the client and Giraff units considering both normal and emergency calls. Three Giraff units and three brands of routers were used in the test. In total 50 connections were made. All connections were successfully established. The connection was also considered robust in most cases. However both Partner 1 and 3 report that possible distance between Giraff and router need to increase.

RECOMMENDATIONS to manufacturer

- In case connection is lost while a communication has been established, the Giraff should reconnect automatically. Reasons may be for example network jitters or short disconnections. Specify within the guide what is the minimal requirement in terms of e.g. bandwidth for an internet connection to be used by the Giraff unit.

RECOMMENDATIONS to partner 5

- The responsibility of positioning the Giraff lies on the client user. Therefore, in case of being disconnected because of being out of reach of the router, the user need to be warned when the signal is getting too low so it can move towards a stronger signal. If possible it would be good if the robot could move backwards in its recent path until reaching a signal allowing for connection to the robot.

An algorithm is being developing to online record the signal strength at different locations of the environment. This information can be reported to the client user, so he can avoid shadowed areas. Moreover in case of losing the connection, the Navigation Assistant could move the Giraff to the closest point with an appropriate signal strength.