D 1.6 – Final report on the requirements list

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Del 1.6	Executive Summary
This deliverable describes the final requirements list of the ALIAS project, established by WP1. Based on the applications and services of the final prototype the usability of the robot was evaluated as well as limitations and open issues were described. The final requirements list based on the results of two tests, regular telephone-conferences of the interdisciplinary team and a wide set of activities of user inclusion. It was strongly affected by enlarging the user groups within the project runtime, upcoming technical possibilities as well as technical constraints. Keywords: Requirement list, second prototype, user inclusion	

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Table of Content

1 Introduction

This deliverable 1.6 (D1.6) refers to a final requirements list of the ALIAS project that has been established by WP1. Based on a secondary analysis and several workshops with different user groups (e. g. elderly users, relatives and professional caregivers) the needs and preferences of relevant target groups had been investigated and a first requirement list (D1.1) for the robot was developed. In cooperation with technical partners the feasibility of user wishes had been estimated and the most important functions were selected (D1.2). These had been realized and sophisticated within a first and second prototype. Within the scope of two field trials (D1.3, D1.4) the performances of these functions were evaluated and possible marketing opportunities were explored. Based on the feedback of WP1, particularly the conducted workshops and surveys as well as the prepared business model, the technical partners have continuously improved the robot. In addition, the entire development process was infused by the technological progress.

This report is divided into six chapters: The following chapter 2 refers to the responsibilities within the ALIAS project and the first requirements list as well as the list of selected functions. Against this background, the robot in its actual state was evaluated from the user side of view (chapter 3). A conclusion is outlined in a final requirements list including further recommendations in chapter 4. A shortened final list of requirements can be found in the appendix.

2 Background

Based on the secondary analysis and workshops, the requirements of elderly users have been specified. In dialogue with the technical partners, the implemented functions had been selected. A detailed description of the approach can be found in D1.2.

2.1 Responsibilities within the Project

In order to verify functions and services of the robot, the consortium followed an iterative development and designing process strongly based on users' decisions. This process has been divided into two phases, each comprising a development/verification cycle with user feedback after test runs.

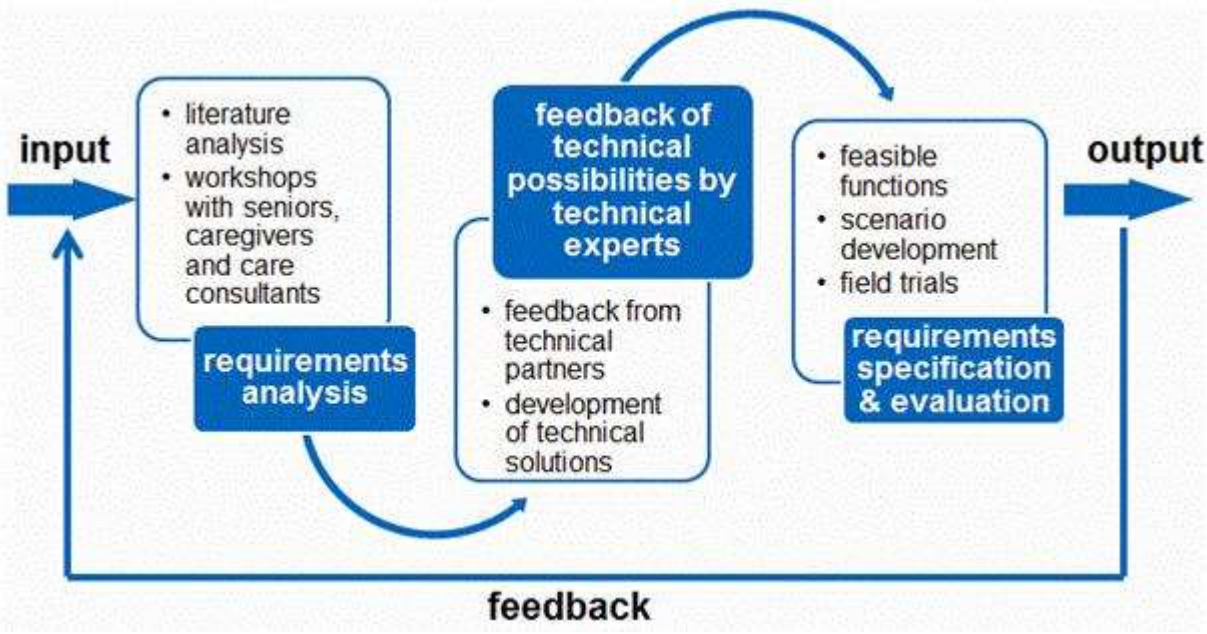

Figure 1: ALIAS development cycle

The applied approach provides a flexible method to handle risks as well as quality and to ensure consistency between initial requirements, development activities and achievements all along the project. This fact is particularly important because of the innovativeness of the technical means and the specific needs of the elderly user groups.

To fulfil the challenges of the project, experts of different disciplinary background work closely together. Therefore, the project was divided into nine workpackages. In each work package the efforts concentrate on specific tasks within the development cycle. A summary of the responsibilities within the project is given in Table 1.

WP	Description
1	User Inclusion
2	Human-Machine Interface
3	Dialogue Manager

4	Services for Net-based linking
5	Brain-Computer Interface
6	Navigation
7	Pilots/Prototype
8	Management
9	Dissemination

Table 1: Workpackages within the ALIAS project

2.2 Requirements of the User Groups

Applications and services for the robot that had been requested by users fall into the following categories (see Table 2). They had been investigated by three user workshops in Berlin and Munich (30/09/2010, 13/10/2010, 10/11/2010), by information events and by user polls as well as a wide secondary analysis regarding users' needs at the beginning of the project. Further details about the results of these activities can be found in D1.1 and D1.2.

Category
Support
Health
Events, leisure and hobbies
Communication
User contact

Table 2: Requirements of Elderly Users

2.3 List of Selected Functions

Based on the feedback from partners regarding technical feasibility a catalog of functions and modules for the first ALIAS prototype was established which selects the most adequate functions and concepts. From the large set of needs and preferences of elderly people a subset had been selected to meet the users' needs in an optimal way and to reduce the complexity of controlling the ALIAS platform by elderly people.

To build a basis for further developments the consortium developed a first set of scenarios which describe typical application areas of ALIAS which were used as testing modules within the field trials. In sum: Typical services of ALIAS as a communication platform are: making phone calls, playing video games, monitoring physiological functions and exploring event related information. These scenarios are described in D1.2.

The four scenarios as well as the list of applicable and feasible functions had been amended and specified on the feedback of users during the test-runs, workshops

and polls. As a result new scenarios had been designed, technically developed and evaluated within two test-runs.
Not all requirements of the users could be integrated in the ALIAS project, because of time and cost restrictions as well as limitations of the technology. Based on the wishes and needs of the user groups and after the evaluation by the technical partners, these reasonable but at the actual state unfeasible functions have been added to the list of postponed functions - having a potential change of making further progress on within the project runtime (see: Table 3).

Function	Responsibility	estimated
Memory and reminder functions: Alarm clock for medication and drinking, wake up; Reminder for body care, birthdays etc. → problem: ALIAS must not be turned off at night; maybe possible with Google Calendar	TUM-MMK and Frauenhofer	not in the project runtime
Looking for the senior by video link in the apartment (taking a look around with the eyes of the robot; giving it instructions to move to designated locations); Monitoring of inhabitants (surveillance of accidents etc.) → rotation of the head	TUI	done
Scan and read out function (e.g. for letters) needs another camera	TUM-MMK	postponed in year 3
Virtual travelling	EURECOM	not in the project runtime
Communication with other services like shopping services (Tengelmann)--> see Dialog Manager	TUM-MMK	not clear
Calming the senior down; domestic emergency call; user says "help"	MetraLabs	done
Advanced, speech-based search function	Cognesys + EURECOM	postponed in year 2
Translation of texts and user manuals (EURECOM to see in which task it could be done and shows a simple implementation with the Google Translate API)	not clear	not clear
Organizational support of care	not clear	not clear
Scheduling with several different caregivers (should be accessible by caregivers and by primary user)	not clear	not clear
Ensuring deactivation	not clear	not clear

Table 3: List of postponed functions

The following Table 4 summarizes applications and services for robots of elderly people that should be considered in further innovative projects in the field of ambient assisted living. All of these functions have been rated as useful for the target groups of seniors by participants of ALIAS' workshops. Nevertheless, they are out of the scope of this project itself.

category	functions	rejected because of
secretary/administration	filling in contracts by speech; tax computation	legal problems, technical problems
physical support	handhold/walking frame; foldable seat; lift and carrier: storage/deposit space for heavy objects; carriage basket; getting and bringing things; cleaning functions	not in scope of the project
device control and security	speech control of household devices (e.g. climate control, light control, remote controlled opening of the door)	no standard established
	surveillance of house/apartment (e.g. burglar alarm, smoke detectors)	no standard established
healthy living and health status surveillance	video-based communication with telemedicine center or medical practitioner	decision of the midterm review: legal problems
leisure and hobbies	specific information on the living environment: bargain advertising; recipes/interactive cooking (giving instructions to user like "make an egg", user gives feedback or information about status by speech, display might show examples of preparation)	not in scope of the project
communication	contact building and motivation (Whom to call if you can´t sleep?; Who has got similar interests?; getting information what friends or relatives do or experience)	not in scope of the project
	encouragement of visits of grandchildren etc. by functions/games that can be used by seniors and kids at the same time	not a real function, but an important point: desirable in combination with physical training and monitoring
usability and design	smaller size for narrow environments; suitable for non-barrier-free environments (e.g. door sills/carpets)	not in scope of the project
	customizable color; use of muted colors	easy to realize in future
character	humanoid faces	controversial issue for the elderly themself

Table 4: List of rejected functions

D1.2 contains more details about the lists of selected, postponed and rejected functions as well as a full description of the first four scenarios.

3 Purpose of the Final Requirements List and Methods

In this chapter, the background and the results of surveys, interviews and secondary analysis concerning the needs, preferences and requirements of the elderly people are described. This is important to know the background of the specific aspects of the final requirement list.

3.1 Purpose

The main objective of the final requirements list is summarizing wishes and needs of elderly users as well as relatives and professional caregivers. In doing so, it is a guideline for technical partners implementing the functions and services of ALIAS.

The purpose of the ALIAS project is to build a robot for elderly people to keep them socially connected and to prevent social isolation. Beyond that, ALIAS supposed to provide a set of modern entertainment technologies, which increase the joy of life for elderly people and their relatives. Therefore, the development process of ALIAS followed a threefold strategy:

1. Improving social connection of the elderly by bridging spatial distances via the integration of state-of-the-art communication methods in a for elderly people pleasant way.
2. Encouraging elderly people to contact family members, friends, and keep them up to date with everyday life events both locally as well as world-wide, e. g. by automatic newspaper reading, etc.
3. Assisting elderly users in their everyday life by ordering items, taking medicine, walking around, etc.

Environmental conditions and daily routines had been analysed to investigate interests and wishes of various target groups. A list of selected functions has been created. In this way and in cooperation with experts from engineering work packages the robot had been improved step by step.

The main objective of D1.6 is to evaluate the processes within the project runtime and establishing a final requirement list. For this purpose, WP1 was analysing the actual stage of development from the users' points of view. If applications and services fell shorter than expected beforehand, WP1 also tried to look for reasons as well as giving further recommendations for technical experts in general who will construct a robot similar to ALIAS in future.

To fulfil these tasks WP1 had closely collaborated with all work packages and had surveyed feedback from technical partners based on the current integration and development status at the end of the project. Based on that, the robot platform and its

applications and service requirements had been evaluated with special focus on the needs of the heterogeneous elderly user groups.

To get a final list of requirements a document had been provided, containing the selected functions and the technical partners were asked to express their opinions on the application and services. It is especially them who should assess the actual integration level and feasibility of the mentioned functions. The detailed list including all statements of the technical partners as well as the responsibilities is attached in the appendix.

3.2 Gender and Diversity

Including gender and diversity aspects in the ALIAS project revealed new perspectives and opportunities for designing human robots, since women and men have different backgrounds, needs and interests. During the project and in collaboration with elderly people, their relatives and professional care givers all project members gained key insights about the requirements of user groups. For the development and optimization of a requirements list, the heterogeneous needs and preferences of the elderly should be notably regarded. Therefore, aspects of gender and diversity were considered during the whole innovation process of the robot. That means gender aspects had been factored in all workshops, field trials, analysis, surveys and interviews with the target groups.

Gender aspects have to be considered in the innovation process of ALIAS and its requirements. Especially interesting for the development of a senior-focused robot were the following points: life expectancy, financial resources, social resources, health habits, risk of diseases, different clinical pictures and caring. These points were taken into account and the similarities and differences of women and men were illustrated in Deliverable 1.3 [1].

Requirements of users differ according to gender and social origins, which can be seen in the secondary analysis [2] and from results of the conducted workshops and tests. Differences between men and women are due to diverse backgrounds and experiences of life and perceptive. For example, elderly men look more often back to a professional career in technical settings than elderly women [2]. Related to that they have more experience using technical devices and are more technique-affine than women. In contrast to that, female seniors try to get the bottom of a new technical device more often. For those particularly the value added is in the foreground. For example: while a male senior focuses on the batteries' life of ALIAS, a female senior cares about the appearance and daily chores of the robot.

Also aspects of gender and diversity were taken into account when the colour design of the robot was determined. Colors are attached to human feelings and so the color of the robot is not self-evident. Emotions are strongly associated with colors (see figure 2). Some colors are age, gender and educational sensitive while others are not. So red, yellow and orange are perceived more negatively by men than by

women, blue is viewed as more emotionally “active” by men. Black is viewed more positively by men than by women [3].

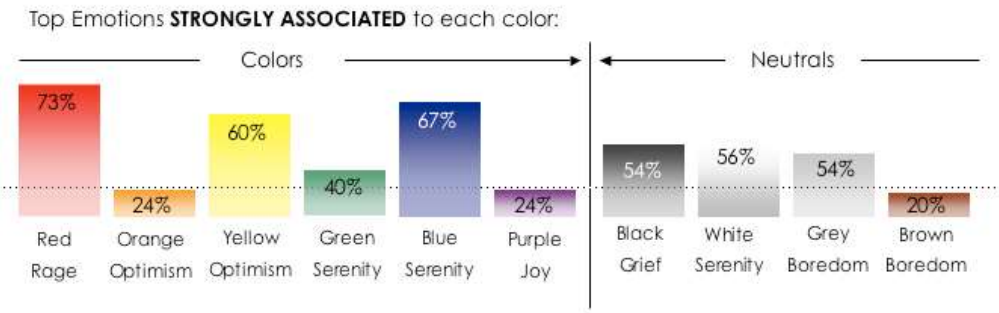

Figure 2: From Harrington L. & Lechner A. (2005); Colour Marketing Group Conference, USA

After research in color psychology referring to elderly we suggest the following variants for the pilot:

1. light beige: #f1e5bf
2. white: #ffffff
3. dark blue: #002a72

Based on this, ALIAS was developed as following:

Here are three examples that illustrate how the ALIAS project has included gender aspects in the development process:

- **Speech**: Compiling the first requirement list senior participants of the workshops ask if the technical partners could provide female and male voices. WP1 discussed this wish with the technical partners and picked up more data during the survey at the senior study programme.
- **Games**: As studies show, men and women prefer playing different video games. In knowing that, WP1 include questions about the favourite pleasure activities and games during the workshops. On the feedback of the participants, a set of games has been integrated that fulfil the wishes of men and women (e.g. Tic Tac Toe, Sudoku).
- **Colours**: Since about 8% of men and 0.4% of women suffer from a red-green disorder, the combination of red and green was avoided during the design of the graphical user interface.

Gender aspects also were taken into account concerning the possible target groups and their living-status: In the year 2009, 73 % of living alone women over 60 years were widowed. Around one in seven senior citizen living alone was divorced (15%) and one in ten single (10%). 2 % of the elderly were married but live apart from the partner. These are results of the census, the largest annual household survey in Europe announced by the Federal Statistical Office [4] on the international day of older persons on 1 October 2010. Elderly remain alone in their household often after the loss of a partner. As the average life expectancy of men is shorter, more women are affected. Of all women over 60 who lived 2009 in a private home, 40 % lived alone in a one-person household. In the age group 60 to 64 years, the proportion of women living alone was relatively low (23%). In the age group of 70 to 74 years the sole survivor rate of women was 36%. From age of 85 years almost three quarters (74%) of women lived alone. Of the single men aged 60 years in 2009 was less than half (45%) widowers, each quarter they were divorced (24%) or single (23%). 8% of elderly were married but live apart from their partner. Of all men over 60 who lived 2009 in a private home, 18% lived alone in a one-person household. With advancing age the living alone rate is less than women. From 85 years 35% of men lived alone. Thus, the proportion was less than half as high as for women [18].

There are also age-specific requirements where gender aspects play an important role. One is for instance the reaction time that is important when looking at the requirements of functions of the robot. There are gender differences in the reaction time at simple auditory and disjunctive tasks as Biermann and Weißmantel showed [5]. Women and men always need more reaction time for the operation of disjunctive tasks than for simple tasks. In average women need more reaction time for both kind of tasks than men. With increasing age also the reaction time for both tasks increases. In contrast to the simple tasks (parallel increasing for women and men),

the reaction time for disjunctive tasks increases more in case of women than in case of men.

The presented gender differences had been passed back to the technical partners in order to find individual gender-sensitive solutions for ALIAS (e.g. male/female voice, implemented games, colour schemes).

3.3 User Committee

The needs of the focused target groups as well as functions and services of the robot had been discussed within an external user committee. This should also intensify the contact with potential users. The user committee was installed after the ALIAS midterm review in January 2012. Once a year the members had telephone conference. The ALIAS user committee advised individual users/user groups, the user accessed coordinators and the project leader on operational matters concerning the conduction of experiments at ALIAS and the daily affairs of users/user groups.

The committee consisted of four international experts that all know the AAL market very well, the project leader and partners from WP1. The members of the committee reviewed the first requirements list. On that basis the ALIAS consortium could improve some aspects of usability and get in contact to some health insurances improving the business model.

The ALIAS user committee collected matters of concern to individual users, conveyed an assessment summary of these matters and suggested appropriate measures to the scientific management. Members were elected by the members of the project board. The user committee commented on topics that are currently being discussed within the ALIAS project, and between project members and the ALIAS management. Feedback on these issues were an important point in decision-making.

3.4 Use Cases

Based on the functions which were implemented for ALIAS, five use cases scenarios had been prepared for testing in 2012. By means of these use cases, the functionality of the robot had been tested. A detailed description of the use cases from the users' sides of view is given in D1.4 [6] and from technical side D7.3 [7].

3.4.1 Self-Experience Scenario

The self-experience scenario had been integrated for testing the GUI and the main modules of ALIAS. In this scenario, the test person was supposed to try to use the robot and its GUI without too many additional instructions by a human advisor. One out of three instructions was given to the user by the test instructor. For example:

“Find the list of games, start ‘Sudoku’ and play a short match. Find the telephone application and start a short telephone call with your daughter. Find and start the Internet browser.” To fulfil these tasks the user was allowed to control the robot either with the touch screen or by voice commands.

3.4.2 Emergency Call/Remote-Control Scenario

In cases of emergency, elderly people can request assistance by relatives or caregivers via Skype and the person is able to operate the robot with a remote control. There is a variety of reasons why a user might ask somebody to control the robot with a remote to visually check something. For example, there might be some unusual noise in the kitchen and the elderly is not able to locate the reason for the noise. The elderly asks ALIAS to call a relative via Skype. During the Skype call, the elderly reports the unusual noise and asks the relative to use the remote control to guide ALIAS into the kitchen and to have a look for the reason causing the noise. In another scenario, the elderly might ask a caregiver to check a skin eruption using the remote video.

3.4.3 BCI Scenario

The object of this scenario was to test the BCI system, which replaces speech input and touch screen by a BCI mask. In general, the self-experience scenario was repeated, using the BCI to control the robot instead of the touch screen or speech commands.

3.4.4 Ground Lighting Scenario

The basic idea of this scenario is guiding a person at night, when no light is present. One possible case of use is that elderly people will be guided to the toilet at night. The robot can drive in front of the user and light up the space behind itself, so that the person can observe the ground when following the robot. During the guiding process the user can control ALIAS by speech commands like "slow down, drive faster, stop" or "abort operation".

3.4.5 Event Scenario

People are sharing an increasing amount of multimedia content on the web (e. g. photos, videos). The EventMedia application helps elderly people to find and to share content captured during events. This way, they can participate on the daily life of their families and friends and remain active and satisfied. The term "media" is to be understood in the broad sense: It can refer to videos and photos as well as tweets, Facebook or audio messages. All these resources are linked to events, which makes finding events through categories like place, date or time particularly easy-to-use for the elderly. In this scenario, the elderly user should use the Event-

Media application on the ALIAS robot to find information about past and upcoming events [8].

4 Results and Recommendations

In the following sections the development status of ALIAS is described and evaluated. The structure is based on the categories of ALIAS' requirement list (see: section 2.2). The discussed functions refer to the final requirement list, which shows the realisable functions and their actual state of the art. It is also available in the internal ALIAS wiki and in Section 7.1 in this Deliverable.

4.1 Support Functions

Reading support functions such as reading-out digital books or newspapers, magnification of pictures and texts (not only for digital content, also for letters, photos, magazines) as well as the translation of texts and user manuals were a wish of participants in the workshops. As shown in secondary analysis especially reading the newspaper is many elderly people's favourite activity.

4.2 Physiological Monitoring

4.2.1 Physiological Monitoring Database

Health motivation and monitoring is another important task of ALIAS: Measuring vital parameters such as weight, blood glucose or blood pressure and storage of health history and status is a good advice of elderly people. The survey at the senior study programme in Munich shows that elderly people are particularly interested in using ALIAS for health issues. In doing so, date security and privacy must be considerate [9].

For the ALIAS-system a physiological monitoring module had been developed. This module can support live-data obtained from two different sensor devices and the manual entering of data. In addition to the four vital signs (heart rate, blood pressure, respiration and temperature), weight and blood sugar can be stored in the database as well. The physiological monitoring module is designed as a web application. Therefore, the interaction with the system takes place via the web browser. The reason behind this design approach is that authorized persons (e. g. doctors, relatives) can have access to this data to check the current health status of the ALIAS user. The system supports multiple users and has two different styles of data presentation (table and graph). More details about the system can be found in D3.5 [10] and D3.6 [11].

In consequence of the midterm review the physiological monitoring module was excluded because of data security problems in the final dialogue prototype. Nevertheless, an inquiry at the senior study program within the ALIAS project has shown that

potential users are very interested in using this kind of service. More details about this can be found in D1.2 [12].

4.2.2 BCI

The BCI system provides an additional interface for ALIAS, which allows handicapped people to interact with the robot. This expands the number of potential user groups (e.g. patients suffering from severe stroke). The BCI system was tested by project partners during the second field trials and works well. For further information see D5.3 [13] which will be published soon.

4.2.3 Remote Control

In addition to the health monitoring services and the video telephony function, the possibility to control the robot with a remote has been developed for ALIAS. In the Alarm Call use-case scenario, the user can start a video telephone call to a relative or care service in an emergency situation. The person called can then immediately control ALIAS via an easy remote control keyboard or Wii gaming console controller. This way, the help assistant can inspect the situation and navigate to the user remotely, using the provided camera image.

4.3 Events, leisure and hobbies

Events are a natural way of referring to any observable occurrence grouping persons, places, times and activities. They are also observable experiences that are often documented by people through different media (e. g. videos and photos).

This strong connection between the needs of social integration and modern media services can be explored in two aspects with the EventMedia application. Firstly, a method for finding media hosted on Flickr that can be associated to a public event is applied. It uses linked data technologies for semantically enriching the descriptions of both events and media, so that people can search and browse through content using a familiar event perspective. Secondly, another method is used to automatically detect and identify events from social media sharing websites. The approach is based on the observation that many photos and videos are taken and shared when events occur. The approach focuses on detecting events from the spatial and temporal labelled social media, and an algorithm is used to retrieve this media, perform event detection and identification and finally enrich the detected events with visual summaries. The EventMedia application is described in detail in D4.2.

4.3.1 Games

ALIAS provides a small selection of games that is accessible via the games menu on the graphical user interface. Very common games have been selected for integration so that elderly people are used to playing them (e. g. Chess, Sudoku, Solitaire, and Tic-Tac-Toe). The games can be started easily either by touching the corresponding

icon on the touch screen or by using a speech command. It is also possible to start the games via the BCI. Additionally, the robot includes a Wii console.

4.3.2 Audio Books

Another service which can be used with the robot is a set of audio books. These can be started via the graphical user interface, speech commands or the BCI system. From this list, the desired audio book can be chosen and started. The contents of the audio books are then played over the loudspeakers of the robotic platform.

4.3.3 TV

Users can also watch TV on ALIAS. Using the TV card mounted on the robot, it is possible to watch TV within the GUI. The signal from the TV card is forwarded to the PC connected to the GUI. The TV function can be started through the menu.

4.3.4 Internet Browser

Additionally, for communication and entertainment purposes, a web browser is integrated in the GUI. It provides a platform for the web-based services like the EventMedia application. There have been several attempts using different techniques to achieve a proper web-browser integration. So far, integrating Firefox or Microsoft Internet Explorer has been tested. Furthermore, developing a browser fully integrated within the GUI, using QtWebKit has been considered. The current version of the GUI uses the QtWebKit-based browser.

4.4 Communication

Elderly people want to stay in contact with their social environment. For this purpose, ALIAS includes not only an easy-to-use telephone function, but also video telephoning and e-mail services. The used technology for telephoning refers to Skype services integrated in an easy to use graphical user interface as well as speech commands which have all been designed according to the wishes and needs of elderly people. The arrangements of the graphical user interface, particularly all buttons and icons have been designed on the requirements of users.

ALIAS includes an interactive address book contains photos of the individual contact persons. This should help elderly people finding and reminding their contacts quickly. It can be used via voice commands or via touch screen. Also the user can add new contacts one their own.

As different studies have shown [2, 15), elderly users are more and more interested in internet services and email communication. Thus, the ALIAS robot platform integrates this service, too; it can be started via voice commands, touch screen or BCI. Nevertheless, it works with a normal internet explorer, which makes it a bit tricky for elderly people using it comfortably. While Internet and email communication becomes more and more naturally, the handling of this application should be im-

proved. Necessary services that all base on the wishes of workshop participants are that email services can be started via voice commands and messages can be read out loud. It is, moreover, desirable that calendar functions of providers can be integrated as well.

The idea of supporting the intergenerational communication with the help of ALIAS could not be implemented within the project, because of time constraints. However, there are some ideas to fulfil this task in further AAL projects. As an example, intergenerational conferences could be implemented on the robot.

4.5 Usability and Design

For the graphical user interface there are some important points to focus on according to the secondary analysis [2, 12]. Some studies [16] show that it is necessary to choose terms that correspond to the experiences of seniors handling interactive products. An example is the usage of the easier to understand word "address book" instead of "contacts" (valid for German only).

The goal of the user interface design within the ALIAS project was to make the user's interaction as simple and efficient as possible, in terms of meeting the user's needs. Therefore, only really necessary information is being shown on the screen of ALIAS, because a large number of graphical elements on the screen could be confusing and stressful concerning the usage. During the development process it had also been emphasized that important buttons need to be highlighted and that the contrast needs to be sufficient. A stepwise addition of new functions based on individual needs and interests takes care of a user-friendly handling.

Depending on the situation the users can choose between voice controlling and touch screen controlling as well as the choice between female and male voices. In the last case e.g. voices of celebrities would be a nice feature.

4.6 User Contact

WP1 workshops have shown that elderly people prefer talking to a friendly and charming robot than to a rude machine. Thus, tasks were integrated to give ALIAS a friendly character and to give it emotional components. Wishes of users concentrate on the following requirements for the robot:

- be loyal, gentle and polite
- take a joke (e.g. reading out the joke or the motto of the day)
- welcome the senior and his visitors
- say "good morning", "good night", "you are welcome" and "thank you"
- announce date and day
- be authentic
- make offers e.g. "Would you like to go for a walk?"
- ask for rituals e.g. "Should the light stay on today?"
- give not only yes/no-answers

In response to these requirements and as a part of the ALIAS project a natural speech function was integrated and the robot was equipped with different voices, which can be chosen by the individual user, as well as a set of friendly speech commands and a variety of emotions.

Thereto, technical partners have not only integrated natural speech, but also a module for generating feedback to the user. Via the head, ALIAS can show different facial expressions (e.g. neutral, sad, lucky). These expressions have been evaluated by users at TUM-MMK in 2012. For more details see D3.8 [17]. Additionally, ALIAS can make offers and ask for rituals to activate elderly people and to support daily routines which both help elderly people to organize their daily lives. Since natural speech is not running smoothly yet, it has not been fully integrated until now. But there are various ideas how it can be implemented in future.

A second requirement in this category was to improve the eye contact between ALIAS and the user in order to establish a better interaction with the robot. ALIAS keeps eye contact when it speaks to the user. Despite this, if the user speaks to another person via the display, both should maintain eye contact as well. The camera perspective needs to change according to the viewing angle. The eye contact function was integrated by TUM-MMK. Since there are still a few problems with the face detection, especially under changing lighting conditions, distances and angles, the functions do not work firmly yet. IUT is still working on these problems.

5 Conclusion

In this deliverable, the applications and services of the final prototype were described from the users' points of view. Based on the list of selected functions the applications and services had been integrated and tested by two field trials. For this purpose, several use cases had been described. Not all needs, wishes and preferences of the elderly users could be implemented during the project duration. This was largely due to time limitations and technical constraints.

6 References

6.1 Literature

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6.2 List of Figures

6.3 List of Tables

7 Appendix

The following section summarizes all notes concerning the current status of ALIAS modules which were given by technical partners.

7.1 The Final List of Requirements

Table 5: The list of functions including responsibilities of technical partners

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
A)Support					
	Reading sup-port functions	read-out function for digital books, read newspaper	→ digital books work well (YES) → reading newspa-pers (hardcopy) does not work well, only ocr of scanned text under good conditions (PARTLY)	FhG TUM-MMK (waf)	Important function as promised in the original proposal, but medium priority. General engineering approach: use of HD still cam (200k€) which may be externally triggered over the dialog manager. Existing OCR tools will process the input image in the background and show the image respectively reads the recog-nized text. Mailing to relatives is also possible. Implementation in 1st iteration. Involved tasks: 2.3, 2.4, 2.5, 3.2, 3.3, 3.8.
		magnification of pictures and texts (not only for digital content, also for letters, photos, magazines)	→ available tools not feasible for touchscreens → does not fit with our target group, no focus on visually impaired users (NO)	IUT	Checked the native windows 7 magnifier. Good usable with mouse, almost impossible to use with touchscreen. Checked also Zoom It 4.1, which is ONLY usable with mouse. The appli-cation "Virtual Magnifying glass" is okay to use with touch. Zoom is only editable with a scroll wheel (on the mouse), so not available here. With the first click the magnifying window disap-pears and has to be restarted to use again. => not really a good application for touchscreens!
	Writing sup-port functions	function for writing letters (e.g. per speech or stylus); function for writing and adding shop-ping lists (e.g. per	→ visual keyboard + email (YES) → no recognition of handwriting → speech to written texts works only partly	FhG, COGNE-SYS	

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
		speech or stylus)	(ASR works, but implementation with email program difficult // (PARTLY with COGNESYS) (already available with Apple Siri)		
	Ground lighting in the night, gentle night light		→ YES (but has to be better integrated with speech recognition and finding the way)	MetraLabs	is being investigated
B) Health			→ NO (advice from reviewers to not get in trouble with medical certification...)		
	Motivation to live healthy	Recommendation of sports activities and contacts to training partners; Support with rehabilitation and exercising (e.g. gymnastic or cardiovascular exercises after hip or knee replacements, apoplexy, heart attack)		G.Tec.	- good ideas available, but agreed as not scope of the project - other solutions available (e.g. Fraunhofer MyRehab)
	Health monitoring	Measuring of health status (e.g. for diabetics or blood		G.Tec.	

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
		pressure) and Storage of health history and status (Important: data security and privacy); Storage of important personal and health information (e.g. diseases, passwords, repository of spare keys)			
	Information on health topics	Information on drugs and on prevention and identification of diseases	→ add a tab with a link to a webpage (e.g. integration of health information from http://www.gesundheitsinformation.de/inhalte-einbinden.121.de.html) → integrate it with speech recognition („I need information about ...“) (YES)	COGNESYS	
C) Events, Leisure and hobbies					
	Information on cultural and leisure events	concerts, theatres, plays, museums, social connection (similar interests)	→ technically available → interface needs to be improved → language German	EURECOM	T4.1-T4.5

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
			→ sources for event information need to be changed to more senior-relevant sources → predefined search (YES)		
	other events	meetings of sports groups, worship services, neighborhood meetings (note: only few use of social network! (see D1.1)	→ sources for event information need to be changed to more senior-relevant sources (YES)	EURECOM	T4.1-T4.5
	Receiving and performing recommendations for entertainment from relatives	Recommendations	→ „like“ events – and automatically inform „friend“ about it → when finding a nice event – allow users to invite others (YES)	EURECOM	T4.1-T4.5
	Learning / teaching functions		(NO)	Cognesys	
	TV-function	Sports entertainment; Infotainment; Entertainment broadcasts	→ Speech command necessary (FhG, Cognesys)) (YES)	MetraLabs, FhG, Cognesys	Investigate
	Music (Player)	Listen, buy, make (Sing together with robot, or robot could play accompanying instru-	→ Speech command necessary (FhG, Cognesys)) → Buying music is skipped due to legal	Cognesys	

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
		ments)	issues (PARTLY)		
	Gaming	Mentally challeng-ing online games (e.g. chess, cards); Brain teasers; Sports games a la Wii, which helps to train balance and coordination; Games which can be played by young and old people together: Replacing missing game-partners	→ Speech command necessary (only for starting/stopping the game, but doesn't make sense while playing the game) (FhG, Cognesys)) → Wii is working (FhG) (YES)	TUM-MMK Cognesys, FhG	This is task 3.4
D) Com-munication					
	Telefone	Skype	(YES)	FhG	see Task T3.5
	E-mail	e.g. share photos	→ EURECOM check the results of the in-vestigation on this → email should be started via voice → email should be read out by robot → gmail with google calendar + add on for speech control (SpeakIt, Simon-Listens) (STATUS NOT FINAL-	EURECOM	

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
			LY DECIDED)		
	Easy-to-use contact list	Contact via Photo	→ will be implemented (COGNESYS) (YES)	Cognesys	
	Support of intergeneratio-nal communi-cation	e.g. with grandchil-dren; encouraged by playful elements	→ due to capacity constraints → not part of scenari-os at the moment (NO)	Cognesys	
E) Usability and Design					
	Flexible, ad-justable dis-play to be used be peo-ple with differ-ent body heights (in-stalled/set up on a flexible arm)		→ Display is tiltable → Next scitos genera-tion will make use of a portable tablet, but too expensive to inte-grate this with scitos g5 (PARTLY)	MetraLabs	investigate (T7.2)
	Importance of ports, con-nectors, sock-ets and card readers (blue-tooth, USB, reader for electronic health card, scanner with easy-to-use		→ available → difficult to integrate other devices since most of them are not open source (YES)	MetraLabs	investigate (T7.2)

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
	feeder)				
	Data input for users has to be very easy to use and speech-based		→ Will be implement-ed (FhG / COGNESYS) (YES)	FhG, COGNE-SYS	not yet clear who integrates ASR, belongs to WP2/3. Has to be clarified
	Simple situa-tional choice between voice control and touchscreen control		→ Works automatical-ly → Depends on soft-ware (where speech input is possible / where not) → Where available, both inputs are im-plemented (YES)	Cognesys	
	Simple and intuitive opera-tion	Highlighting of the most important control elements	→ Icons used → Color codes used for showing which kind of function is used (YES)	Cognesys	T2.1.
	Adaption to individual re-quirements depending on the clinical picture and the level of care	Individual adapta-bility of the degree of assistance (just much support as necessary or re-quested by the senior)	→ Skipped and agreed with reviewers during mid term re-view, since medical functions are prob-lematic due to legal constraints (NO)	G.Tec Cognesys	
	Stepwise ad-dition of new	Leading careful to the operation; Re-	→ next generation of scitos will be app-	Cognesys	

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
	functions based on individual needs and interests	peating the steps of operation; Giving feedback, whether order was understood or not	based (probably Android) and will implement this requirement → too late to change this in the project (NO)		
	Remote configuration of functions and calendar events		→ By using google calendar → Will be integrated (COGNESYS, support by FhG) (YES)	TUM-MMK, COGNESYS, FhG	
	Individual determination of access privileges		→ face and speaker identification available (EURECOM) → will be implemented by EURECOM, support by COGNESYS (YES)	TUM-MMK, EURECOM	
	Choice between female and male voices e.g. voices of celebrities		→ male and a female voice will be implemented (MMK) (YES)	FhG, MMK	
	GUI: Easy wording – Choose terms such that they correspond to the experiences of users in	Example: Use "Address Book" instead of "Contacts"	→ recommendations for easy wording have been made in the short user manual (YOUSE) → FhG adapts menus and uses defined	FhG, YOUSE	

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
	the use of interactive products.		wording (YES)		
F) User Contact					
	Independent perception and recognition of the user	Making and maintaining eye contact (ALIAS should maintain eye contact when it speaks to the user; if the user speaks to another person via the display, both should maintain eye contact as well --> Kind of eye contact depends on the counterpart!)	EYE CONTACT: → Implemented, but does not work stably, due to erroneous/buggy face detection (problem of lighting conditions, distance, angle, computing power) → IUT is working on that, but takes longer (PARTLY) PERCEPTION OF INDEPENDENT PERSONS: → Identification of users is not stable (face and speaker recognition) → Would work with RFID tagging Could be used under reasonable efforts / possible solutions (PARTLY)	TUM MMK, IUT	planned in combination with face recognition: ALIAS detects and looks at faces
	Being a friend - ALIAS	a) take a joke (e.g. reading out the	(STATUS NOT FINALLY DECIDED)	IUT	- NO not yet

Category	Function	Details	Realization (Linz Meeting 2012) (YES, PARTLY, NO)	Responsi-bility	Old Comments (2011)
	should:	joke or the motto of the day); b) announce date and day; c) say "good morning", "good night", "please" and "thank you"; d) make offers e.g. "Would you like to go for a walk?"; e) welcome the senior and his visitors; f) not only give yes / no - answers			a) assuming we have sufficient speech synthesis there are some options: Firstly, there is an English web-service available (http://puna.net.nz/jokes/jokes.asmx) to get access to a data base. Secondly, there is a RSS joke-feed available, which randomly selects a joke every hour (http://www.witze-datenbank.de/witzstunde.xml). These jokes can be read out b) should be no problem with speech synthesis since this information is easily available within the system c) depends on the flexibility of the dialogue manager (or can be included into the design process ???) d) more complicated issue, since these are random events that have to be generated with background knowledge of the agenda of the day, the weather, health status and so on: who will implement the interface to the dialogue manager and will the dialog manager handle such information? e) the main problem is to detect when a person is coming home. For this, there has to be information on how long a person has left the home or if the person stands up in the morning. The rest of the problem is covered by approaching and greeting the person by speech synthesis. But quite a complex task ... f) done, when all points above are fulfilled