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AMBIENT ASSISTED LIVING

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1 Executive summary

Aim of the deliverable
The aim is to present the outcomes of all SafeMove components' conceptual and by demonstrating impressions. This report gives impressions of the SafeMove system and its integration.
Brief description of the sections of the document
Brief description of each component of the SafeMove pilot.
Mayor achievements
Pilots of each component are available and ready to be tested by end users. Based on the user needs of WP1.2 an integrated SafeMove system was developed, tested by technical stuff of each developer company, tested by end users in test sessions as well as deployed to several test sides.
Summary of the conclusions obtained
Not applicable – report on practical output.

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2 Output on the creation of the SafeMove system's components

2.1 SafeMove OnTour

2.1.1 Overview

The goal of the OnTour component is to encourage clients by taking part in various activities and preserving a sense of social connectedness and belonging. To achieve these goals OnTour assist clients during the typical strategies of the everyday life of elderly people: Selection, optimisation and compensation. For the selection strategy OnTour offers the opportunity to take advantage of existing potential. For example it's achieved through reducing burden, by avoiding challenging social situations and focusing on personal meaningful activities. Furthermore, clients could obtain and improve their agency with OnTour. For that, OnTour assist clients to facing their challenges head on to working harder at things. This is a common optimisation strategy of elderly people. If means if a client will become unreliable and unstable elderly people typically tend to use the compensation strategy seeking and accepting help from others. For this OnTour offers assistance to still the need nevertheless.

2.1.2 Focus for this development phase

The focus during the development of the enhanced OnTour pilot was integration and accessibility. Essential for both goals is a robust data synchronisation mechanism between OnTour and Assist. Typically the synchronisation mechanism from mobile applications is depended from the network status. If the network connection is unavailable or unstable some of the functionality may be unavailable or unreliable. Usually in such a situation the user is responsible to establish a stable network connection. The recognition and handling of such a situation is a challenging task for the target group of SafeMove. As a consequence, the accessibility of the application becomes limited.

Other rather typically accessibility topics like font size, wording, symbols, colours, multimodal feedback and navigation hierarchy are also tackled during the development of the enhanced OnTour pilot. Some of these points are closely linked to the hardware requirements of a smartphone like screen size, contrast ratio in the sunshine and sensitivity of the touchscreen.

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To achieve a robust data synchronisation mechanism the OnTour application based on an on-device database. This is charged with all necessary data for the application. In this way, even without or an unstable network connection to Assist the functionality of the application guaranteed. Technically this database is a snapshot of a part of the Assist database. A replication service from OnTour listens on the network connection and uses every possible moment to synchronise as much as possible data with the Assist database. This approach constitutes a good compromise between availability of the application functionality and actuality of the data.

To conserve network and memory capacity the database snapshot contains only a part of the whole Assist database. This is realised through a subscription principle. The data in the Assist database is partitioned in channels, which can be subscribed by the replication service of the OnTour application. In this way, only the necessary data for the mobile application can be synchronised. Relevant data channels for OnTour are for example the contacts, appointments and reminders of a client. Unsubscribed channels are for example the pictures of the gallery or the data of the serious games.

2.1.3 Call for Help Assistance

To assist clients in the process of applying the compensation strategy seeking and accepting help from others OnTour offers a call for help assistance. The interface of this functionality is very minimised to ensure the accessibility and usability of this component also under stressful panic situations. The navigation hierarchy consists of one level. The number of contact items cannot become bigger than the available space on the screen to prevent scrolling.

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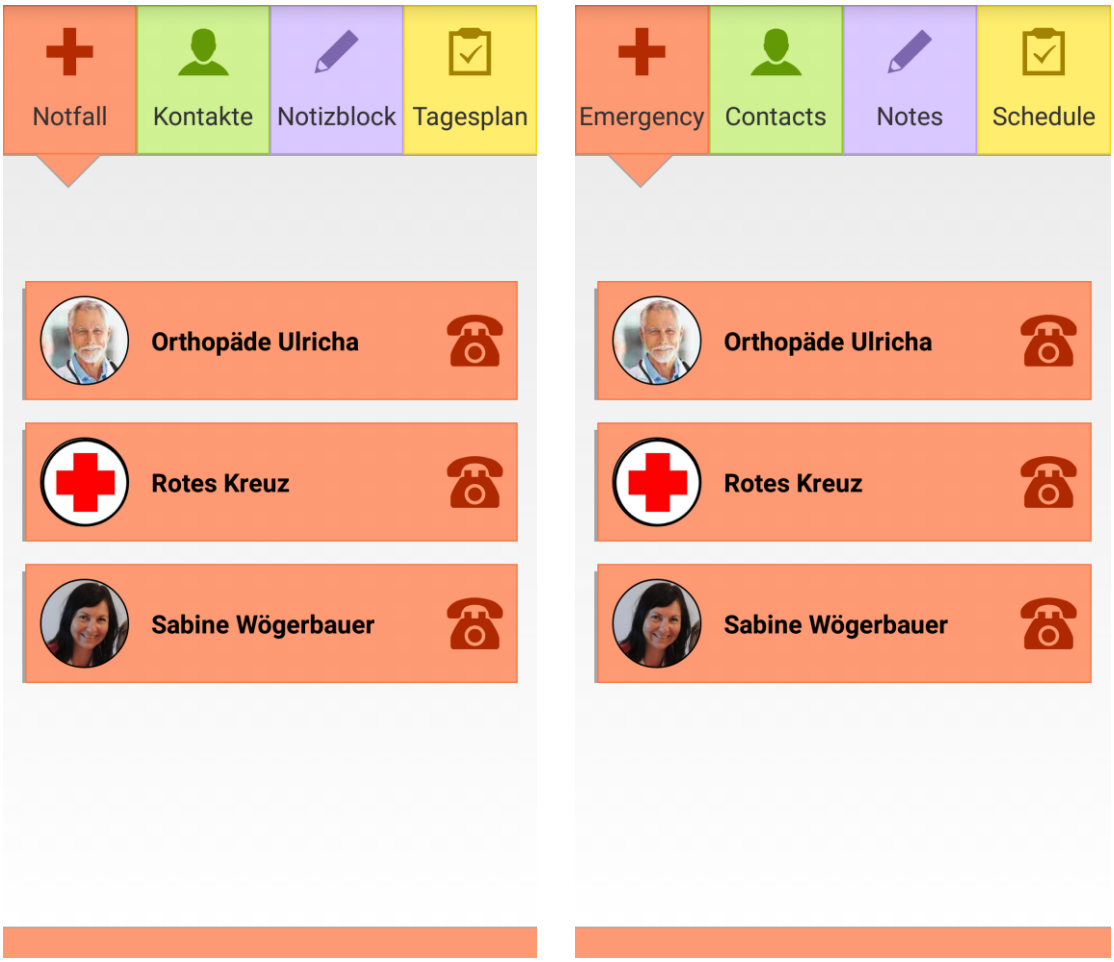

Figure 1 all for help screen (left: German, right: English)

2.1.4 Contact Assistance

The selection strategy of elderly people is supported by OnTour through a list of contacts. In comparison with the call for help assistant is scrolling available and the navigation hierarchy has two levels. Besides the obvious goal “stay in contact” helps this list under the use with pictures and roles to identify personal meaningful persons.

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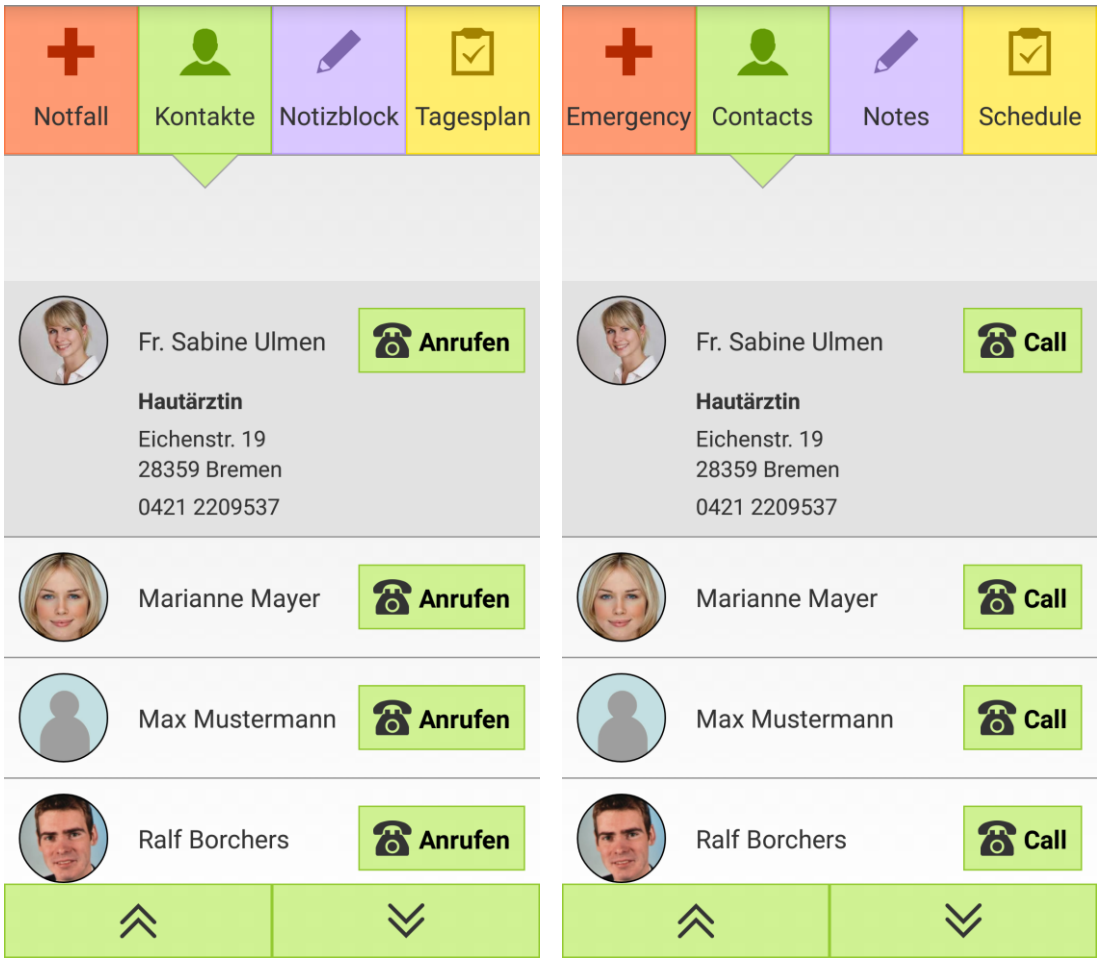

Figure 2 Contact list on mobile device (left: German, right: English)

2.1.5 Daily's Schedule Assistance

The Daily's Schedule Assistance is another possibility to support the application of the selection strategy of elderly people. A list of upcoming or past appointments of the current day gives the user temporal orientation. In this way it decreases the burden of planning appointments and reduces the risk of challenging social situations like being late or forgetfulness. Additionally this encouraged the user to become more active by getting a feedback about the activities. A status bar with the current date and time supports the daily's schedule.

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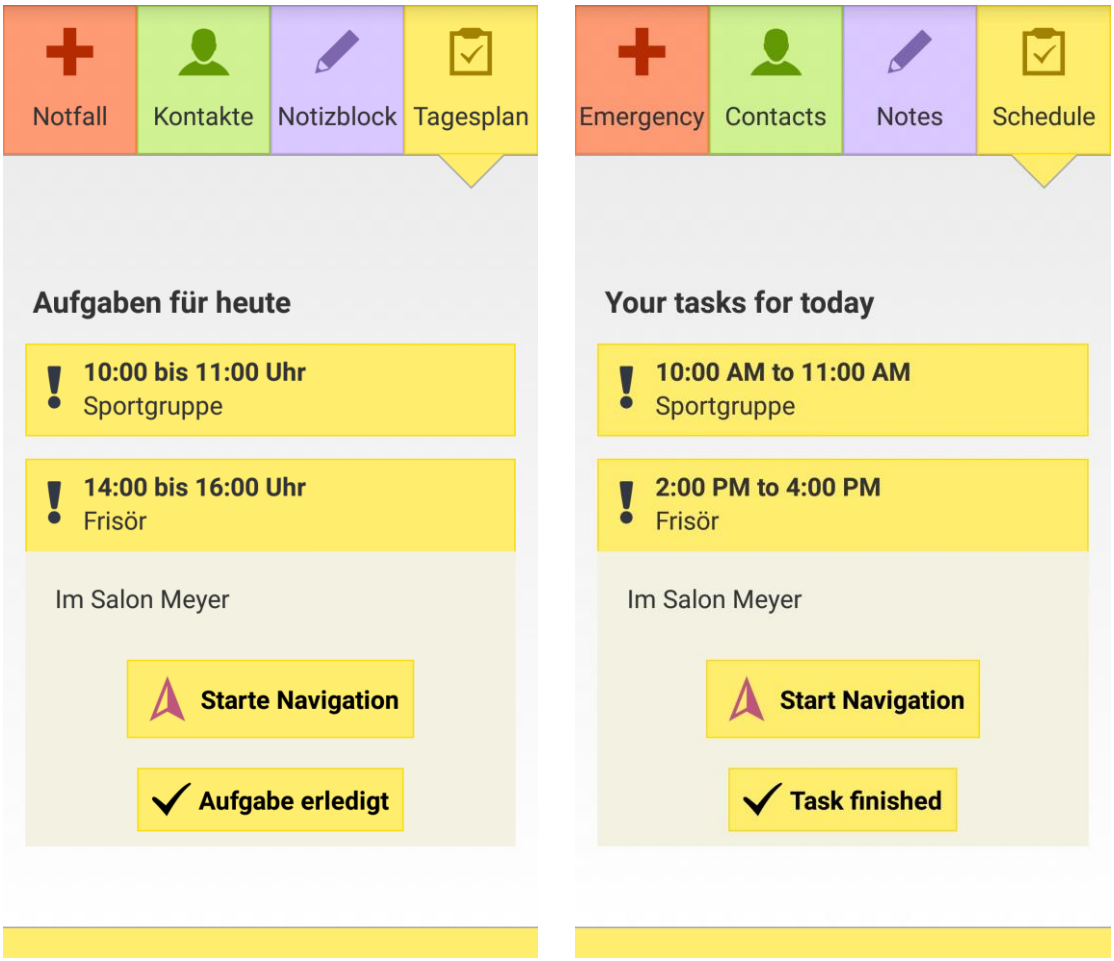

Figure 3: Scheduled activities on mobile device (left: German, right: English)

2.1.6 Reminding Assistance

Reminders suddenly pop up on the device whenever an appointment or task is due. The pop up is supported by tactile and acoustic signal of the smartphone. They remind the client to do something. This supports the optimising strategy of elderly people to work harder on challenging issues like forgetfulness.

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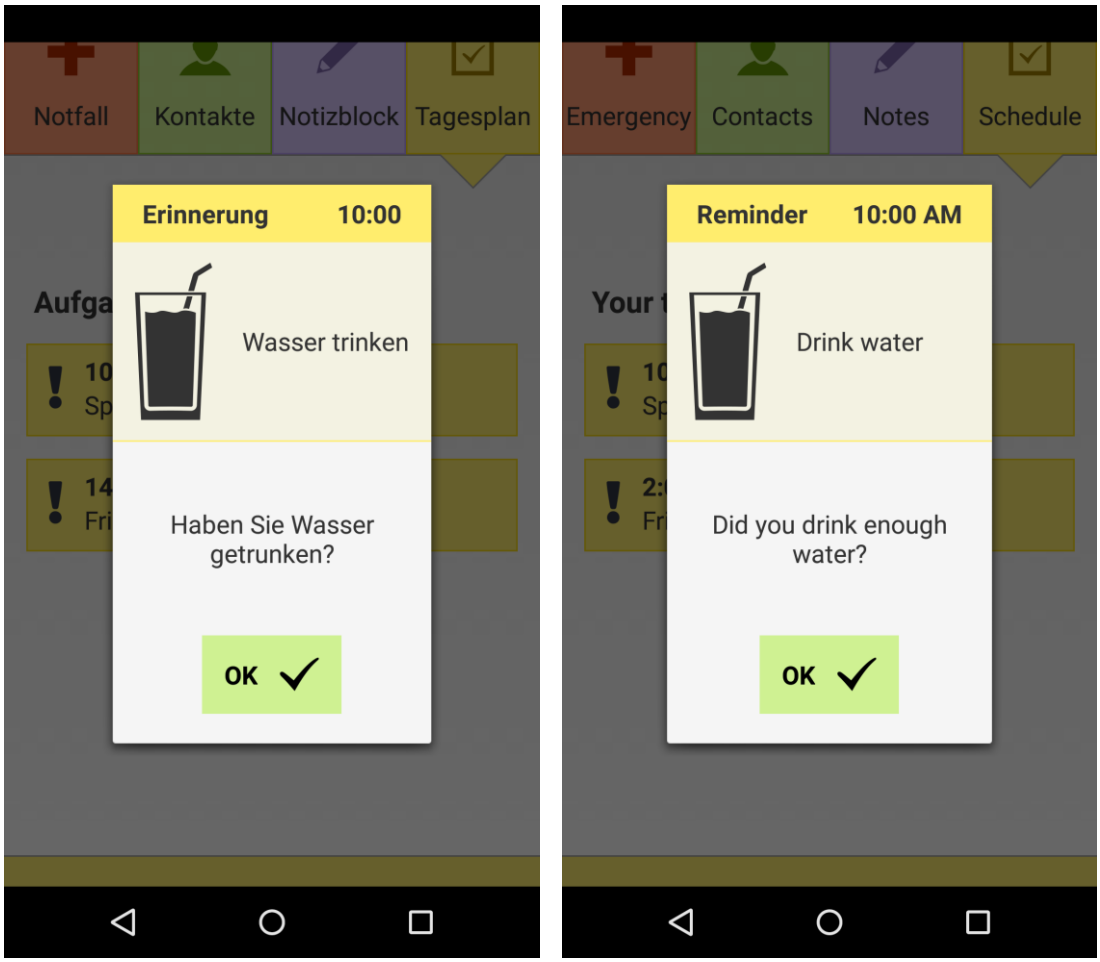

Figure 4: Confirming an activity on the mobile device (left: German, right: English)

2.1.7 Navigation Assistance

The navigation is started through the daily schedule when a route for the task is added. A circle shaped indicator shows the position of the user and his orientation. The route is shown as a line consisting of arrows pointing in the direction the user has to walk. At the top the name of the target destination and the remaining distance is shown. Additionally at the bottom an image of the next landmark/waypoint is shown to the user. By touching the image it gets expanded and will disappear automatically after 5 seconds.

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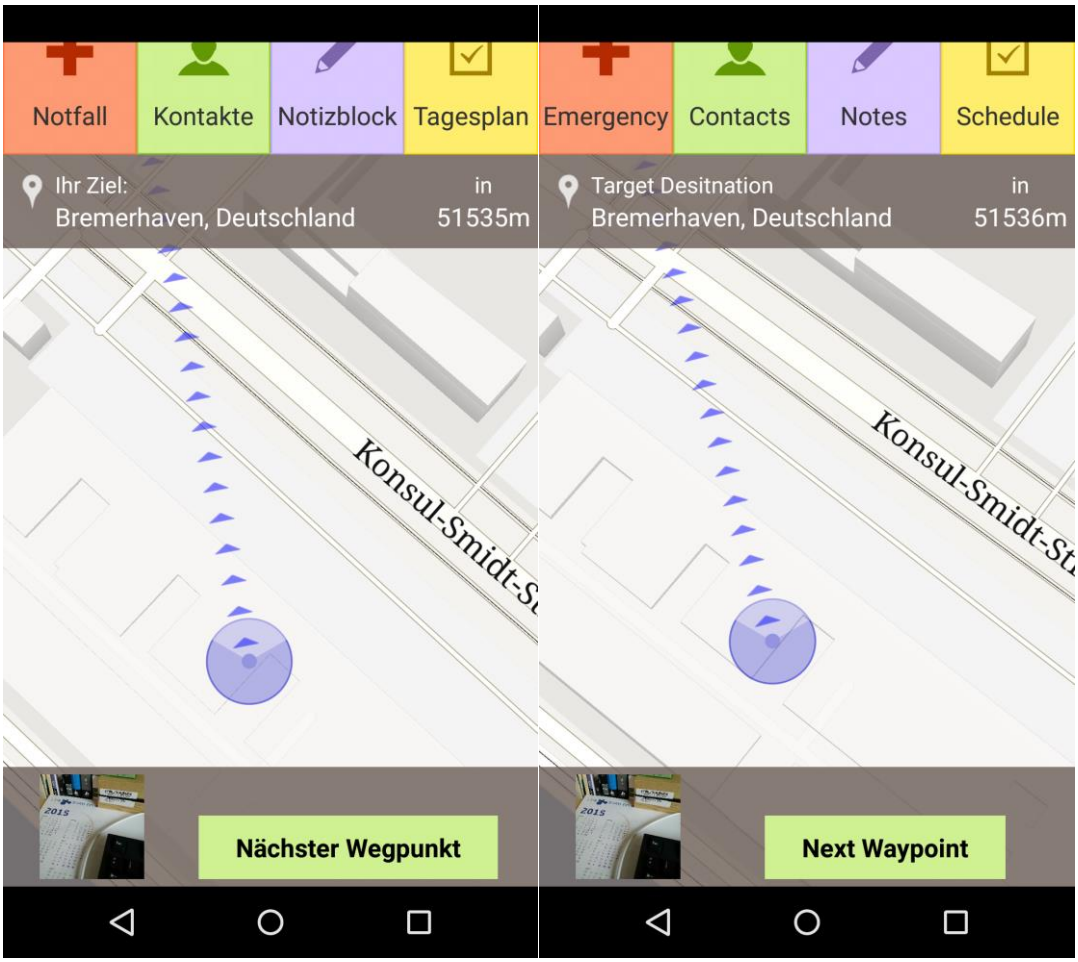

Figure 5: Showing current position and navigation details (left: German, right: English)

2.1.8 Notes Assistance

Notes are helping the user to remember things of any kind. Notes are created by the user himself by typing it into the app. It is possible to delete or mark notes. When notes are marked they remain on the list but are highlighted by changing the text colour to light grey und striking through the text.

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Figure 6: Notes can be checked (displayed grey and striked) (left: German, right: English)

2.1.9 Remote Management

The interaction design of OnTour is minimal and straightforward to achieve an easily understandable interaction between user and application. For this it was necessary to abandon any direct configuration functionality. Maintaining the contacts, appointments and reminder will be controlled completely from SafeMove Assist. A positive effect of this is the relationship development between client and caregiver during the common management of contacts, appointments and reminders.

The replication service of OnTour is responsible to synchronise automatically inputs from Assist to OnTour.

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2.1.10 General Interface Design

The functionalities of the OnTour application are distinguishable by colour to achieve an easily understandable interaction. The font size is customisable to each client's requirements.

2.1.11 Smartphone Requirements

Besides the common features of typical smartphones (wireless network, touchscreen, speaker….) the ageing of the sensomotoric system sets special requirements. Due to the usage of OnTour in an outdoor environment the contrast of the screen needs to be also in bright sunlight high enough. For the same reason the battery runtime needs to be high enough to span a whole day without recharging. Due to the low skin moisture of elderly people the sensitivity of the touchscreen is another typical problem during the interaction. To avoid this, the smartphone needs to offer digitizer pen. Capacitive, so called active digitizer, would be preferred to improve the reliability of the touch recognition. On the one hand the screen size needs to be big to reduce scrolling and to facilitate big buttons and fonts. On the other hand the device size is dependent on the screen size. And a big device is hard to hold from a person with an aged sensomotoric system, low skin moisture and stiff fingers. Five till six inches diagonal is a good compromise. Also the speaker of the smartphone needs to be loud and clear. A recommendation from the SafeMove Project, which meets all these requirements, is the Samsung Galaxy Note 3 (Model Number: N9002, N9005, N9006, N900W8, N9009).

2.2 SafeMove Assist

2.2.1 Overview

The SafeMove assist component is the part which is meant to be used by formal and informal caregivers (professional caregivers and/or family members etc.) The functionality focus lies on supervision, statistics and patient details so the core features of SafeMove assist are a detailed overview, monitoring and managing the clients and their activities.

Caregivers with more than one client are provided with a clear overview that communicates the current status and well-being of all of their clients. If a client needs their attention they should instantly respond via messaging or voice (and maybe video) -calling services.

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In the current version of SafeMove solution, only one client can be monitored and managed by a caregiver. So each of the “SafeMove AtHome” is a standalone unit. However, the function e.g. to manage clients activities, to setup its contacts and so on, can be done with the SafeMove Assist component. The personal data are stored and managed in the “SafeMove AtHome unit”, the barebone PC. The implemented dialogs to operate with that data are also implemented in the SafeMove AtHome unit.

The SafeMove Assist component is related to the SafeMove AtHome unit. On that unit, over the SafeMove Wi-Fi-network or via the Internet oven a VPN (virtual private network) of the specific SafeMove AtHome unit it can be opened with an internet web browser (e.g. google Chrome), see Figure 7:

- localhost/HTML_Assist/overview.html or
- 192.168.188.21/HTML_Assist/overview.html or
- <ip address>//HTML Assist/overview.html (only over VPN-connection)

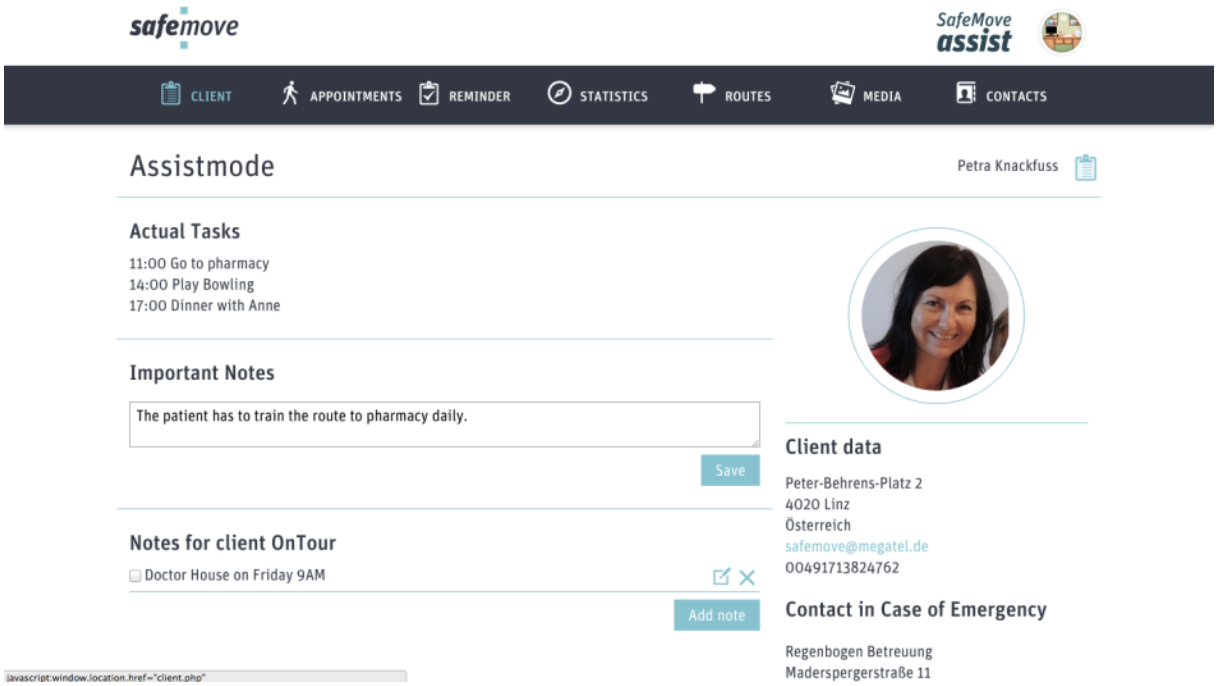

Figure 7: Assist dialog to give overview data about the client

A detailed description of the output on SafeMove assist is included in D2.4c Report on personalised user-environment interaction.

The operational Infrastructure is explained in Report D2.1b.

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2.2.2 Language

With the Assist component the caregiver is able to define the system language for the client. The language which is set in Assist is also automatically set in AtHome and in the OnTour remote control unit for AtHome, see the left and right pictures of Figure 8, Figure 9, Figure 10 and Figure 11.

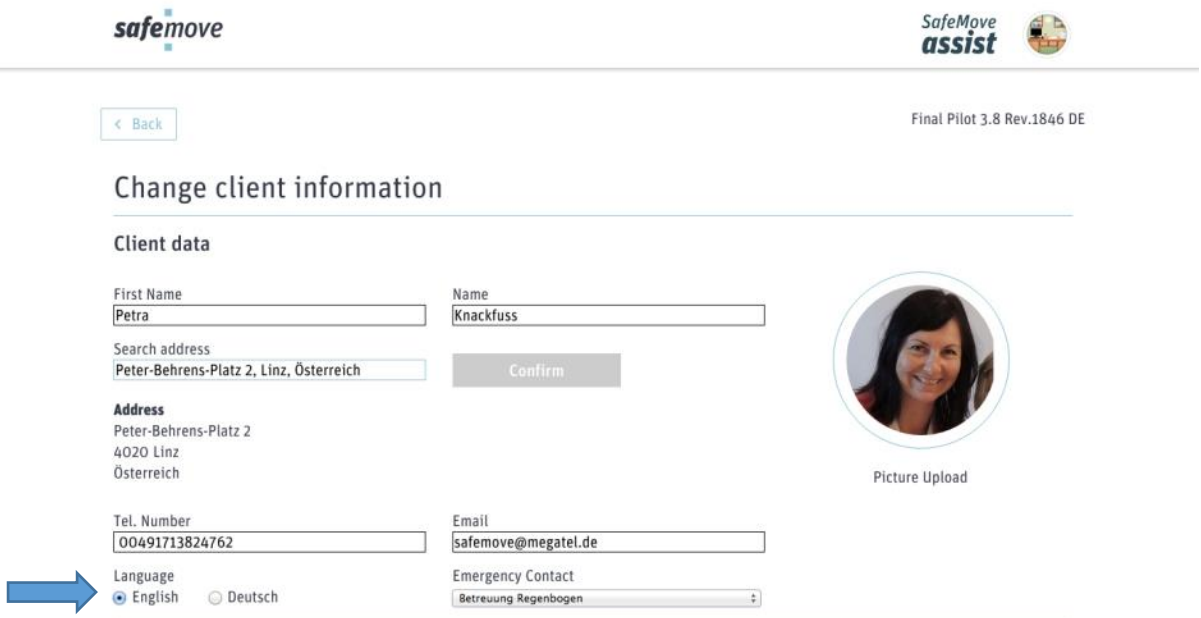

Figure 8: Dialog to set the system language (English, German)

Figure 9: Example pages in AtHome with different language settings (left English, right German)

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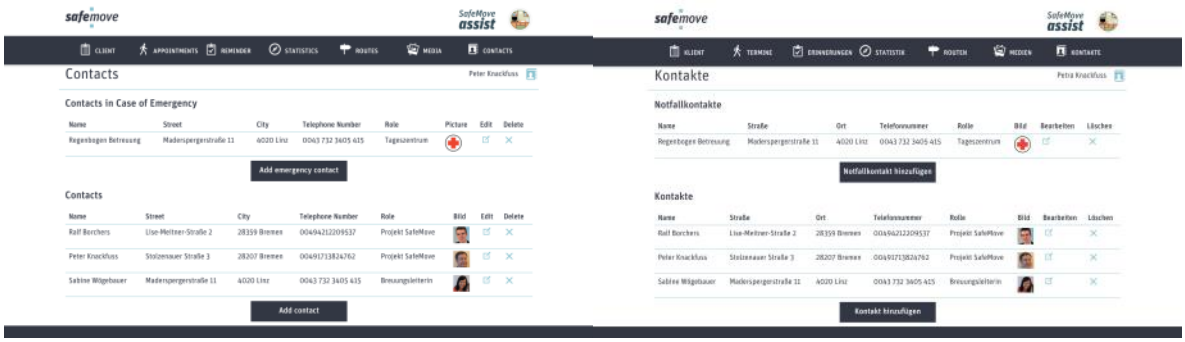

Figure 10: Example pages in Assist with different language settings (left English, right German)

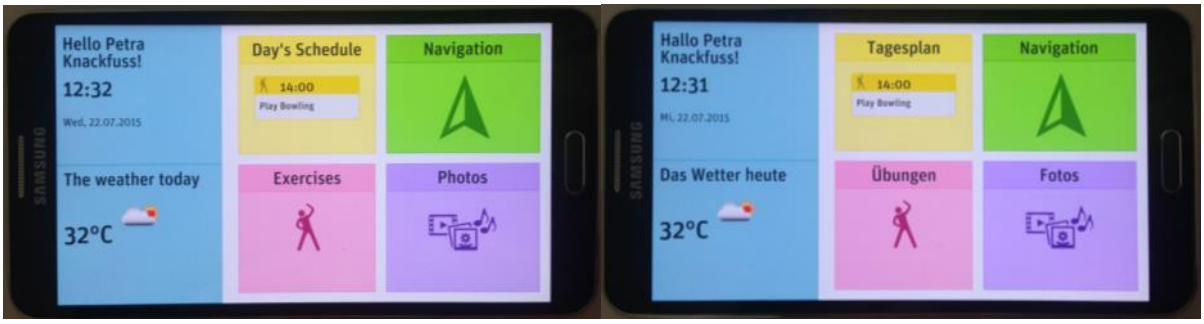

Figure 11: Example pages in AtHome on remote control unit with different language settings (left English, right German)

2.2.3 Functional Sections of SafeMove Assist

2.2.3.1 Managing and Planning Routes

In section “Routes” the caregiver can manage (select or delete routes) as well as plan or edit a route for a client, see Figure 12. Waypoints, guidance information and landmarks can be added to route, see Figure 13.

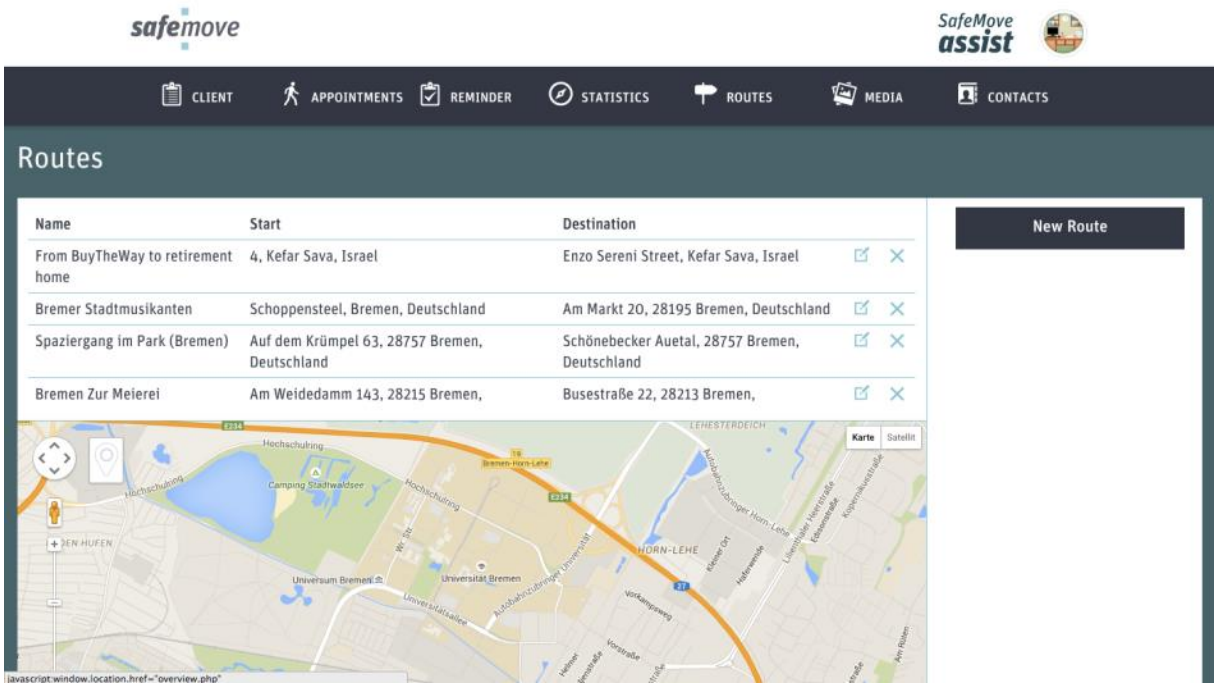

Figure 12: Routes on the Assist screen

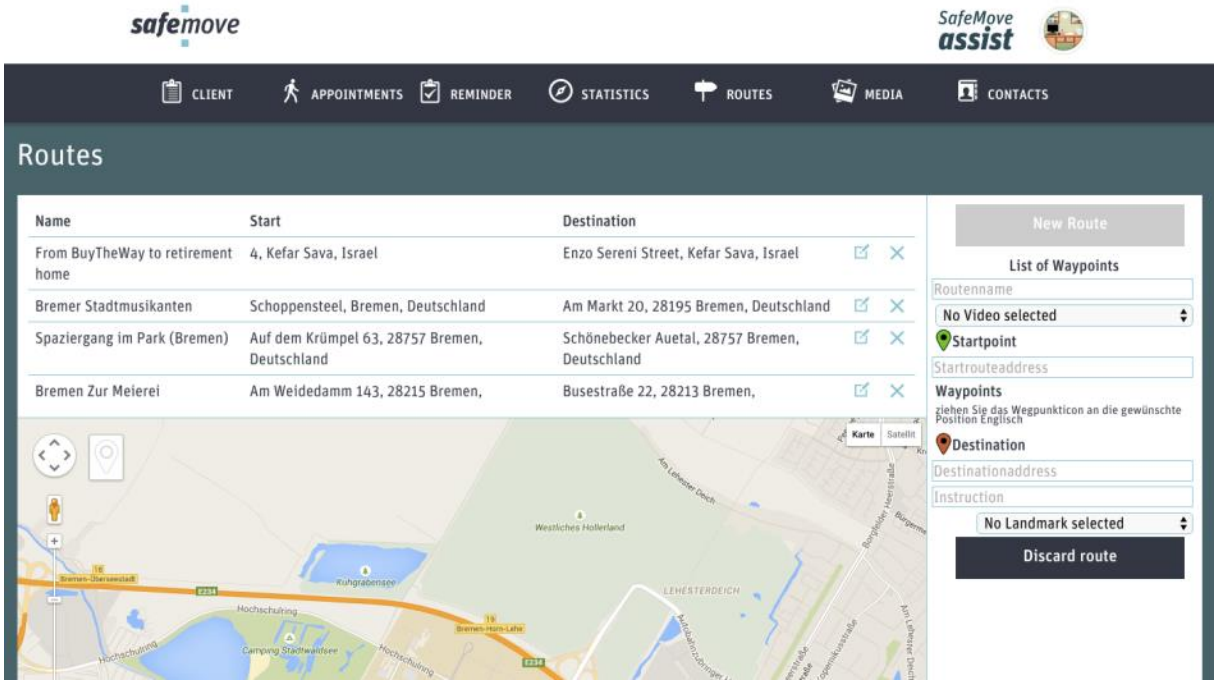

Figure 13: Creating a new route on the Assist screen

2.2.3.2 Managing and Setup Reminder

Reminders are pushed information to inform the client frequently to “don’t forget” things to do. The overview page of reminders is shown in Figure 14 and the edit dialog in Figure 15.

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Reminder is given to client via pop-up dialogs, sounds or vibrations through SafeMove OnTour.

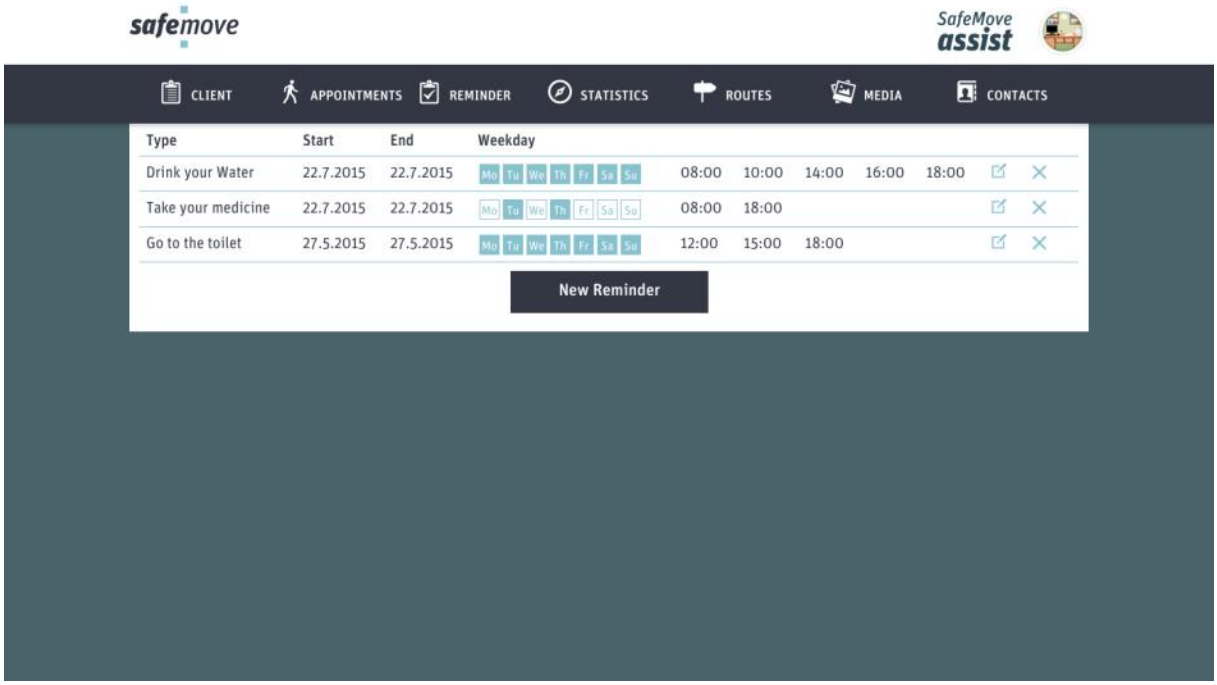

Figure 14: Reminders in Assist

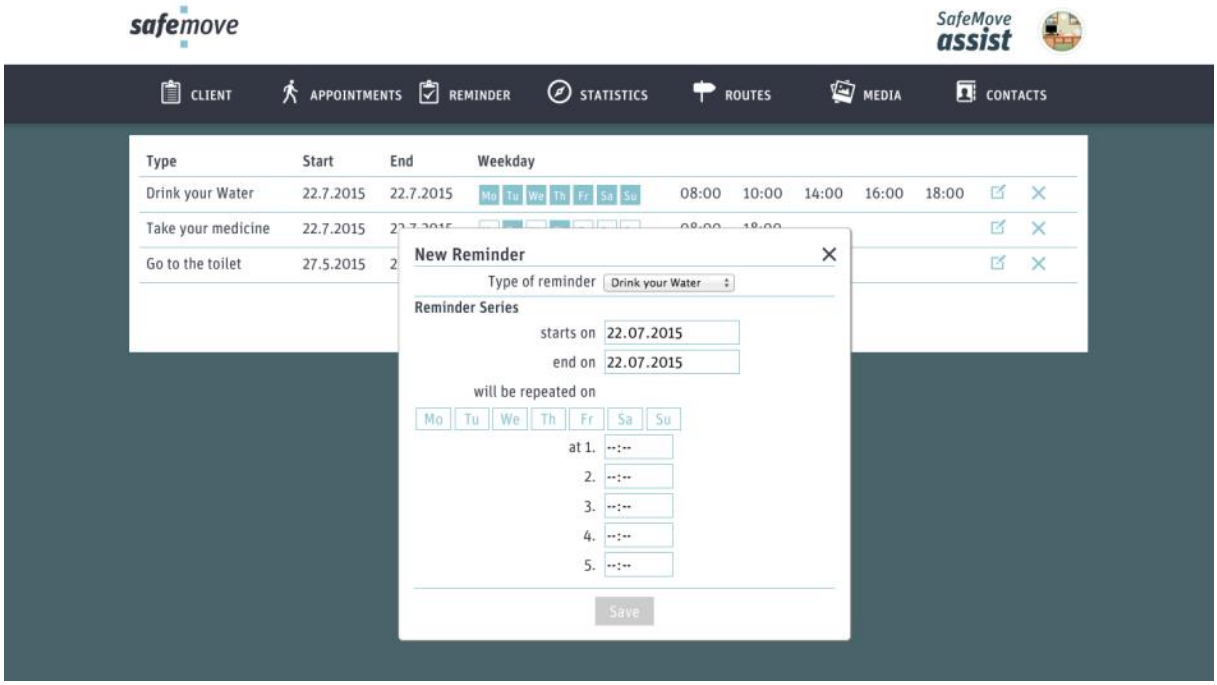

Figure 15: Create or change reminders in Assist

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2.2.3.3 Setup Contacts

In the OnTour app contacts can be select to show address information, a show it's picture or to establish a phone call. Configurations of these contacts are managed in the section "Contacts" or "Kontakte" in Assist component, see Figure 16.

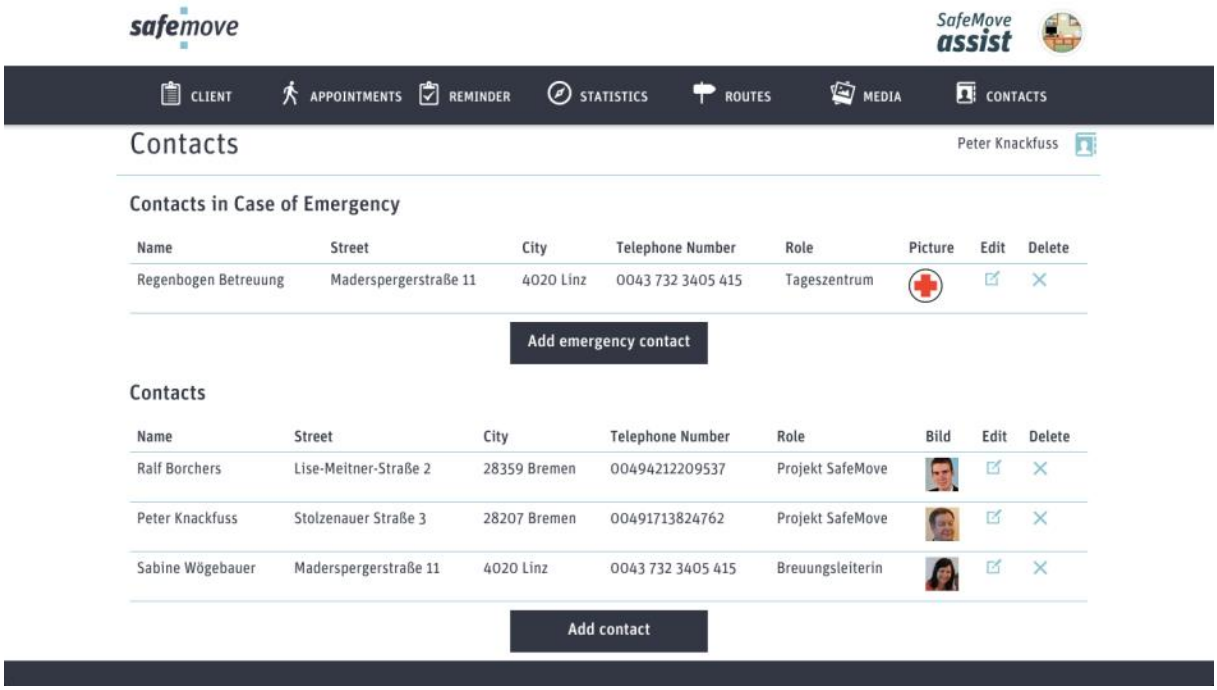

Figure 16: Contacts shown on the Assist display

2.2.3.4 Setup Emergency Contacts

In urgent (medical) emergency cases up to six contacts can be setup as an Emergency contact. These six contacts are shown in SafeMove OnTour in the separate section "Emergency" or "Notfall", see Figure 17.

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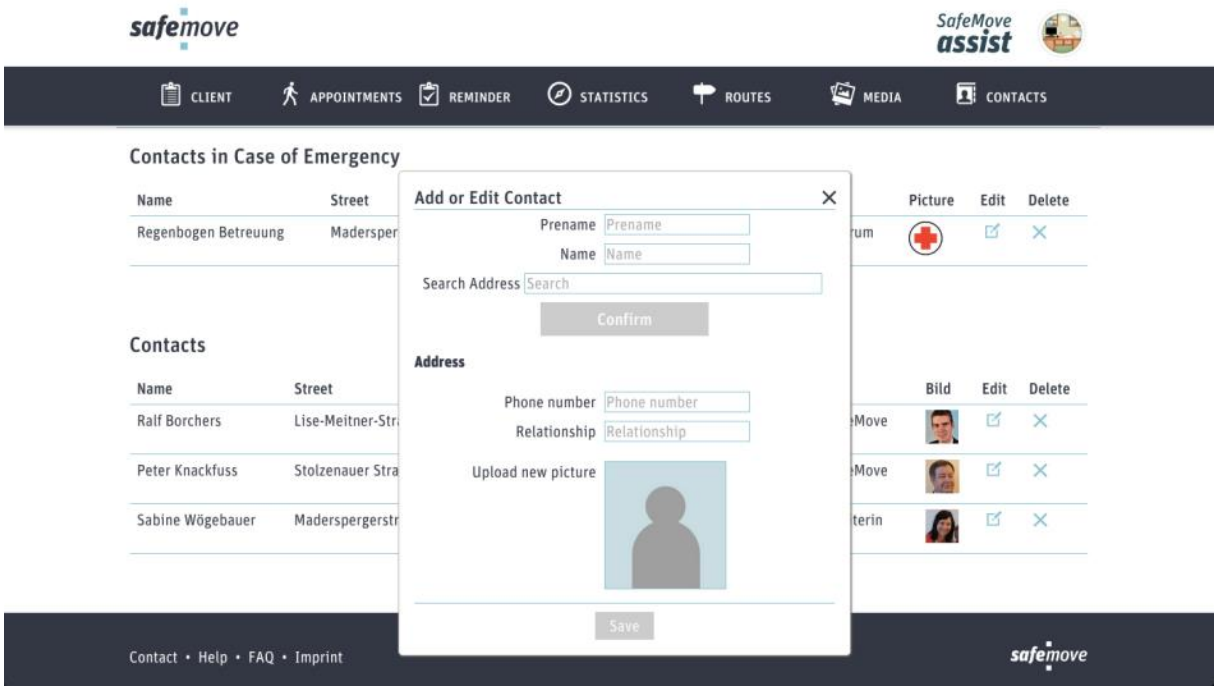

Figure 17: Entering an emergency contact

2.2.3.5 Manage Picture Gallery

In SafeMove AtHome the clients can view picture in gallery prepared in SafeMove Assist, see Figure 18 and Figure 19. Each picture can be setup with a subtitle.

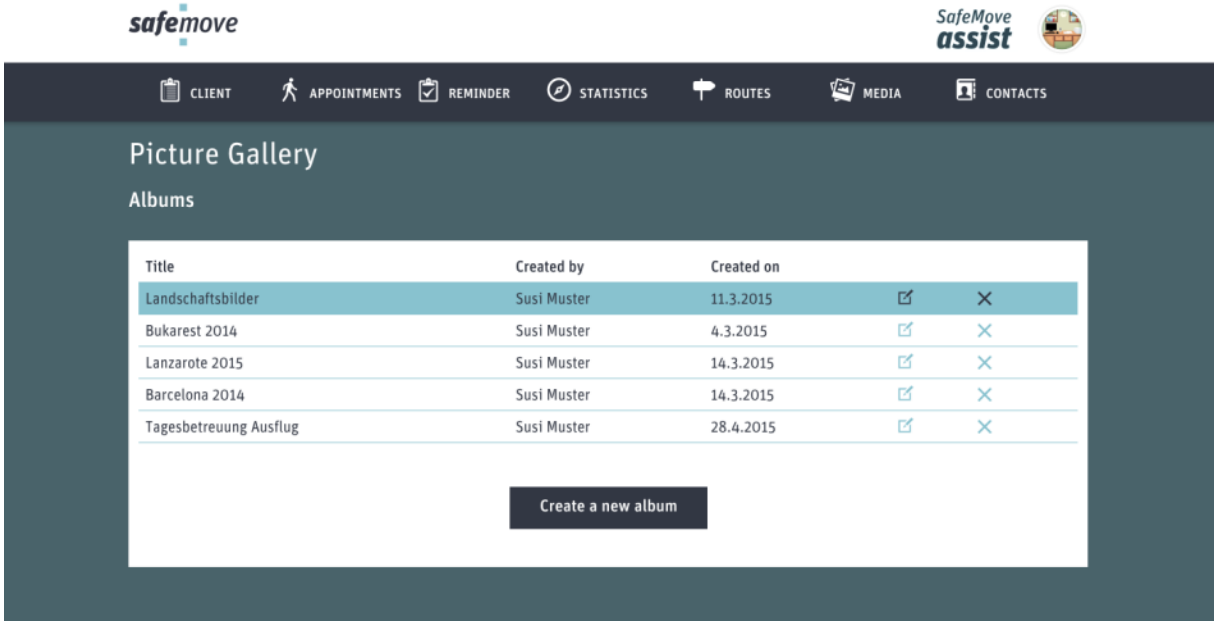

Figure 18: Albums of the Picture Gallery

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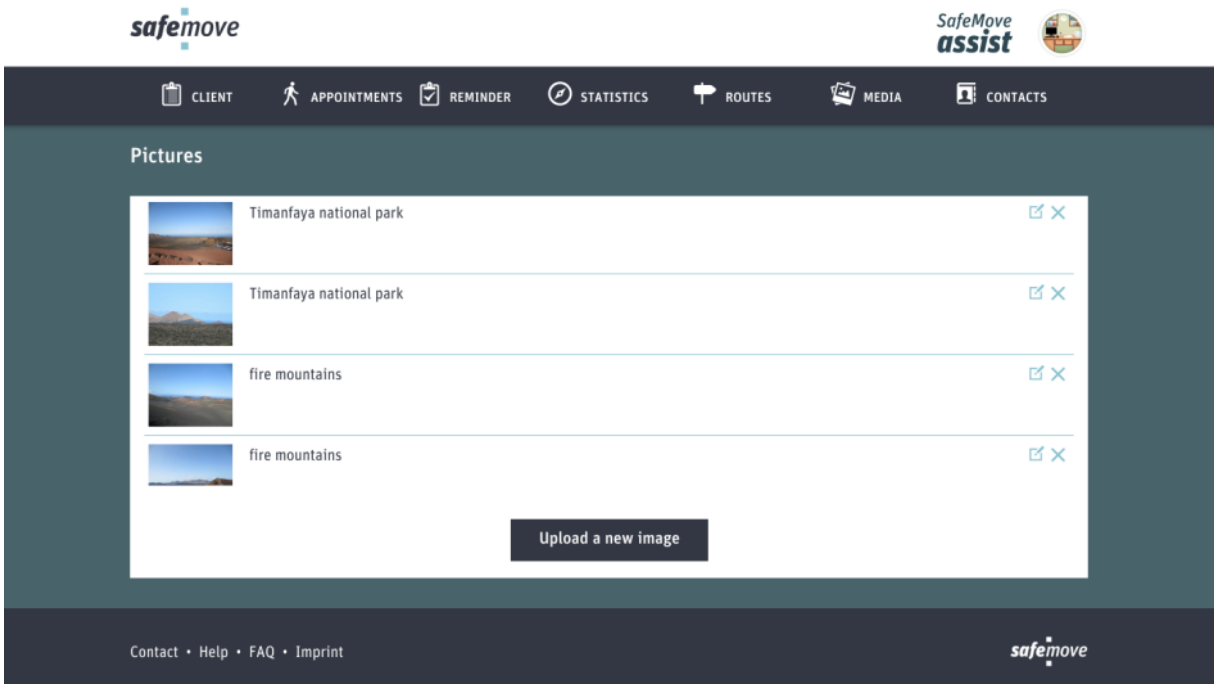

Figure 19: Images of an album of the Picture Gallery

2.3 SafeMove AtHome

2.3.1 Overview and Interaction Method

The AtHome component is displayed on a HDTV. The OnTour component is used as a controller for AtHome when it is in landscape mode. The screens of the TV and the smartphone are synchronised.

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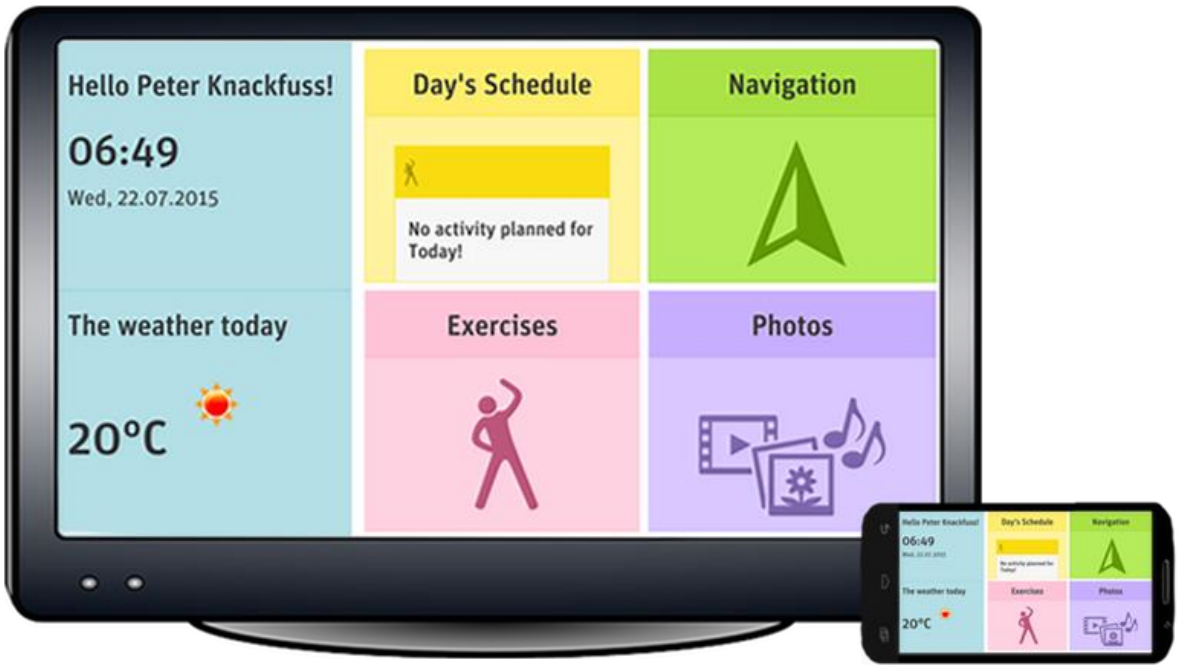

Figure 20: SafeMove AtHome on a HDTV and as remote control on the OnTour device in landscape mode

2.3.1.1 Main menu

In the main menu of AtHome the clients are always able to see time and weather conditions, see Figure 21 and Figure 22. The main menu also gives an overview of all functions of AtHome. In the field “Day’s Schedule” the next appointment for the day is shown.

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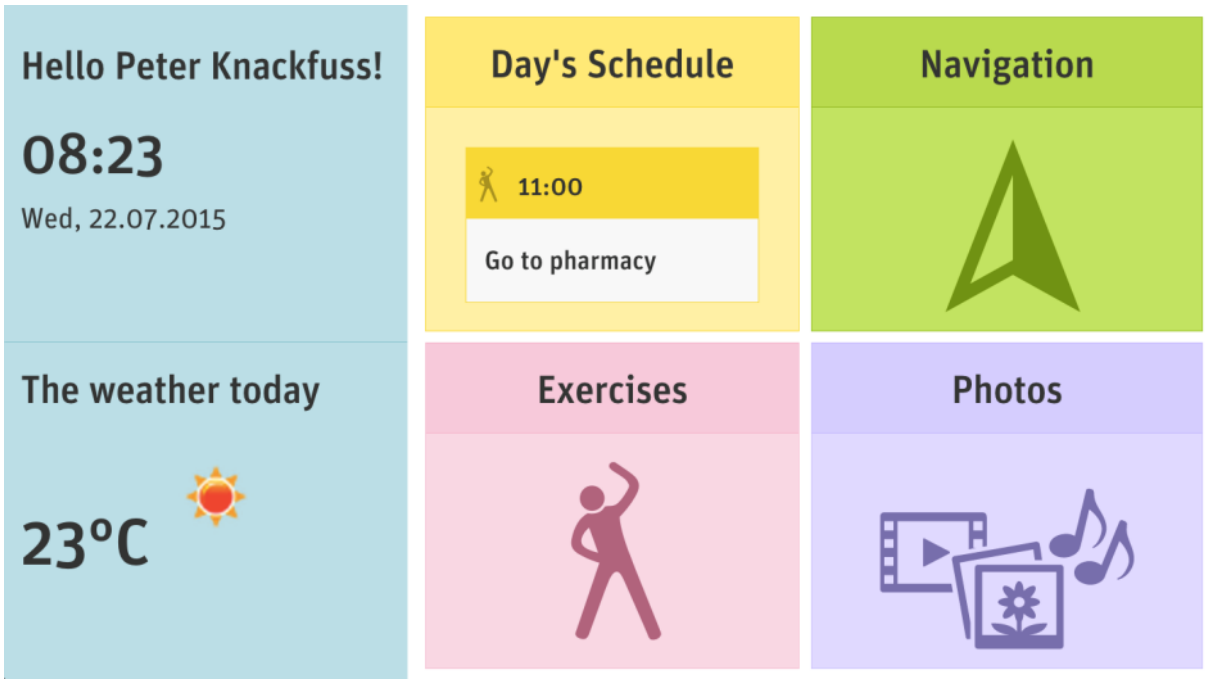

Figure 21: Main menu of AtHome

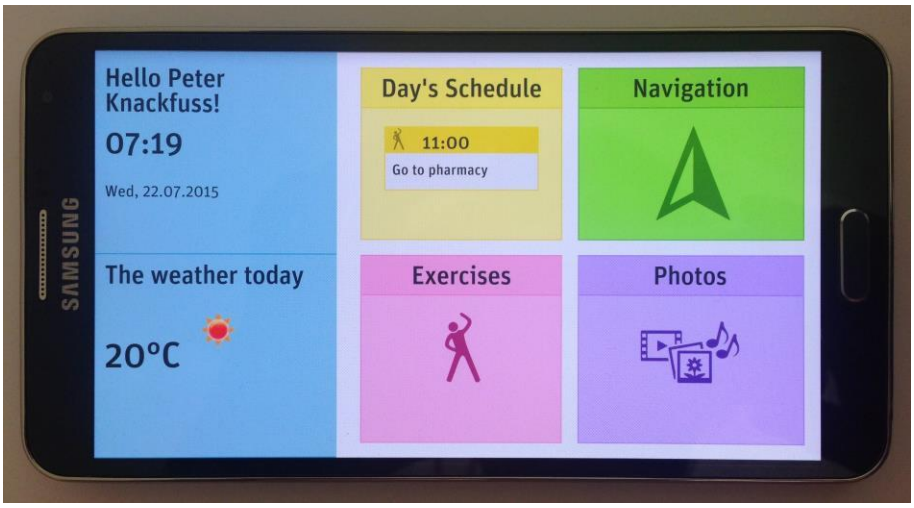

Figure 22: Main menu of AtHome on control unit

2.3.1.2 Activities

In the schedule view all activities are shown, see Figure 23 and Figure 24. The caregiver saves activities for the client with the assist component; afterwards activities can be seen and started in AtHome by the client.

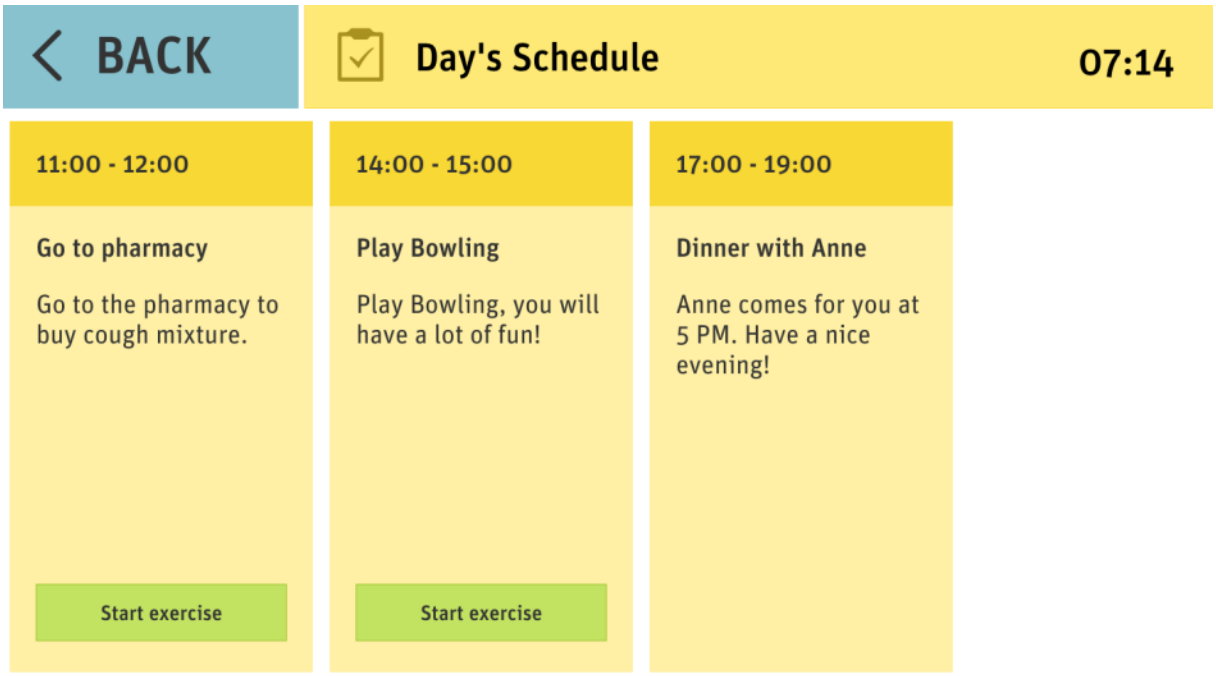

Figure 23: Activities on the AtHome screen

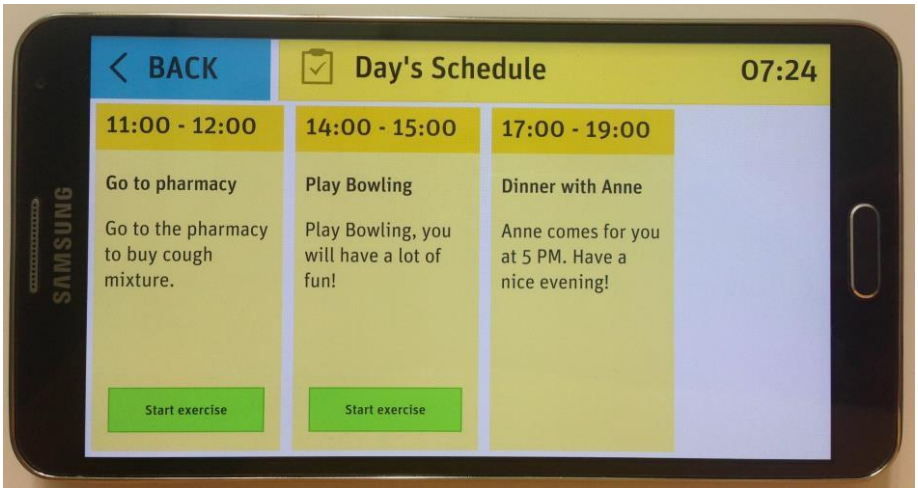

Figure 24: Activities on the AtHome screen on control unit

2.3.1.3 Navigation

With the Navigation function clients are able to train routes they need to know. The routes are organised by the caregiver with the assist component. Every available route can be seen in the navigation overview, see Figure 25 and Figure 26. For starting a route the client has to

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click on one route, a detail view appears, see Figure 27and Figure 28, and then start the "videowalk".

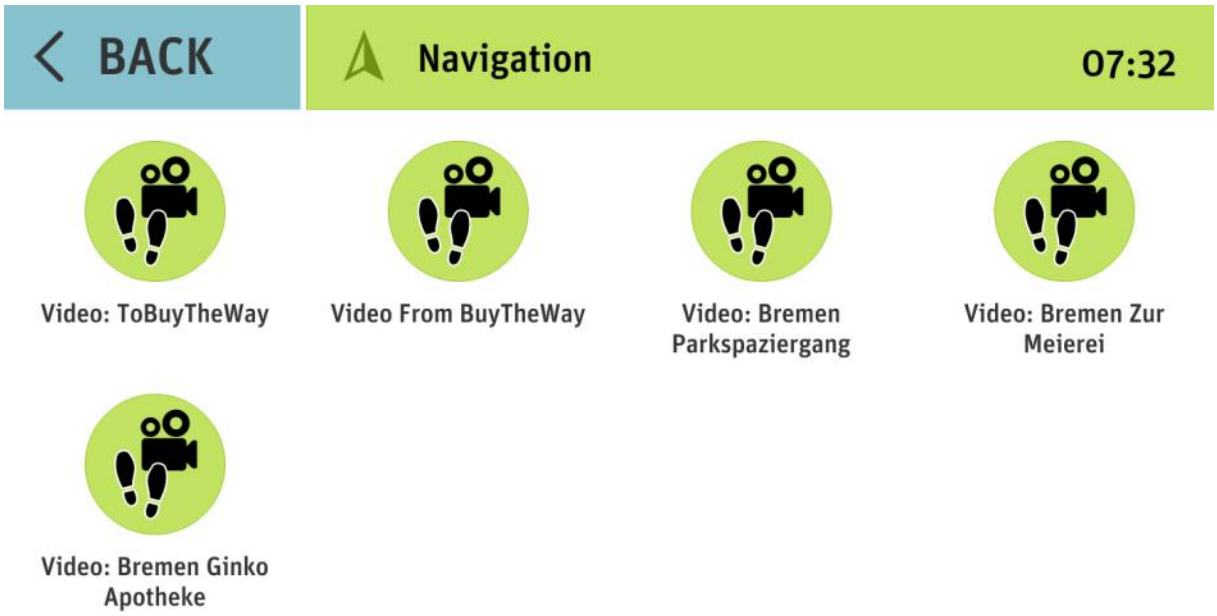

Figure 25: Overview of Navigation, select of a route to train

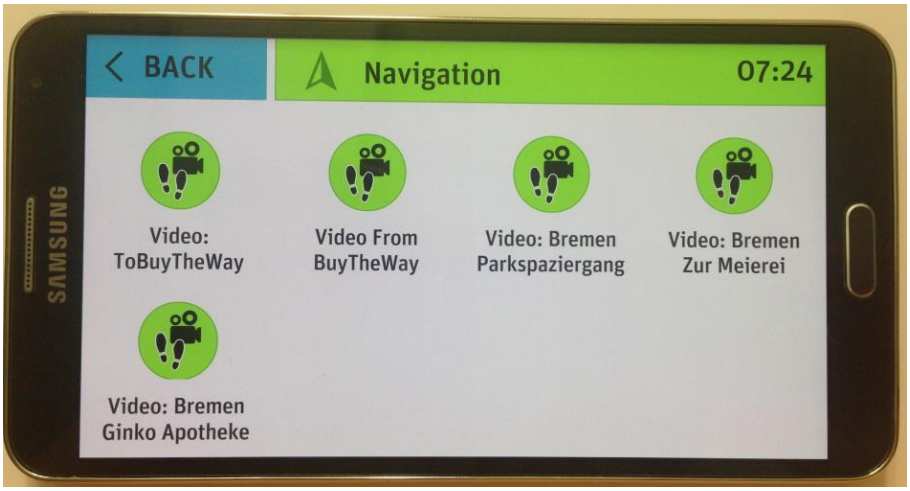

Figure 26: Overview of Navigation, route selection, on control unit

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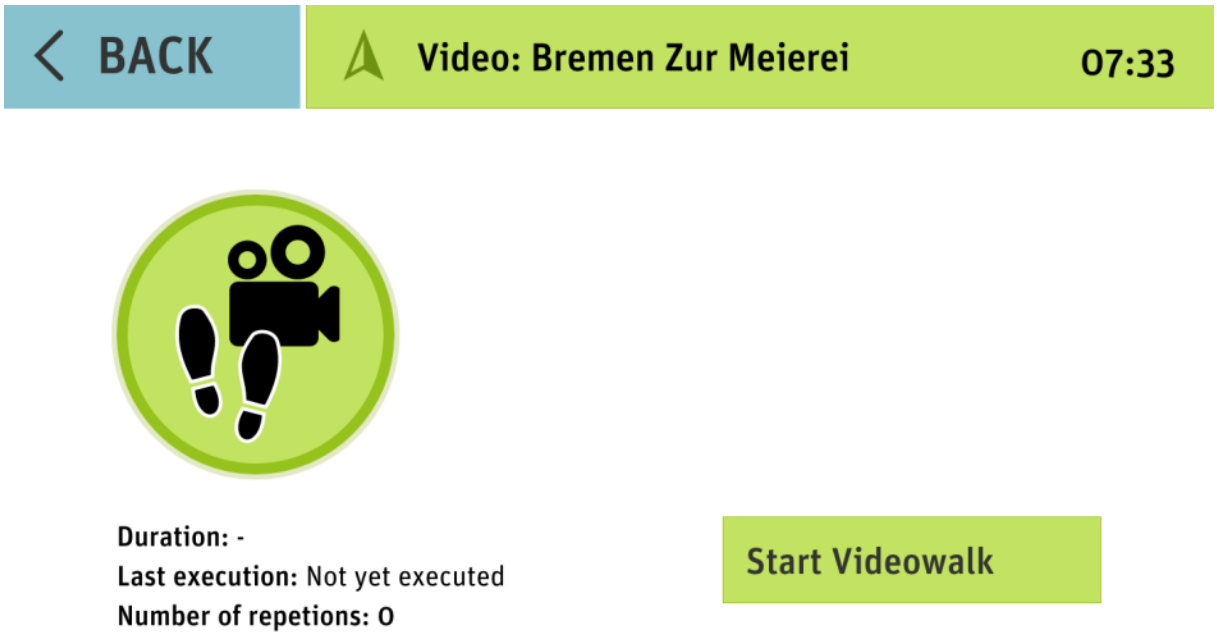

Figure 27: Navigation Detail on HDTV screen

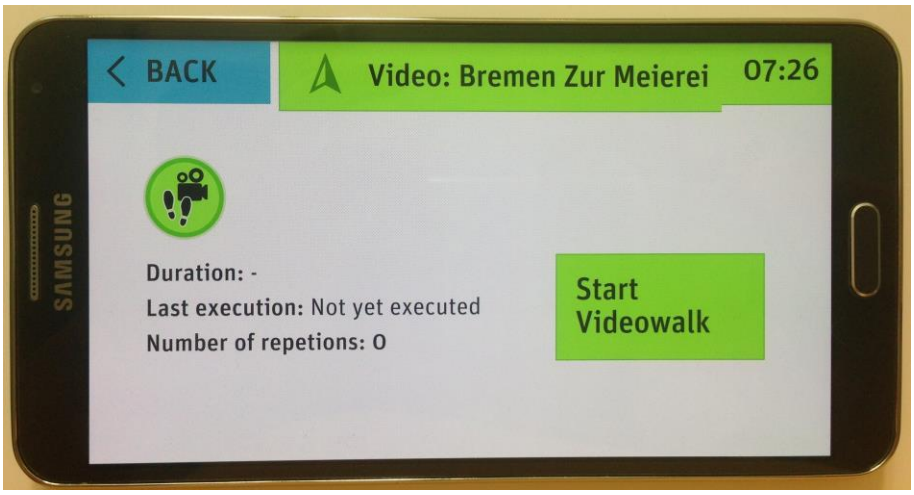

Figure 28: Navigation Detail on control unit

2.3.1.4 Exercises

With the Exercises function clients are able to play serious games for training. The games are organised by the caregiver with the assist component. Every available exercise can be seen in the exercises overview, see Figure 29 for the screen on HDTV and Figure 30 for the view

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on the control unit. For starting an exercise the client has to click on one, at first the detail view is shown, see Figure 31 and Figure 32, and then click on “Start exercise”.

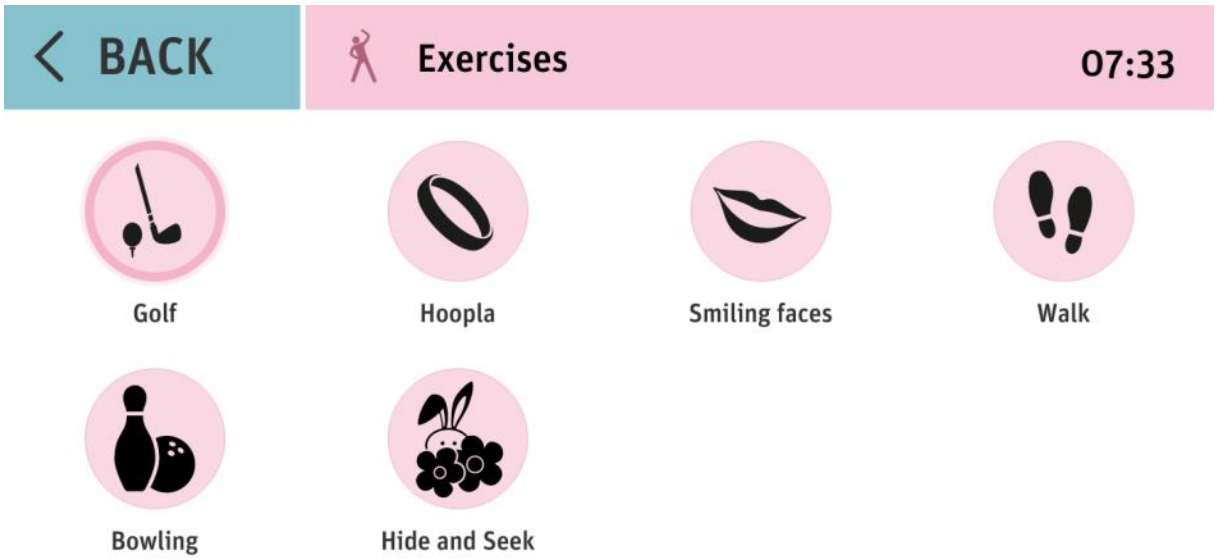

Figure 29: Exercises overview on the AtHome screen

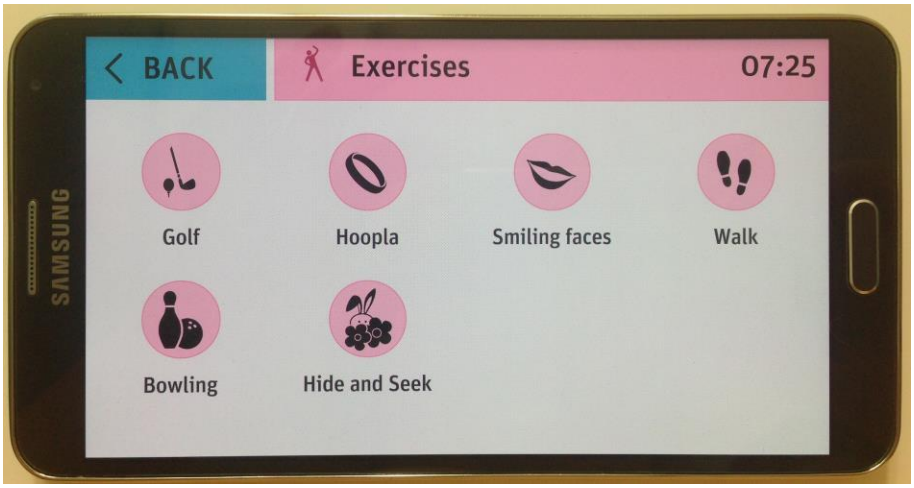

Figure 30: Exercises overview on the control unit

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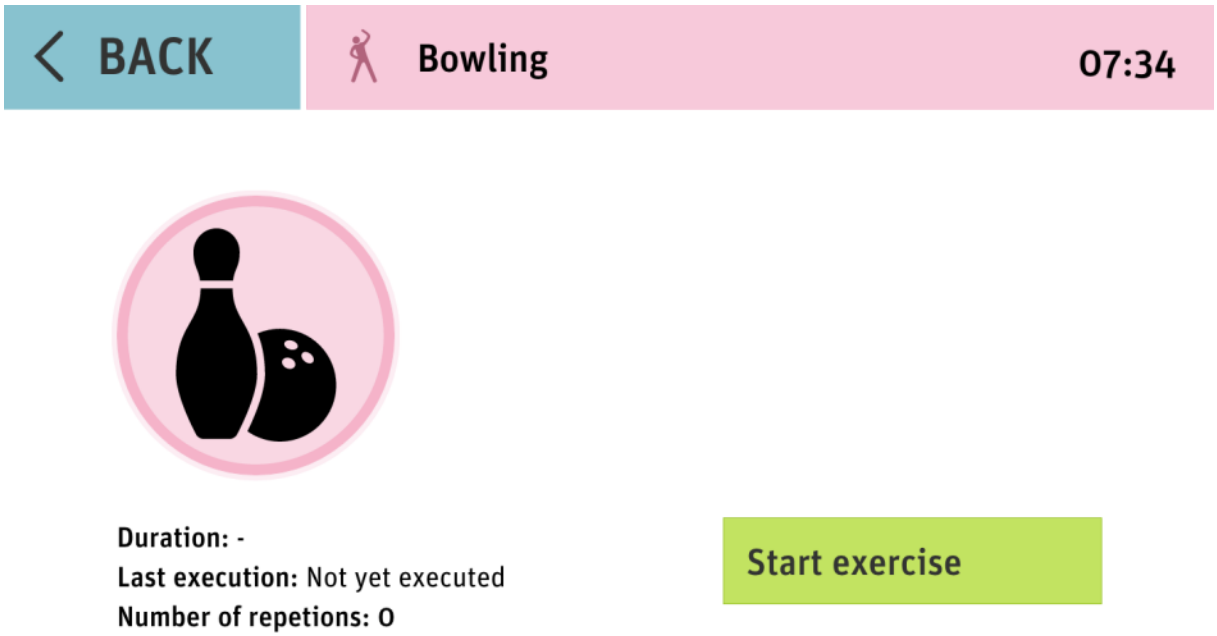

Figure 31: Exercises Detail on the AtHome screen

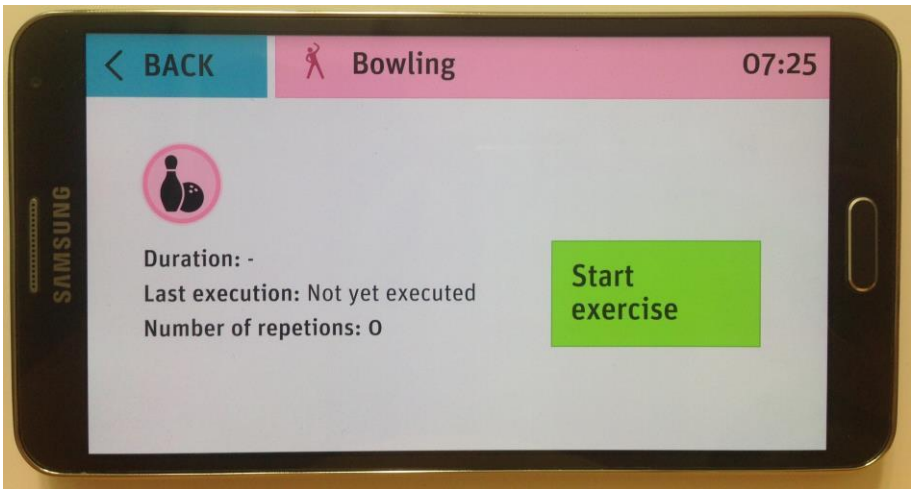

Figure 32: Exercises Detail on the control unit

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2.3.1.5 Start of Games and Route Training Games

The game is started by pressing “Start exercise” on the control unit. Short tutorials explain how to play games and train routes, see Figure 33. When the game is started it can be interrupted by pressing the “BACK” button on the control unit or the “cross arms” gesture.

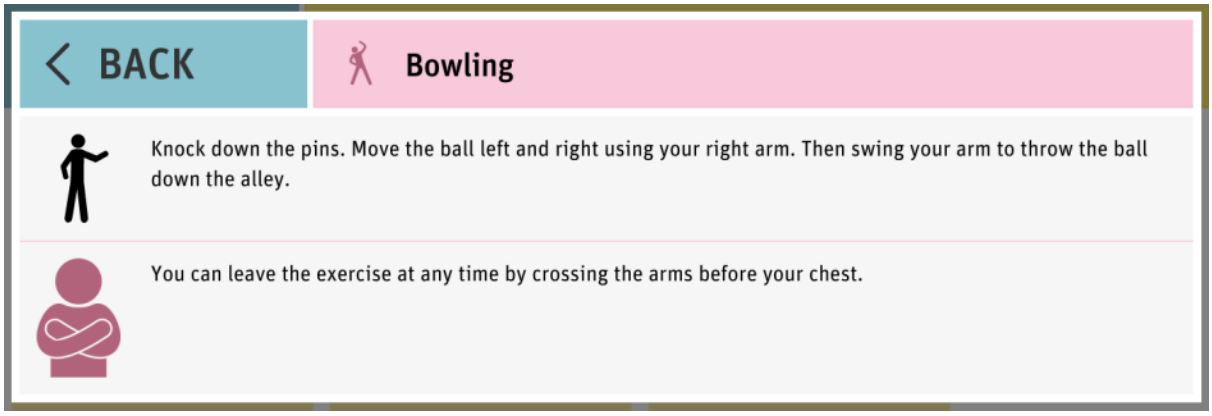

Figure 33: Brief instructions on control unit

2.3.1.6 Media

With the “Photos” function clients are able to look at photos grouped in albums. The photos are organised by the caregiver with the SafeMove assist component. Every available album can be seen in the photos overview, see Figure 34 and Figure 35. By pressing the control unit the client can look into an album and see the photos one at a time on the HDTV screen, see Figure 36, as well as on the control unit, see Figure 37.

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Figure 34: Photo gallery overview on HDTV screen

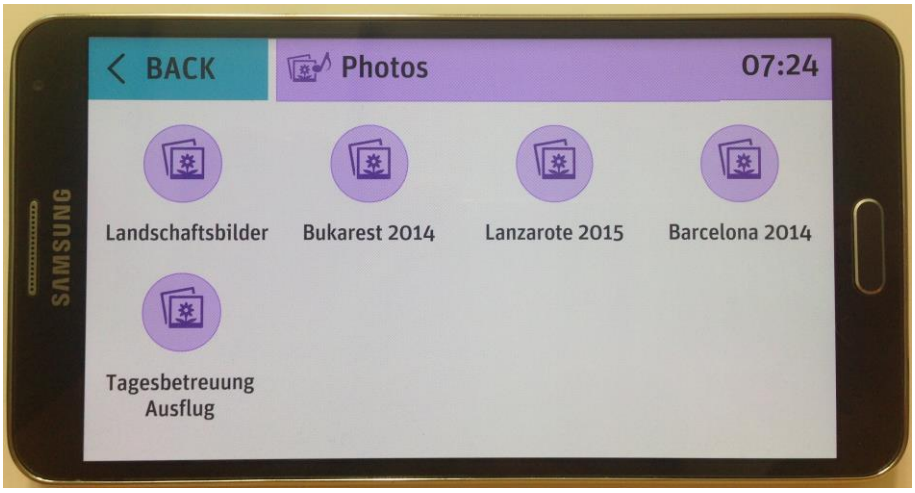

Figure 35: Photo gallery overview on control unit

In the single photo screen the client navigates between the photos by pressing the left or the right arrow on the control unit.

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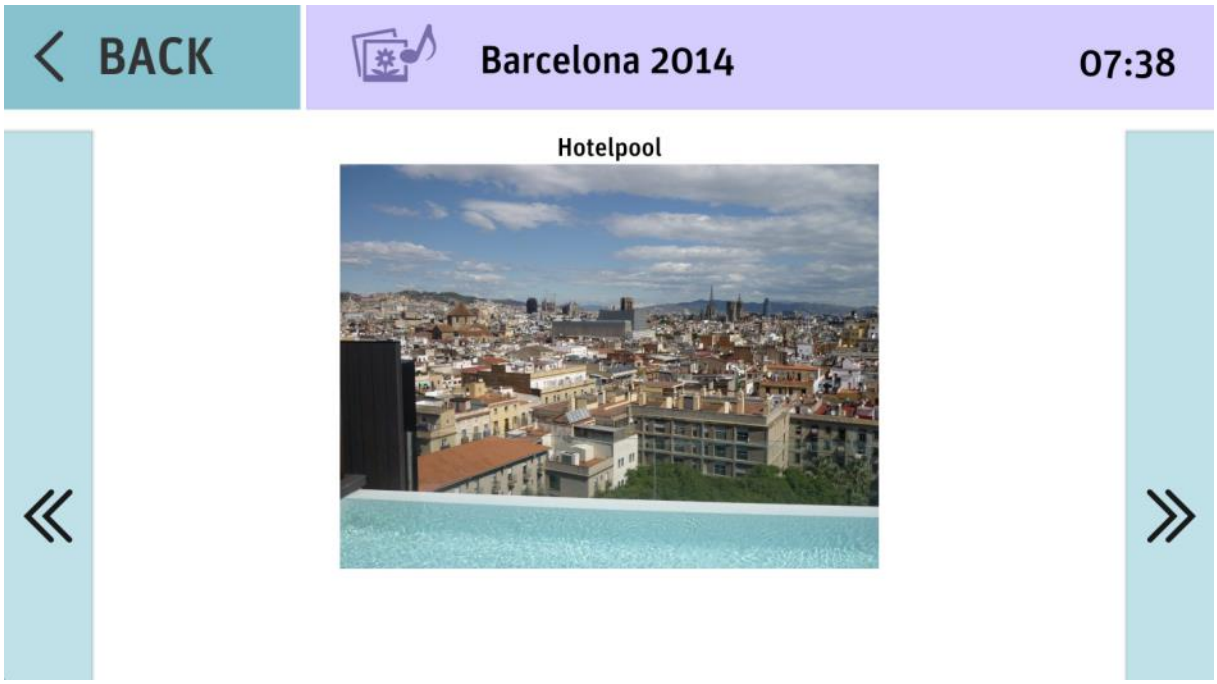

Figure 36: Photo on HDTV screen

Figure 37: Photo on control unit

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2.3.2 Serious Games

2.3.2.1 Overview

The Motivational Training Game is designed to support the overall SafeMove project and will address the following goals:

1. To inspire confidence in users that they are able to achieve and manage limited physical movement: we will achieve this by asking them to perform simple movements and providing positive reinforcement via verbal and visual feedback.
2. To inspire confidence in the users mental ability: we will achieve this by asking them to perform cognitive agility activities and providing positive reinforcement via verbal and visual feedback.
3. To inspire social confidence to encourage users to go outside their home and interact with other people within and outside of their social circle. We will do this by providing exercises around social intelligence, emotional intelligence and attempting to reduce the fear associated with some elements of modern living (for example seemingly threatening hoodies).

The game is all set in one environment, a park, where the user will be able to explore and launch 'mini games' which are each designed around the Physical, Cognitive and Social elements.

Physical, Cognitive and Social elements are not mutually exclusive and we expect a significant amount of cross over in the mini games.

Behind that background the games "walk in a virtual park", "hoop-la", "bowling", "hide and seek" and "find all smiling faces" were developed. In the following section some visual impressions of the game are given. The games are implemented in SafeMove AtHome and can be select via the dialog in Figure 38.

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Figure 38: Serious games overview

2.3.2.2 Visual Impression

2.3.2.2.1 Golf

The game is based on a spatial span task exercise, your visuospatial working memory; the component of working memory that allows you to temporarily hold and manipulate information about places. Many everyday activities involve visuospatial working memory, including finding your way around your environment, judging the position of other motorists while you are driving and searching for your keys.

The objective of the game is to get the ball as close to the flag as possible, whilst also getting the ball through the golden hoops flying in the sky to score bonus points, see Figure 39. There is also a complete new difficulty scaling system that includes wind to push the player's ball off course, and a whole new visual effects system including slow motion and ball rotation cameras.

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Figure 39: The Golf game

2.3.2.2.2 Walk in a Virtual Park

This game is designed to give the users gentle and guided exercise, see Figure 40.

Figure 40: Virtual Park on the AtHome screen

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2.3.2.2.3 Hoop-la

This is a variant of the classic Stroop Test. The user is faced with 3 colour posts in the ground at the same distance away. The colours are Red, Blue and Yellow. The user will be given hoops to throw to these posts

There will be a tombola sign which spins around and will have one of the 3 colours written on it but it may be displayed in a different colour. For example, the word says **RED** but it is written in blue, see Figure 41. The user must then throw the hoop to the blue post. So the user must throw the hoop at the correct post according to the colour of the word and not the word itself.

Figure 41: Hoop la game

2.3.2.2.4 Find All Smiling Faces

The idea of the game is that each time the user drags their attention away from one of the frowning faces in order to find a smiling, accepting face, it helps to build a mental habit, see Figure 42. The next time they are reminded of a rejection or criticism from someone else, rather than dwelling on it, they may be able to 'let it go'.

It also can help users feel accepted and supported by others this and in turn can help them feel more confident in dealing with daily challenges.

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Figure 42: Smiling Faces screen

2.3.2.2.5 Bowling

The game starts with the player being able to move the ball left and right by using arm gestures similar to the golf game. They then swing like the golf game to throw the ball down the alley, where it then smashes into the pins with a flurry of dusty particles and a chorus of pins falling and the crowd cheering, see Figure 43. The aim of the game is to knock down as many pins as possible. After each round more pins are added.

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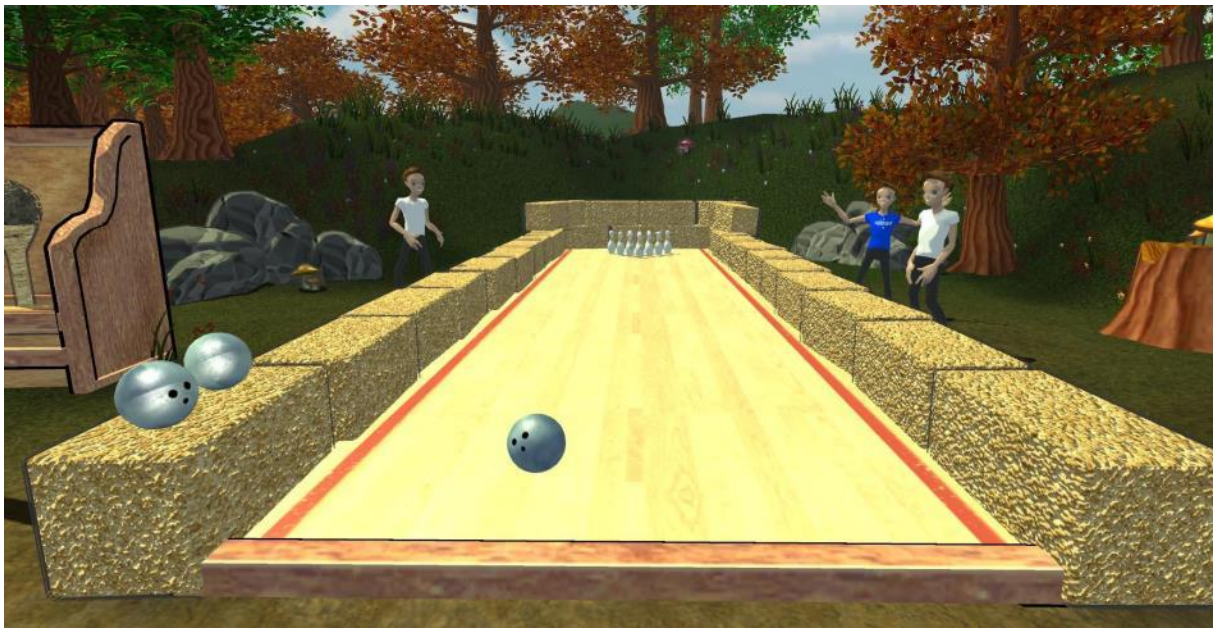

Figure 43: Bowling screen

2.3.2.2.6 Hide and seek

This game was all about increasing the player's spatial awareness by making them find a rabbit that has hidden in or under a specific landmark. The player would start by looking at an almost top down view of 10 large hiding places, a rabbit would then hop out onto the screen and then jump into a hiding space, causing a dust effect and a rustling sound, see Figure 44. The player would then have to select that hiding place to cause the rabbit to jump back out, and score points. The difficulty scales with the points earned, and slowly more rabbits will join the game, with a total of 4 at the highest difficulty, with all of them then switching places after hiding initially.

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Figure 44: Hide and Seek screen

2.3.3 Download of demonstration software

To try out the pilot of the motivational training game click here to download. This will download a ZIP file. You will need to unpack this and launch the file named **SafeMoveVer3.exe.**

You will need a Windows Kinect device attached to your Windows PC (Windows 7 or 8).

You will also need to download the Kinect SDK. Click here to launch the website.

3 Integration Infrastructure

The SafeMove solution combines four components: SafeMove Cloud, SafeMove AtHome, SafeMove Assist, and SafeMove OnTour. In figure below an overview of the architecture of these components in SafeMove solution is given. Contextual all components of one client are connected to, and via a small SafeMove Cloud. All data and information are stored in it, and are distributed (controlled by several permission checks) on demand. Technical the data are transferred using internet technologies, wired (Assist, AtHome) and mobile data (OnTour).

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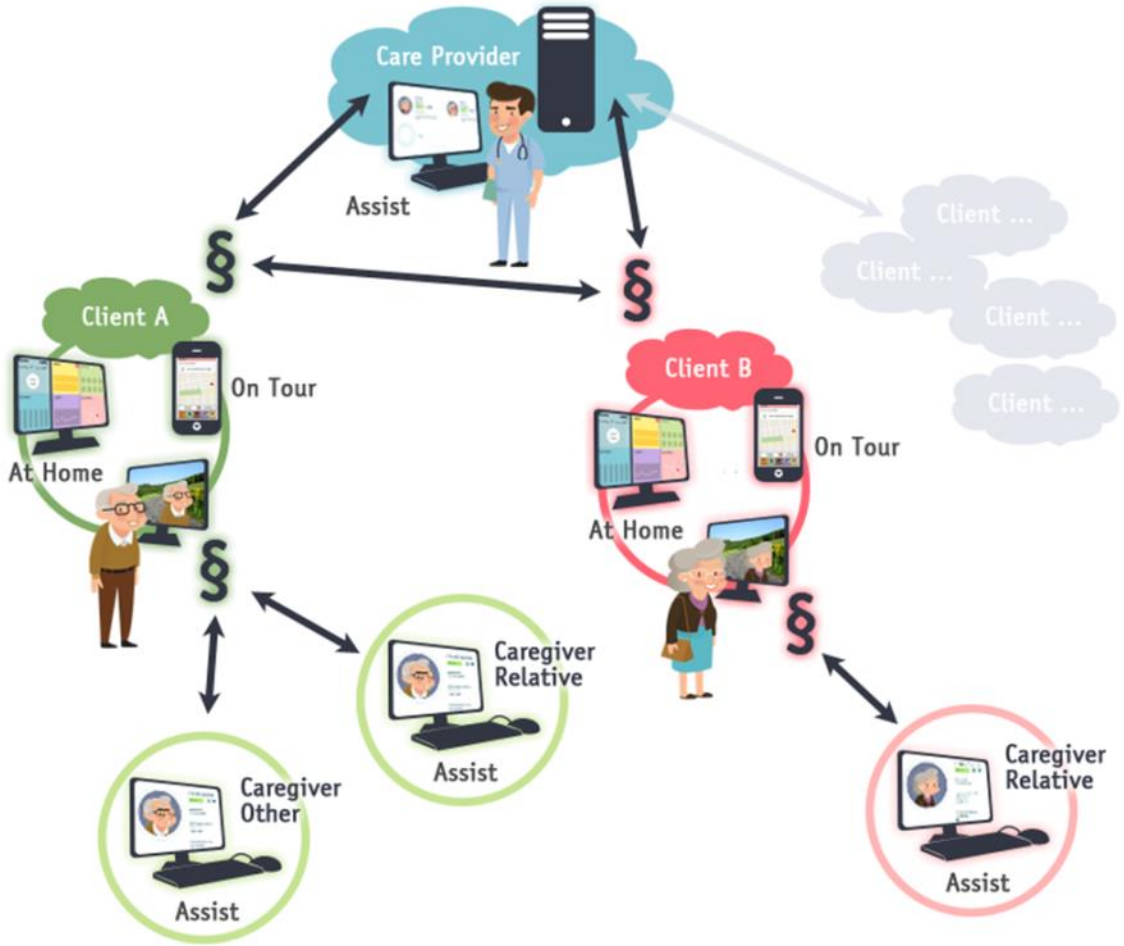

Figure 45: Overview of the architecture of SafeMove solution

In the pilot of the SafeMove solution the implementations of all components focused on the use cases and its requirements of deliverable D1.2c of work package 1. Actually the SafeMove solution unit is working alone, as a standalone system, but the architecture is designed to be a part of a multi user system. All components are part of the SafeMove AtHome hardware that is a barebone computer GIGABYTE GB-BXi5-4200, see a picture below, with the following criteria:

- Supports dual display video output via HDMI and mini DisplayPort
- Includes IEEE 802.11b/g/n Wi-Fi / Bluetooth 4.0/3.0 Combo Mini PCIe module
- Includes VESA bracket for discreet display and wall mounting
- Dimensions: 29.9 mm x 107.6 mm x 114.4 mm

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Figure 46: Hardware of SafeMove AtHome Computer

In the next step, the final pilot, these AtHome units will be combined, so that a care provider person can setup and overview one or more clients.

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