



Adaptive Ambient Empowerment of the Elderly



Deliverable 3.1.

User Requirements

Including updates

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Adaptive Ambient Empowerment of the Elderly

I. A2E2 Narrative Mission Analyses

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This document summarizes the general user requirements of the A2E2 system. It summarizes answers to the following questions:

- What is the A2E2 system?
- What does the system do?
- Who will use the system?
- What are the circumstances and environments in which the system will be used?
- What does the virtual coach do?
- What sensors are used in A2E2?
- What output data does A2E2 generate?

What is the A2E2 system?

The A2E2 system fulfills the following needs:

1. Providing support for the elderly care receiver (CR) in the self management of daily activities.
2. Providing support to the care giver (CG) and the Health Company (HC) in helping the (CR) in this self management process.
3. Providing support to the Scientific Researcher (SR) in evaluating the self management of the CR, the care given by the CG and the dyadic interaction between the CR and the CG.

What does the system do?

The A2E2 systems gives the following types of support:

1. Supporting the creation of a set of daily tasks activities for the elderly. This is done by an authoring tool by which a generic activity task can be created.

2. Supporting the selection and planning of these activities from an activities tasks set, with a start and end time for a specific moment on the calendar of the day. There is the option to repeating an activity task with interval times of such activities.
3. Supporting the creation of prompts that indicate the occurrence and/or closing of an activity task. The prompts appear on a specified start/end times with the option of repeated intervals during the day. There is the option that the systems requires a multiple choice response from the user to the prompt.
4. Supporting the selection between the following types of prompts: text that remains on the on screen for a limited time, audio and visual signaling or combinations of these.
Prompts appear with specified start/end times with the option of a repetition with intervals during the day.
5. Supporting the import of motivational video messages (through flash/flex/internet hyperlinks) that appear on a specified start/end times with the option of repeated interval during the day. There is the option of that the systems requires a multiple choice response to the video message or not.
6. Supporting the creation of closed, and open end questions and combinations of questions (generic questionnaire module). The questions appear with specified start/end times with the option of a repetition with intervals during the day.
7. Supporting routing functionality between answers, questions and messages. The answer to one question or a set answers to questions can be the input for other questions, messages or prompts. These routed messages can appear directly or appear on a specified start/end times, with the option of repeated intervals during the day. There is the option of that the systems requires a multiple choice response to this or not.
8. Supporting the choice and use of at least 4 sensor types:
 - (a) A sensor for measurement of frequency, duration and intensity of long term activity. This measure provides summary info per activity task and per day.
 - (b) A sensor for measurement of frequency, duration and intensity of short term activity. The measure provides summary info per activity task and per day.
 - (c) A weight measure
 - (d) Heart rate measure. This measure provides summary info per activity task and per day.
9. Supporting a routing functionality between sensor output and prompts, messages and questions.
10. Supporting the creation of a virtual coach messages. The Virtual coach messages are (a) verbal with text to speech messages. The messages are typed in directly or imported through an external file;

(b) a selection option from the following non verbal messages: smiling face, laughing face, surprised face, sad face, neutral face and angry face.

The virtual coach messages can be made appear with specified start/end times and with the option of repetition during the day.

There is the option of that the systems requires a multiple choice response to the virtual coach message or not.

11. Support in the selection between three coach types to be chosen for each message: The mentor, the expert and the motivator coach. These three coaches have distinctive appearances.
12. Supporting a routing functionality between coach messages based on input from sensor data, prompts and, message response and answers to questions.
13. Supporting the creation of a daily task structure file where prompts, messages, activity tasks and the virtual coach messages, and sensor types are selected in an organizational daily activity structure.
14. Supporting a library function for the organizational daily tasks structures and their separate elements can be stored and managed. Files including multimedia files can be imported and exported.
15. Supporting a calendar function where daily organizational task structures can be placed upon.
16. There is a preview functionality that support the creation process of prompts, tasks, messages and virtual coach messages.
17. Supporting graphical summary evaluation of activity task performance, questionnaire and sensor information.
18. Supporting the option of direct contact between CR and CG through a webcam functionality.
19. Storing all information of both CR and CG input, output and system use.
20. Supporting the download of stored information for SR and HC in an SPSS, csv and XML format

Who will use the system?

The system is used by the following types of users:

1. Care receivers. 65+, retired, able to self management either independent or partly independent living styles. Excluded are severely retarded people with extreme low IQ scores. (CR)
2. Elderly care receivers CR + HC

3. Researchers SR
4. Management and maintenance personnel.

As mentioned by using the system, the elderly care receiver, the care giver (GC + HC), the researcher and the manager/system maintainer can all plan and schedule the activities task during a day. This results in a daily task structure generated by the system.

What are the circumstances and environments in which the system will be used?

The system is located in the living room or bedroom of the elderly home and is a stable part of the living room environment. Home sizes are from 14m² to 50/60m² (ideal) or 90m² (see: attached drawings of home environment types).

Requirements are:

- stand alone system
- multi touch screen PC
- 24-27" to balance between comfortable display size and costs stationary set up, fixed. On a distance of 2m the elderly user must be able to watch a activity video (e.g. in flash) read the accompanying texts and imitate the activity.
- All in one
- optional: wall mounted or with stand to sit on a table
- Option for Wireless connection and Cable
- Including webcam, speakers, and mike
- While non being used, system could function as an e-picture frame or other tasks
- integration w/ TV and Internet services

Extra Non-functional requirements:

- Upgradable, for functionalities and sensor types
- Usable for the elderly
- Entertaining
- Affordable, the total set of equipment should not cost more than 2000 euro

What does the Virtual Coach do?

The virtual coach is a virtual entity that has an animated visual appearance and a voice. The coach function can be put on or off. In practice it is always or almost always visually present on the screen for the care receiver. For the care receiver, it appears to be the entity that communicates with them. All messages and questions are by default conveyed through the virtual coach in audio (in the care receiver's language, using a text-to-speech system), accompanied by subtitles of the exact same text. The virtual coach looks realistically human (but not quite as realistic as a video of a real human being) and is animated. This means that, even when "doing nothing", it is moving in a way that would be natural for human beings (scratching a small itch, a slight shift of balance from one leg to another, etc.). When the coach is talking (conveying a message or question to the care receiver), its mouth makes

speaking movements when there is audible text. It does not make speaking movements when there is no audible text. Also, specific body language and facial expressions can be scripted in a message. A scripted message including body language and facial expression would look something like this: "<wave><happyFace>{happyVoice} Hello,{pause 0.2s} how are you feeling today?". Messages and questions can be created and inserted into the daily task structure by all users. When creating a message or question, the utterance and body language of the coach can be previewed before implementation. When the coach asks a question, the care receiver can answer this question by touching one of the possible predefined options on the touch screen. A conversational interaction between coach and care receiver can be created by making a path between multiple questions, routing the possible paths depending to the answers that are given by the care receiver. Also, a sense of interaction with the virtual coach can be created by using text piping in sequential questions (e.g. "Oh, so you like <answerfromQ1>, do you? So do I!").

Categories	Attributes	Coach	User or system driven
overall style	simplistic naturalistic	X	system
perspective	third person	x	system
gender	Female	x	user
	Male	x	user
age	49 years old	x	system
full body display	Option to zoom in face only	x	System user
ethnicity	dark skin color	x	user
	middle skin color	x	user
	white skin color	x	user
clothing	casual outfit	x	system
	8 color options	x	user
	24 color options		user
face	close-ups	x	system
	unsynchronized speech moderate emotional expressiveness	x	system
		x	system
body	strong and healthy	x	user
add-on's	sunglasses	x	system
	umbrella	x	system
	chef's hat	x	system

What sensors are used in A2E2?

Sensors include:

1. A long term activity sensor (accelerometer) that is worn or kept in a pocket by the care receiver as much as possible. This is to assess overall daily activity and sedentary behavior.
Based on recorded data from this sensor, certain thresholds can be set by which messages or questions become active or not (e.g. a suggestion to take a walk in the park only set to become active if `today'sActivity < 2000 && userLikesWalk && weather == good`)
2. A short term activity sensor (accelerometer) that is held in hand or on a specified place on the body during a specific activity in the daily task structure. This is to assess specific movements of the care receiver during a specific exercise/activity or even to navigate in a game or menu.
Based on data from this sensor, the virtual coach can give feedback to the care receiver on his or her movements or posture during a specific activity (e.g. "try to move a bit faster" or "try to make longer arm movements")
3. Heart rate sensor. This is also a sensor that is worn only during specific activities. Based on data from this sensor, the virtual coach can make suggestions during exercises (e.g. if `heartrate > 140 --> "You should slow down a bit! Exercising is good, but do not overdo it!"`)
4. Weight. This is measured and recorded every once in a while. Feedback from the virtual coach could be given on the basis of it.

The data of sensors 1, 3 and 4 are downloadable by the researcher and some aggregated sensor can be represented directly on screen for the nurse (statistics of average heart rate, statistics of daily total activity).

What output data does A2E2 generate?

The data recorded consist of:

1. Sensor data. These include overall activity values per day and per every task in the daily task structure, "raw" activity sensor data over the whole day, average heart rate per task and all heart rate data, and weight. Also duration bouts of activity intensity are recorded (e.g. 16:32 – 17:35, sedentary; 17:35 – 18:06, light intensity; etc.).
2. Responses to questions by the care receiver.

All data can be downloaded by the researcher in SPSS, Excel, or XML format with appropriate labels. When downloading the data, the researcher can select which data to download (only responses to questions, only aggregated sensor data, or only "raw" sensor data from activity or heart rate sensor).



Adaptive Ambient Empowerment of the Elderly

II. a2e2 Framework

This document describes the framework underlying the generic task description of activities. This generic task description is based upon a variety of use case that were examined with the end users. It is also derived from the building blocks (cyber coaching, elderly and new media, exergames, health communication, motivation and self-regulation, parasocial relationships, narrative impact and self presence, physical activity) included in the literature review (see the State of the Art document; deliverable 3.3). In addition, we conducted a series of focus groups and pilot studies to identify user requirements and preferences that are also guiding the rationale applied below.

Content

1. Goal and challenges
2. Prototypical user
3. General requirements
4. Digital coach
5. Sensors
6. Delivery environment
7. Prototype day structure
8. Physical activity
9. Use scenarios for the generic task description

1. Goal and challenges

The overarching **goal** is to create a tool that identifies opportunities for increased physical activity in senior citizens age 65+. The main **challenge** is to develop a system that empowers the elderly, that is adaptive, fits into the daily structure of an individual, is self sustained, easy to use and so attractive that the user is drawn back to its usage over a longer period of time. The motivational elements are therefore crucial to the project. We recognize that sustained usage contains three phases that require distinct motivational strategies: how can a user be motivated to use the system at a specific time in his/her life (selection), how can we assure that usage is not interrupted (persistent) and is repeated over a longer period of time (habituation, c.f. figure 1)?

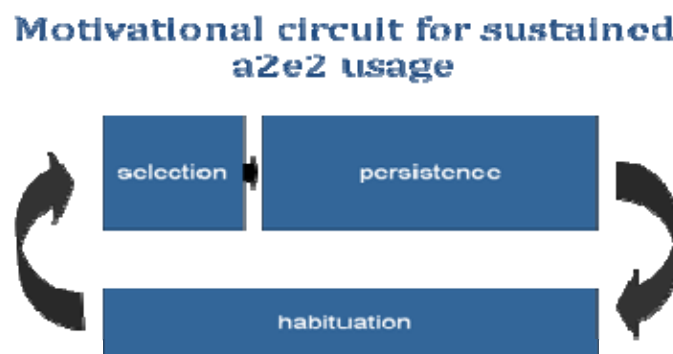


Figure 1.

In addition, the development of motivational strategies has to take into account that the situation of the user will change over time when s/he starts using the system. Motivation to increase physical activity could already be well pronounced (e.g., I want to exercise); which is the assumption that is clearly underlying most health applications. However, our main target group is not in possession of clearly expressed and consistently pursued intentions. In fact, the challenge for this ICT solution is to reach out to those who are not yet motivated enough to increase their levels of physical activity. These are the individuals who suffer from chronic life style diseases or are in risk of developing them. For those persons different motivational strategies need to be applied. One opportunity is to seduce a person into participating in fun activities associated with an incidental increase of physical activity (e.g., gaming). However, even these enrichments may be too challenging for those users who lead a primary sedentary life style. In these cases an increase of physical activity has to build on daily routines that are necessarily followed (e.g., washing the dishes while building in little extra movements). Figure 2 exemplifies these distinct sets of motivational strategies depending on the phase of usage (selection, persistence, and habituation) and the psychological approach (intentional, incidental, functional).

Motivators for exercise

	selection	persistence	habituation
Intentional (I want to exercise)	Push prompt, alarm, life salience	Goallocks, scores, adaptability feedback	??
Incidental (I want to enjoy and btw I exercise)	Para-social-relationship, ongoing soap activities	Para-social-relationship, ongoing soap activities, social presence, self presence	Para-social-relationship, ongoing soap activities, social experience
Functional (I need to exercise and btw I exercise)	Necessity (clean up, groceries etc.)	Necessity (clean up, groceries etc.)	Necessity (clean up, groceries etc.)

Figure 2.

Taken together, we recognize that the main challenge for a2e2 is to facilitate behavior change in providing opportunities for enriched and new patterns of daily activity while at the same time limiting influences that may inhibit any change (e.g., fear, mortality salience). Although we appreciate that some change can be derived from establishing and pursuing good intentions (top of the pyramid in figure 3) the main effort of intervention is directed towards the middle part of the pyramid. Here the potential for change is the greatest.

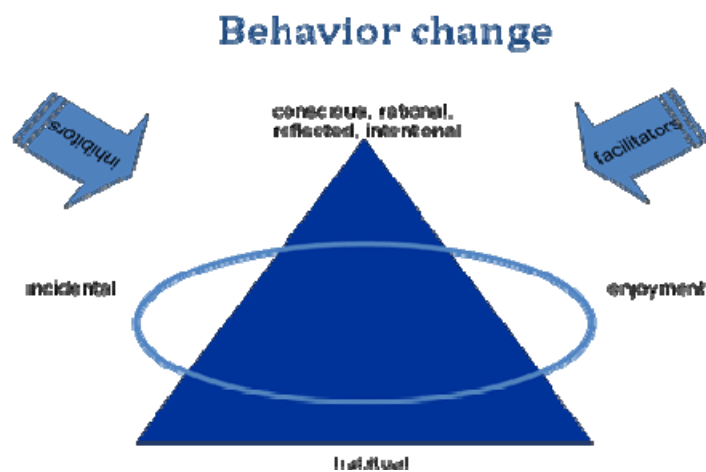


Figure 3.

a2e2 establishes a system entailing a user (patient at risk), a digital coach that is connected to sensors, as well as first and second line experts (figure 4). We concentrate on the triad users- /coach-sensors as well as on the connection to health care givers and researchers.

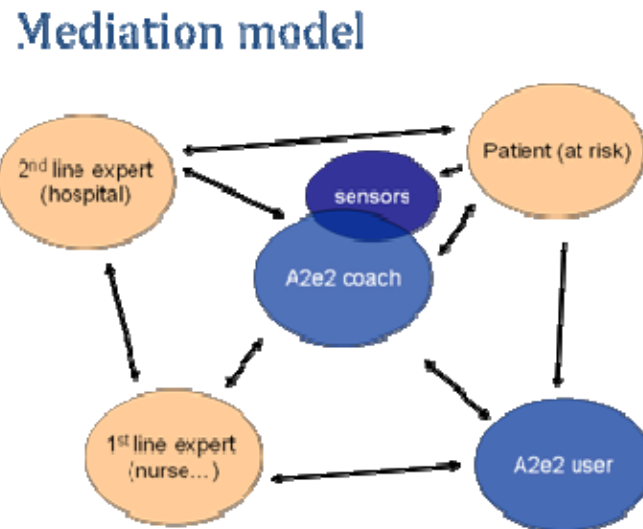


Figure 4.

2. Prototypical user

General facets of the type of user we are designing for have been discussed and decided early on. These facets limit and focus the design process.

- 65+
- full retirement,
- living independently in private homes
- both sexes and ethnic/cultural variety
- EXCLUDE; immobile persons, people with obvious low intelligence, people with dementia, people with mental illnesses, people using any other kind of exercise intervention at the same time.

To give more substance to our imaginary user and to make sure we are all thinking of the same end-user we propose a prototypical female and male user representing the target group. We acknowledge cultural differences that may be taken into account at a later phase of the project.

John D.

- 75 year old male in reasonable good health, is religious Christian but does not go to church
- used to be a sales clerk at a magazine store, now full retirement
- recently two of his closest friends died,
- living alone in his own apartment; 1 bedroom and 1 living room
- average intelligence, no mental disorders but a little forgetful,

- loves his fried chicken and a beer, used to play soccer, keeps track of his favourite soccer team
- has slight overweight, has high blood pressure, his parents were both diagnosed with cardio-vascular diseases, he is at great risk to become a heart patient himself.
- At the recommendation of his doctor he now has the support of a professional caretaker, who advised the use of a2e2 and programmed it for him.

Anna

- 65 year old female, a positive and spiritual person but not part of any religion
- living alone, has a one-floor apartment with a separate living room/bedroom/kitchen, had a chair built into her shower,
- her husband died 5 years ago, she has 2 children that live 500 km away, her oldest daughter bought a2e2 for her.
- She has recently been diagnosed with diabetes type II, doctor recommended a change of lifestyle, she wears glasses
- she used to be an elementary school teacher,
- with her partner she used to take long walks and boat cruises along the Rhein, used to sing in a choir but stopped when her husband got ill and hasn't returned since, in the past years she has gotten more and more inactive
- loves food/cooking/chocolate, likes to read romantic novels.

3. General requirements

Based on empirical research, extensive conferring and engaging with a focus group, a user requirement list could be assembled describing various attributes of the Virtual Reality Coach.

SET UP OF VR

- Digital representations of the coach
- Full body display, but face must contain possibility for mimic expression (emotional adequacy and responsiveness)
- Lip synch: coach should have some form of lip synchronization, but not overly precise. However, it should be right in timing.
- Style: (less polygons, more elements of humor possible)
- Personalization of coach: sex, age (3 steps), ethnicity (skin color, dress style)
- **Environment**: basically empty room that user personalizes with picture or video uploads on the walls, user can exercise in this room, coach appears there
- "Panic button": there should always be an easy possibility to return to a2e2's default state with the push of 1 button or so. This is to reduce the fear of technology and to motivate the user to experiment with the system.

MOTIVATORS

- Coach must be as responsive as possible to users' history, situation, and behavior
- Coach picks up user's mood change (through routing of questions and answers)

- Users' well-being meter is on the side
- Coach uses oral language in addition to written text since many elderly have hearing problems, user may respond, but has limited opportunity for Q&A (e.g., coach: I have the impression that you are getting tired. Is this so or were you only distracted?) in combination with simple selection of possible answers (yes, no)
- Text piping (simple-to-program responses to user's answers: this doesn't have to be complex AI to give a sense of interactivity)
- Play back option incl. photo shoots for interactions and exercises for fun but also for before-after displays; keep in mind that future in the elderly may refer to only a few days or weeks, clearly no long periods of time
- Piggy bank for completed exercise/activity (currency: activity, not time): counting all elements that are monitored (possibly also bed making, shopping, dish washing etc). Compare to scores or experience points in games.
- Music (see also optional add-ons)

USABILITY

- Quick startup and small loading times
- "Flexible push technology" (alarm clock function, but easy to turn off)
- Very simple controls for the novice, but advanced controls for advanced users
- During exercise, there needs to be a **large screen** (such as a tv screen) to enable the user to follow instructions with his/her hands free

4. Digital coaches

We decided that the system would present itself as a friend or coach, an anthropomorphic and social entity that is likeable, communicative, and therefore appreciated. Based on a literature (see: Deliverable 3.3 Update II) and focus groups three virtual coaches are identified as the requirement: An expert, a motivator and a mentor. The three coaches guide the subject to change intentions when needed with specific instructions and feedback. They also help the subject to commit to these plans and provide support when they fail. Through use of an authoring tool instructions, tasks with verbal and facial expressions can be defined from a generic task description (see: part III of this document). This is done by advanced users or care givers/ researcher. We suggest to use the elderly healthy living intervention by Kelly and Abraham (2004: see deliverable 3.3 Update II) as prototype content for changing intentions to increase activity by the separate virtual coaches. Also we recommend to include to this content coach instructions and feedback derived from Multiple Self Theory (see: deliverable 3.3 update II) The use of virtual agents will have an overall enhancement of implicit motivation as result in bringing in a game and entertainment element.

5. Sensors

Sensors play a critical role within the physical activity pyramid. They guide the exercises, and give motivational instructions and feed-back. Our leading question hereby is: How can the sensor feed-back help for motivation? Note, that we are not building a health monitoring, but guide life style changes. However, it is also important to tailor the system's/coach's suggestions specifically to the (1) medical condition, (2) the user's history and profile, and (3) the current situation. In addition, it is crucial to frame the sensor information in such a way that it increases and sustains motivation (psychologically modified feed-back of sensor information).

Psychologically modified feed-back of sensor information:

- User perspective: How do we build a sensor system that can easily be integrated in daily life, is unobtrusive and fun to use?
- Sensors are necessary to control factual activity, changes over time, success (e.g., goal fulfilment)
- It is crucial that environment measures are used to prompt and activate behaviour within the push approach
- Speech recognition can only be reliably applied if used w/ closed questions or for shut off button.
- Sensor information is not always specific enough for valuable user feed-back. Therefore we need an additional loop in asking user question what specific data do indicate in a situation (e.g., did you slow down because you are tired or because you are distracted?). This interpretation of sensor data is used in the algorithm for an appropriate response of the system

The following sensor types will be employed, Bluetooth and ideally, Continua standards compatible (should be rank ordered according to importance):

- a. Pulse-oximeter, finger based (incl. heart rate, respiration), contin. measure
- b. Activity monitor: Over the course of 24 hours how much activity (measure unit could be caloric value) and possibly what kind of activities? (several brands for quantifying activity are available)
- c. Weight, once a day
- d. Ambient sensors, situation specific sensors: Weather outside, temperature inside and outside, contin. Measure (alternatively, Internet data, not sensors)
- e. Motion/proximity detector (for identification of non-activity and proximity to system so the coach can initiate communication), event measure

Sensor types may be categorized according to the following 2x3 schema with the dimensions (1) type of physical activity/exercise and (2) sensor type:

Purpose/Type	<i>Bio feed-back</i>	<i>Activity</i>	<i>Ambient</i>
<i>Daily life activities</i>	Weight Blood pressure	Yes	Motion detector Proximity to system Temperature inside/outside Weather
<i>Training situation</i>	Heart rate Respiration	Yes	Posture, quality of some activities/movement

Table 1.

6. Delivery environment

The following decisions were already made:

- stand alone system
- multi touch screen (market expansion expected)
- size: ideally 24-27" to balance between comfortable display size and costs (challenge: required space for montage)
- stationary set up, fixed location (challenge: limited space for screens in the elderly's rooms, aesthetic problem to set up another screen next to TV)
- all in one
- optional: wall mounted or with stand to sit on a table
- Wireless connection
- Including webcam, speakers, and mike
- suggestion: while non being used, system could function as an e-picture frame
- challenge: self or professional installation required? (for pilot: professional)
- future perspective: integration w/ TV and Internet services
- technology to insert video window w/in VR (no browser); web feed possible (e.g., could be applied for existing training modules)

7. Prototype day structure

A2e2 differs from basically all other exercise applications in merging into the users' daily life. In order to meet the challenge of reaching out to the not yet motivated user to partake in any kind of activity, the system has to be proactive. In other words, we are not expecting that the user makes a conscious decision to use a2e2. A2e2 offers itself as an opportunity that the user can hardly resist. We decided to match the daily routines and, with knowledge of these routines and state measurements, identify the best possible activity, time, and location.

A template for a prototypical day structure is developed that is organized by one of the favorite activities in elderly individuals: meals and drinks. We assume that within all cultures and ethnicities, ages, and SES background meals and drinks play an important role and is highly habituated. Meals are associated with well-being and emphasizes life salience. The resulting day structure is broken down in the table below into smaller tasks. Through prompts and feedback from the coach, a2e2 helps the elderly along and supports the day structure it uses to incorporate physical activity. It is also important that the system does not exclusively 'belong' to physical exercise from the user's perspective. By being incorporated into the entire day the coach can gain a greater footing for a para-social relationship. A variety of activities and tasks can be created by using the A2E2 authoring tool.

The day unfolds between waking up and going to sleep and is separated into phases: before breakfast, before lunch, before afternoon tea/coffee, before dinner, and before bedtime. We insert 3 opportunities for enriched physical activity (before lunch, before afternoon tea/coffee and before dinner). They are introduced by motivational instructions from the virtual coaches based on social science theory. The physical activities can consist of enriched daily routines or even exemplify an exercise regiment (see the following section). Selection of the proper activity depends on the user state analysis that takes previous and current conditions into account (which makes a2e2 an adaptive system).

AWAKE

A01 System generate a wake up prompt (PUSH)
A02-Systems sensors user activity in bed –PUSH-
A03-if no activity is measures w/ sensors then system generates a snooze period kicks in (delay)-PUSH-
A04-Systems activates Real world triggers –PUSH-
A05-System generates prompting signal stimulating bath room activity and personal hygiene –PUSH-
A06-Systems generates a questionnaire to check the emotional state –PUSH-
A07 User fills in the questionnaire –PULL-
A08 If user does not start this task then: System generates system feedback for an unstarted task –PUSH-
A09-If this task is not finished by the user within the task time interval set than Systems generates feedback for unfinished tasks until the task is finished –PUSH-
A10 If task is finished system generates finished task feedback –PUSH-
A11 System generates visual inspiration –PUSH-
A12 System generates a welcoming of the day and inspirational thought of the day –PUSH-
A13 System generates easy exercises/stretching/meditation –PUSH-
A14 User selects from easy exercises/stretching/meditation. –PULL-
A15 If there is no selection-Systems generates feedback for unstarted tasks -PUSH-
A16 If task is not finished with the task time interval then System generates ‘unfinished task feedback’ –PUSH-
A17 If task is finished system generates finished task feedback –PUSH-
A18 System generates prompting to stimulate preparations for breakfast –PUSH-
A19 User selects type of breakfast task –PULL-
A20 If user does not select a task System generates unstarted task feedback –PUSH-
A21 If task is not finished within the task time interval then System generates an unfinished task feedback-PUSH-
A22 If task is finished system generates finished task feedback –PUSH-

BREAKFAST
B01 System generates a breakfast prompt –PUSH-
B02 System generates Reinforcements for enjoyment of breakfast –PUSH-
B03 System generates news global and local/weather through RSS and music through internet radio –PUSH-
B03 Systems generates PHYSICAL ACTIVITY MODULE 1 housecleaning, taking a walk, exercises –PUSH-
B04 User responds by accepting the task –PULL-
B05 If user does not respond Then system generates an unstarted task feedback –PUSH-
B06 If task is not finished within the task interval time Then system generates an unfinished task feedback –PUSH-
B07 If task is finished system generates finished task feedback –PUSH-
coffee/tea/fruit break
B08 System generates a coffee/tea/fruit/break prompt –PUSH-
B09 System generates PHYSICAL ACTIVITY MODULE 2 housecleaning, taking a walk, exercises/LUNCH PREPARATIONS –PUSH-
B10 User responds by selecting Lunch preparation or a physical activity -PULL-
B11 If user does not respond Then system generates an unstarted task feedback –PUSH-
B12 If task is not finished within the task interval time Then system generates an unfinished task feedback –PUSH-
B13 If task is finished system generates finished task feedback –PULL-

LUNCH
C01 System generates a lunch prompt –PUSH-
C02 System generates prompting to stimulate preparations for LUNCH –PUSH-
C03 User selects type of LUNCH task –PULL-
C04 If user does not select a task System generates unstarted task feedback –PUSH-
C05 If task is not finished within the task time interval then System generates an unfinished task feedback –PUSH
C06 If task is finished system generates finished task feedback –PUSH-
C07 System generates a signal prompting for a Clean up meal –PUSH-
C08 User responds by accepting the task -PULL-
C09 If user does not respond Then system generates an unstarted task feedback –PUSH-
C10 If task is not finished within the task interval time Then system generates an unfinished task feedback –PUSH-
C11 If task is finished system generates finished task feedback –PUSH-
C12 System generates a resting prompt –PUSH-
RESTING
C13 System generates a Motivational thought –PUSH-
C14 System generates PHYSICAL ACTIVITY MODUL 3 housecleaning, taking a walk, exercises -PUSH-
C15 User responds by accepting the task -PULL-
C16 If user does not respond Then system generates an unstarted task feedback-PUSH-
C17 If task is not finished within the task interval time Then system generates an unfinished task feedback –PUSH-
C18 If task is finished system generates finished task feedback –PUSH-

AFTERNOON TEA/COFFEE
D01 System Generates a tea/coffee prompt –PUSH-
D02 System generates afternoon tea tasks –PUSH-
D03 User responds by accepting the task -PULL-
D04 If user does not respond: Then system generates an unstarted task feedback – PUSH-
D05 If task is not finished within the task interval time Then system generates an unfinished task feedback -PUSH-
D06 If task is finished system generates finished task feedback –PULL-
D07 System generates (physical) activity prompt –PUSH-
D08 System generates physical activity tasks –PUSH-
D09 User responds by accepting the task -PULL-
D10 If user does not respond: Then system generates an unstarted task feedback – PUSH-
D11 If task is no finished within the task interval time Then system generates an unfinished task feedback –PUSH-
D12 If task is finished system generates finished task feedback –PUSH-

DINNER
E01 System generates a dinner prompt –PUSH-
E02 System generates a dinner tasks –PUSH-
E03 User responds by accepting the task -PULL-
E04 If user does not respond: Then system generates an unstarted task feedback – PUSH-
E05 If task is not finished within the task interval time Then system generates an unfinished task feedback-PUSH-
E06 If task is finished system generates finished task feedback –PUSH-
E07 System generates a signal prompting for a Clean up meal –PUSH-
E08 If user does not respond Then system generates an unstarted task feedback – PUSH-
E09 If task is not finished within the task interval time Then system generates an unfinished task feedback –PUSH-
E10 If task is finished system generates finished task feedback –PUSH-
Evening
E11 Systems prompts for filling in the evaluation of the day questionnaire –PUSH-
E12 Systems generates a questionnaire evaluation of the day state –PUSH-
E13 If user does not start this task then System generates system feedback for an unstarted task –PUSH-
E14 If this task is not finished by the user within the task time interval set than system generates an unfinished task feedback-PUSH
E15 User fills in the questionnaire –PUSH-
E16 Systems generates feedback for finished tasks when task is finished –PULL-
Evening entertainment
E17 System generates prompting signal stimulating bath room activity and personal hygiene -PUSH-
E18 System generates a goodnight message > spiritual thought from coach -PUSH-
E19 System generates going to sleep prompt –PUSH-
E20 System generates sleeping tasks –PUSH-
E21 User responds by accepting the task -PULL
E22 If user does not respond: Then system generates an unstarted task feedback – PUSH-
E23 If task is not finished within the task interval time Then system generates an unfinished task feedback –PUSH-
E24 If task is finished system generates finished task feedback –PULL-
GOING TO SLEEP

8. Physical activity

The available research on behavior change in the realm of increased physical activity not only indicates that moving your body is essential to physical but also mental health and consequently, to well-being. Research also identifies which steps need to be taken in order to be successful. Experts agree that the kind of activities recommended should include endurance (e.g., aerobics), strength, and balance exercises. Frequency and strain of the exercise regimen depend heavily on the capability of the user.

We suggest a leveled approach for a2e2 consisting of five levels building on each other. The pyramid represents the amount of required motivational strategies. At the lowest level 'Breaking sedentary lifestyle' a big part, or even all of, the motivation needs to come from the system. As the user becomes more and more motivated to be physically active the intensity of the activity can be heightened while the amount of motivational strategies can be lessened and adapted accordingly.

Activity list level 1-3 (lead: VUA/AMS, review: HOS, VTT)

Based upon the physical activity pyramid we compiled a list of potential activities popular with seniors that could be build into the system. The following overview distinguishes between the five aforementioned levels within the pyramidal structure of physical activity. This list is by no means exhaustive but gives examples of activities for the various levels; enough to build a prototype with.

Activity	Level
Vacuum a room	Breaking sedentary lifestyle
Get daily groceries	Breaking sedentary lifestyle
Make a pot of tea/coffee/lemonade for yourself	Breaking sedentary lifestyle
Cooking	Breaking sedentary lifestyle
Go buy a newspaper/magazine	Breaking sedentary lifestyle
Go buy a book	Breaking sedentary lifestyle
Go to the library	Breaking sedentary lifestyle
Go feed birds	Breaking sedentary lifestyle
Do the dishes	Breaking sedentary lifestyle
Do the laundry	Breaking sedentary lifestyle
Walk around the room	Breaking sedentary lifestyle
Walking the dog	Breaking sedentary lifestyle
Take a foot bath	Breaking sedentary lifestyle
Sway along songs	Enriched daily activities
Toe-heel exercise while doing dishes	Enriched daily activities
Stretching exercise while doing laundry	Enriched daily activities
Pirouettes while cleaning up a meal	Enriched daily activities
Stretching exercises	Enriched daily activities
Take a walk alone <30 minutes	New activity patterns
Play apple-picking game with sensor balls	New activity patterns
Go cycling <30 minutes	New activity patterns
Go bowling	New activity patterns
Wash the windows	New activity patterns
Dust a cupboard	New activity patterns
Dust a room	New activity patterns
Go to day care centre for the elderly	New activity patterns
Play a virtual 'sjoel' game	New activity patterns

Activity list level 4 (lead: VTT, review: VUA/AMS, HOS)

Level 4 activity represents the kind of training module that underlies basically every digital exercise/exergame approach currently available. As there are many successful tools available over the counter it may be reasonable to just use them within a2e2. PWL suggests a window in the a2e2 set up through which any video material can be accessed. Note that the digital coach can guide towards the window but won't be active inside.

As potential applications we discussed so far:

- <http://www.engadget.com/2010/03/10/ea-sports-introduces-active-2-0-at-gdc-complete-with-sensors-ga/> (only available after Oct 2010)
- <http://kotisivukone.fi/files/a2e2.kotisivukone.com/tiedostot/jumppafinal.mp4> (application produced by VTT)

Here are some activities collected by VUA/AMS that may or may not be introduced in addition to the implementation of off the shelf applications. This list is random and not exclusive.

Take a walk alone >30 minutes	Intentional easy exercises
Go cycling >30 minutes	Intentional easy exercises
Participate in an exercise TV-show (NL in beweging)	Intentional easy exercises
Take virtual dance lessons, ballroom	Intentional easy exercises
Take virtual dance lessons, latin	Intentional easy exercises
Conduct a classical music piece	Intentional easy exercises
Practice fall-prevention	Intentional easy exercises
Core stability exercises	Intentional easy exercises

Activity level 5: exercise training module (lead: VTT, review: VUA/AMS, HOS)

Regimen on endurance

- 6 minute warm up
- 4 minutes vigorous training (at least 2 min are required to elicit higher stroke volume):
- So vigorous that one cannot talk, heavy breathing, but no discomfort
- 85-95% of max oxygen uptake
- It's all about muscles: move as many muscles at the same time as possible

- Do not push TOO hard: no discomfort / pain / leg stiffness
- One should be able, if needed, to carry on for at least another minute
- 3 minutes “break” – moderate training:
- Still exercising, but one should be able to talk
- ~70% max oxygen uptake
- Repeat 3 more times steps 2 and 3 (possibly omitting the final step 3, cool down is only really necessary with high level sports)
- After training, one should have the feeling that one could handle another 4 minute interval of vigorous training
- 3 times per week
- do not increase training time, only vigorousness
- what is vigorous depends on individual, but it’s quite easy to figure that out for each person
- endurance training is all about pushing the heart: this way, heart increases in size and arteries in width, which makes blood pressure drop, etc.
- best way to push the heart is to employ as much muscle tissue as possible
- strength training is not so much about actually increasing size or objective strength of a muscle, but more about increasing the “signal strength” from the brain to the muscle. It’s about increasing the capacity to use the available muscle mass by training the nervous system (signal to muscles). What you achieve is higher command frequency, more than coordination and morphology.
- A coach is necessary especially in the beginning of the training.

Regimen on strength

- 4 series of 4 repetitions (e.g., leg press, weight lifting)
- 1 repetition should be at least 70% of repetition max.
- Repetition max is the max weight one can handle in 1 repetition
- So heavy one cannot carry out more repetitions
- 1 – 5 times per week
- When exercise becomes light, do not increase amount of reps or series, but increase weight
- Strength training may also include balance

- Only risks: overtraining, not vigorous enough training
- Indicators – oxygen intake (VO_2) , stroke volume, heart rate
- For a2e2: which sensors would be required? Short term: heart rate (stroke volume difficult to measure); long term impact: blood pressure

9. Use scenarios

The following use scenarios were developed by the VUA team in order to give a better understanding of how the system might be implemented in the daily life of the elderly and interact with the user several use cases have been created. These are random examples and do not elaborate the range of possible interactions. Again, the activity tasks can be created using a generic task as offered by the authoring tool.

Scenario ID	Weather forecasting and social network association
Illustration of the flow of events from users' perspective:	<p>Cécile is a 67 year old woman, who lives by herself. She has accepted a2e2 in her home as a solution to promote a healthier lifestyle, because it is subsidized by her health insurance. However, she is sceptical of its merit, as she has no interest in computers or gaming whatsoever.</p> <p>When Cécile comes near the machine, it turns on. Cécile sees the annoying little figure appear on the screen. It's smiling. It says (the sound is turned off, but Cécile can see text appear on the screen): "Good morning! Have you seen the weather outside?". "Yes", Cécile thinks, "it's crap, so what?" The machine continues: "Not that great, is it? But according to my information, it will be nice and sunny for a long time in about an hour's time! Maybe that would be a good time to take a walk. You like taking walks, don't you? Maybe you could even call Tine to see if she wants to come along"</p> <p>"How does it know that I like taking walks with Tine?", Cécile thinks, forgetting that she had told the machine herself a week ago by answering some of its annoying questions. "But actually I would like taking a walk in the park if the weather would indeed clear up in a moment".</p> <p>Cécile decides to call Tine to take a walk together when the weather clears up.</p>
Technologies available/ need for development	<ul style="list-style-type: none"> - Downloading current and predicted local weather conditions. - Proximity meter
Scenario ID	Explicating conflict, uncertainty, and relapses
Rationale	<p>Life style changes don't follow a linear track. They rather display substantial ups and downs with an averaged improvement as goal. This fluctuation is caused not only by external circumstances that are unforeseen or impossible to change (e.g., acute illness) but also by substantial changes in performance, visible success and - partly as a consequence of that - in motivation. If these changes are not accounted for and the client is only confronted with a repetition in goal, the client will question her/his self-efficacy and eventually drop out. It is of utmost importance to immediately respond to lacking performance, improvement or a decrease in a psychologically encouraging way. This means above all, acknowledge the situation as is without blame. Express understanding for this completely natural behaviour and offer slow steps out.</p>
Illustration of the flow of events from users' perspective:	<p>Karen has been using a2e2 for some weeks by now and was thrilled that she was able to navigate the system by herself. She chose a sweet figure as her coach, naming her Qi to indicate that she would help her develop her own Qi. In the first weeks she was beginning to feel better, more energetic. Qi helped her to establish a light exercise routine and put an extra effort into daily</p>

	<p>activities such as dancing in between cleaning the house. However, she was expecting that this substantial change in her lifestyle would automatically result in weight loss. Instead, Karen has to admit that she gained 3 pounds within 6 weeks. This a2e2 is a fraud, she thinks. What good is it if I cannot lose weight which I urgently need to?</p> <p>With these doubts Karen is not motivated to continue with her schedule.</p> <p>After a day Qi approaches her “Karen, are you there? I have not seen you for a whole day!” Karen shouts “shut up!”, she is angry. Qi: “Karen, are you angry?” Karen: “shut up!” Qi: “Ok, I get it. You are angry. I am sure you have a reason. Maybe you want to share it with me. I have seen many other women in this situation and based upon these experiences I may be in the position to offer a recommendation.” Karen does not reply. Qi: Thank you for listening to me. I suggest we go through some questions so I do understand better what frustrates you.” === Funnel questions === Then, Qi summarizes: “Ok Karen, I think I do understand your frustration. You are upset because you have been following my instructions, but you did not see any success. Yes, that can indeed be disappointing. You expect that your weight decreases, but instead you gain weight. You feel tricked. Clearly not helped. Well, the fact is that weight loss is very complicated and erratic, especially in the beginning. === offers explanation === Let’s know see what would be the best for today. === elaborate short term goal and get agreement ===</p>
<p>Technologies available/ need for development</p>	<p>Sensors report back on improvement/relapse/missing goals etc In addition, self reports add substantial information System responds with text piping and questions</p>
<p>Scenario ID</p>	<p>The a2e2 ball, gaming possibilities, and the stop button</p>
<p>Illustration of the flow of events from users’ perspective:</p>	<p>Cor is a 69 year old man, who lives by himself. He is a diabetic, overweight, and is in bad physical shape. He has a2e2 in his home, because his son had convinced him to get it. However, he is sceptical of its merit, as he has no interest in gaming whatsoever, his general image of gaming being based on his son who used to play on the (old) Nintendo with complicated controls, shooting enemies from outer space on the screen. Cor does have an interest in puzzle solving.</p> <p>When installing a2e2, the a2e2 coach had asked Cor several questions. More questions followed: sometimes when Cor decided to have a look at the machine himself, sometimes when it turned on by itself. One time, when Cor was in the room, a2e2 turned on to say: “Hello! Previously you had mentioned that you had no interest in computer games, but you did have an interest in solving puzzles. Maybe I can offer you a computer game that is still interesting for you, as it involves puzzle solving!”. This is how Cor discovered one of his favourite features of a2e2: playing “Block Builder” with the a2e2 ball. The game is a kind of Tetris</p>

	<p>clone. To control the game, you have to use the ball controller. To move the figure on the screen to the desired position, you have to move the ball in the air. To tilt the figure on the screen, you squeeze the ball. To drop the figure, you must make a strong dropping movement with the ball. The more Cor advanced in the game, the faster it went. Cor was so immersed in the game, that he did not even notice that he was sweating because of it. This time, as Cor walks by a2e2, a2e2 turns on and the coach pops into the screen. It asks "Good morning! Hey, do you remember how much fun you had playing Block Builder yesterday? Do you fancy playing another round? Maybe you will beat yesterday's score!". Cor does remember how much fun it was, but also remembers he has an appointment to see his son soon. He doesn't even let a2e2 finish its sentence and pushes the "Stop"-button that is always in the top right corner of the a2e2 touch screen. Immediately a2e2 stops talking and its screen turns black.</p>
Technologies available/ need for development	<ul style="list-style-type: none"> - Sensor ball - Proximity meter
Scenario ID	Invitation to exercise
Illustration of the flow of events from users' perspective:	<p>Margaret is a woman of 67, living alone with her dog. She got A2E2 because one of her friends was enthusiastic about it and the insurance covered most of the costs. Although getting on in years there is nothing physically wrong with her but she is at risk for diabetes.</p> <p>Today it is raining outside so she lets the dog out in the backyard instead of taking a walk and turns on the TV. In a little while the coach appears in the right lower corner of the screen holding an umbrella. She accesses the coach through the remote control. The coach suggests to do some inside exercises since it is raining, ending with a game of some sort. Margaret thinks 'Why not?' and accepts the request. She gets up of the couch and takes her place in front of the screen where A2E2 soon registers her.</p>
Technologies available/ need for development	<p>possible integration into multimedia station</p> <ul style="list-style-type: none"> -several interface possibilities; body movement, remote controller - multiple user possibilities <p>Weather monitor</p>
Scenario ID	A good start
Rationale	<p>There are several digital devices in our lives, a2e2 does not want to add to the heap of machinery but wants to make life simpler by organising several functions into one machine with a simple interface. By taking over functions previously done by other machines it also firmly places itself in the daily life of the user.</p>

	Rationale
Illustration of the flow of events from users' perspective:	<p>Ronald (69) and his wife Mary (63) bought A2E2 because they are concerned about their health and quality of living; they read how it helps prevent and manage diseases and is generally helpful. Ronald finds he is getting more forgetful. Mary has diabetes and tends to forget her insulin shots sometimes, A2E2 reminds her and since they bought it, her diabetes is managed better and slowly improving.</p> <p>In the morning A2E2 wakes them up with a song they both like, when the song ends an inspirational thought of the day is given and the coach goes through a series of stretching exercises that they both do in, on and out of bed. Then the coach goes through the events of the day such as (doctor) appointments or birthdays. Usually it also gives walking tips 'Today between two and four the weather will be very nice for a walk'. Every day at nine it has a riddle for Ronald, which is an ongoing game; the faster Ronald gets it, the more points he obtains.</p>
Technologies available/ need for development	<ul style="list-style-type: none"> – Alarm clock function Medication reminder Agenda function media player weather tracking
Scenario ID	The life of Susan
Rationale	<p>Five layers that are identified in which the environment can be intelligent (Emile Aarts and Stefano Marzano). Each successive layer builds on the previous one.</p> <p>1 Embedding The equipment is incorporated in the person's environment in such way that he is scarcely notices it. (physical embedding) and he can communicate with it in a 'natural' manner (social embedding)</p> <p>2. Context-awareness The technology links characteristics of the person to characteristics of the environment. (a warning, reminder)</p> <p>3. Personalization On the basis of a personal profile, the equipment can be adjusted to the needs of the user.</p> <p>4. Adaptation The technology automatically responds to changing conditions. (automatic medication, advice)</p> <p>5. Anticipation The technology responds to environment factors to prevent problems arising. Warning or adviecs</p>

<p>Illustration of the flow of events from users' perspective:</p>	<p>Background information</p> <p>Susan is a woman of 74 years. Her husband died two years ago and she removed to a smaller house for just herself. Susan is living now in the neighborhood of a Medical help Center, which guarantees her “medical safety” , <i>just in case</i>. Once every two weeks she gets some help from the centre in housekeeping. Twice a year there is a visit from the centre . In this visit she discusses her wellbeing and here physical condition. There has been no contact between the visitor and the family doctor. She suffers from loneliness now and then and has some light depressive symptoms, also lately her weight has increased. Susan had the advice to buy A2E2- to keep her going. Susan needed this little push. She already wanted to buy one, cause of the results she heard about in her social network.</p> <p>Installation of A2E2</p> <p>The unpacking of the A2E2 was very easy, The A2E2 box was not too heavy and easy to carry. Susan thought, ‘so I can bring the A2E2 with me to show the A2E2 to my friends from “The dining Club “. The installation was easy, she did not need to ask somebody else to help to mount it on the wall like her flat screen TV last year. It’s more like a electronic photo frame you can put it on a table or book-case. It’s “plug and play” the electricity wire was long enough from the transformer to the A2E2 and like a modern lap top it has a good battery so you can even use it sitting on the bed or chair and use the touchscreen (embedding). There are two sensor balls that come with it, one red and one yellow. They fit in a special plastic box, a docking station. On the box there is a light that indicates when you should plug it in to load the inner battery of the ball.</p> <p>User directions</p> <p>If you suffer from a heart disease you should have a proper medical examine by a doctor. Doctors and nurses are familiar with A2E2. If you have overweight you can inform A2E2 about your weight and it will keep track of you Body Mass Index. If your weight is alright you can skip this feature; . losing weight is no goal at all for most elderly. If you suffer from diabetes you can input the average sugar level on a daily or weekly basis, and you can let A2E2 contact the database at the medical centre, so that you don’t have to actively give out this information all the time. (Some anticipation elements). The explanations on screen were immediately clear to Susan(in different languages) The first thing she had to do is to give A2E2 a name. Susan chose <i>Maggy</i>, her mother’s name. Maggy asked some questions about her medical condition, to be sure that the coach does not give any wrong advises. Susan already knew that A2E2 is meant as support for people</p>
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who are in good shape. Next Maggy is asking about her mood and feelings. Seven questions are asked that you can give a score with smiley's from one to five. This mood information you have to fill in every two weeks. Maggy will ask you to do so, so you won't forget.

The moodmeter questions:

- Do you have any headaches
- How good did you sleep
- Did you do what Maggy asked you to do
- Do you feel alright today (How good)
- Do you like the Felix games
- Do you like Felix's looks today
- Do you want Maggy to help you today

Working with Maggy

When you start Maggy up and the first thing are the rules and the code. Next you choose the type of coach gentle or nasty. Susan chooses the nasty coach. Maggy will always give her advises, just on the moments that Susan is not in the mood for it. Maggy assures you however that following her, will bring your moodmeter up to five smiley's every day. The moodmeter is a very interesting thing because the results of Susan's motions are shown by the coach. That's another issue which is new for Susan. 'What is this she thinks. Well the moodmeter is corresponding with the sensor- balls, together the outcomes and performances are integrated in - and are shown by,- the virtual coach. Susan does not understands but she listens very carefully to what Maggy is asking: "Did you do the vacuum cleaning already today. ? If not, I want you to do it right away while I can give you some examples how to move healthier and better. Do it like this for example. Put one knee down on the floor, I'll show you how to do this" While Susan is taking the cleaner out of her cupboard she is thinking, Maggy I won't do the cleaning every day.

In this example Susan cannot stand on a housekeeping staircase. For people however which can use the steps. Maggy has some good advices about window cleaning inside /possible outside – not ladders, for gardening etcetera.

The next day (There is a motion sensor in Maggies frame) Maggy starts to talk about going out for a walk and do some shopping. Felix is already purring gently. He likes the idea. 'I cannot go out its raining' Susan thinks, but Maggy shows the umbrella already. Maggy knows the weather conditions outside. Susan is curious what kind of reaction Felix will give her when she returns. And why do have to take this red ball. What purpose has it ? Why do I have to take it along with me?

Working with the balls.

The next day Susan goes for shopping in the City. Of course she takes the red ball with her. She puts it in her handbag. The red ball is specially to use outside. It measures the time you spent outside and has a GPS. When Susan comes back she puts the red ball in the docking station next to the yellow one and Maggy shows her from Google maps the road she has taken. She even shows the different travel possibilities to travel by bus and metro in her city where she lives. (If you still can bike , of course in Holland you should take your bike!)

Now Maggy shows her the road which is preferable when she wants to go out shopping next time

(When you want to do shopping in the same shopping area.

Maggy shows her the road with the difficult staircase and little hill. After shopping with the heavy weight to carry Maggy gives advices about what kind of shopping bags you can take and the advices about the bus. Susan is very impressed, so you can move better and more efficient.

Special Exercising

Once or twice a week you can do the special exercises with the red and yellow ball. Standing for her television she does some exercises holding the balls.

After the work out it will be analysed by Maggy and Maggy sends her online 'registration of movement report' to the central A2E2 computer. The computer will select a special 'your level ' program which can be downloaded by the media player. (Or can be done streaming video so the adaptation can be done more rapidly). Maggy will appear next time and will comment Susan's last performed exercises. Felix will give the results by being well or not satisfied. The moodmeter is indicating (see the questions*) her general feelings.

If you are not willing to do the exercise program twice a week Maggy is seducing Susan. She shows the results by using Felix and the moodmeter. All kind of seducing methods are used (promises, that will come true)

Maggy gives compliments and advices: " Susan do the exercises not before sleeping in the evening but on a better time". "No problem if you want to do it after dinner, but wait one hour and don't eat too much ", and by the way don't shower instantly after your exercises. Take a half hour of rest while you drink you tea . Don't take these so called sports drinks they are poisoned with sugar and it will give you a overweight. Please don't buy any drinks in the supermarket at all, they are with too much sugar or a sugar replacement. Just let the tea get cold.

Easy and very cheap. And better for your life! And weight

The yellow and red ball registration register heart beat rhythm , the power/strengths/force of the movements, and the spatial elements. These three elements should give a good overview

for the computer analyses. There can be corrections in position of the body, the speed you do the exercises and the level . (If you want you can buy a optional camera and the registration can be done more properly) With the camera you can see (rewind) what you have done and Maggie says what you have done wrong.

The gaming element

The gaming element is not included in the more serious module exercising. The gaming element is more in the battle with Felix in your daily live. Felix appears at random with challenging games. Try to beat me on finger stretching and making a fist, (with or without the balls) or stretching the back like the cat can do . Felix is not like Maggy, Maggy is more serious, she is the coach, and even when she is joking it has to be taken seriously. Felix is not always serious no you don't have to do what he says. But it's crazy Felix will get his attention, and more crazy Susan likes Felix, he is this naughty character. Perhaps a bit like Susan herself.

Technologies available/ need for development	<p>1 Embedding Light weight, easy to carry and bring along Easy installation Two sensor Balls with rechargeable coin cell battery and a docking station, one of them meant for outside use and equipped with GPS.</p> <p>2. Context-awareness Monitoring sugar levels through biometric sensor, monitoring motion by the sensor balls Monitoring weight, mood and fun of experience/exercise by self report</p> <p>3. Personalization Personalization of the coach by naming the coach and choosing sex and character: <ol style="list-style-type: none"> 1. soft and gentle 2. Direct and nasty Practical advises based on daily activities</p> <p>4. Adaptation The expression of the coach changes according to the input from the sensor balls (excellence in performance) and the mood measurement Based on the GPS information the coach can calculate new routes with funny difficulties and give several options for the same destination According to the mood measurement the coach knows which exercise program to choose and at which level, different programs can be downloaded making for a limitless supply of programs Advises on body posture according to sensory software Camera records, giving the option of instant replay</p> <p>5. Anticipation Monitoring weather by internet connection</p> <p>Further requirements No medical referral needed The info appears at random, gaming and fun elements Daily creative activities, with more movements Travel advises, walking and biking Special modulated exercising Gaming by the coach The coach is a coach and no fun</p>
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Adaptive Ambient Empowerment of the Elderly

III. A2E2 Generic task description

Peter Roelofsma & Leo Versteeg

Background

It is often the case in A2E2 that the users will be required to read and follow instructions, answer questions, learn lessons and perform specific activity tasks. This can be accompanied with interactive multimedia and be guided by the virtual coach. End users have often indicated the need for a generic toolbox to create such specific virtual coach guided instructions, lessons, tasks and questions. This generic activity task should enable care giver, (advanced) elderly user or extended personnel to create tasks, instructions and questions themselves. Not only allows this for more flexibility in use of the system, it also avoids time consuming interaction with ICT personnel in the creation or changing of these important system elements. Indeed the creation of such a generic task as an authoring tool, is also one of the aims of A2E2. In this document we propose a generic activity task functional description for the user requirements of this component. This document is based on focus group interviews and discussions with end user groups which were performed in several fields studies with care givers and experts as well as elderly groups. The document is also based on the narrative mission analysis, the user requirement checklist and the daily activity task structure.

This documents enlists the functional specifications that are used for the generic activity task. The generic task is created by the users: care givers, (advanced) elderly users or extended personnel. A generic task contains instructions, questions, lessons, tasks, multimedia and feedback. The online activity questionnaire task can be guided by an virtual coach or self representation. The flow of activity in the creating of a online task is seen follows. First the activity task is defined. This is done using 'question definition' screen. Then, the questions are defined, with virtual coach instructions, routing and feedback and use of sensors. This is done using the definition screens. Next, the screen types are defined. This is done on a screen definition screen. Finally, the questions, and instruction etc. are placed on the screen.

On the following pages an enlistment is given of the functions that can be used on each of the definition screens (questionnaire definition screen/Question definition screen/Screen.definition screen). In the first column the screen names are mentioned. The second column lists the functions that can be selected on the corresponding screen. The last column gives a description of these functions.

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Screen name	Type of Functions on screen	Description of functions
Activity Task Definition Screen	Backwards allowed	Here it is defined whether or not a respondent can go back to previously completed screens.
	Colophon	Colophon text, to be entered via Text blocks. After that the colophon text can be linked to a questionnaire. If a colophon text has been selected this text is shown to the respondent in a small window when he clicks on the link 'colophon' in the menu in the left hand-side of the screen.
	Contact	Contact address of contact person for the questionnaire. Clicking on the link 'Contact' in the menu in the left hand-side of the screen will allow the respondent to contact the contact person.
	Delete	To avoid mistakes one can only delete a questionnaire (and all what is linked to it) after entering the password.
	Delete response	This allows to delete all given answers and all anonymous respondents linked to this questionnaire. For security reasons it is obliged to enter the password.
	Description	Description of the questionnaire.
	Footer	From the list of available footer texts one can make here the choice on questionnaire level. (Footer texts can be defined via 'Text blocks' in the navigation menu of the screen.) At screen level one can overrule the choice.
	Header	From the list of available header texts one can make here a choice on questionnaire level. (Header texts can be defined via 'Text blocks' in the navigation menu of the screen.) At screen level one can overrule the choice.
	Help	From the list of available help texts can be made for a choice on questionnaire level. (Help texts can be defined via 'Text blocks' in the navigation menu of the screen.) At screen level one can overrule this choice.
	Sensor Use	Here it can be defined whether sensors are used during the questionnaire intake ,which sensors are used and when they are used.

Coach Selection	Here it can be defined whether an Virtual Coach is used during the questionnaire intake and which Virtual Coach is used.
Language	Language of the questionnaire. In this language also messages for the respondents will be formulated.
Log on	Here it can be defined whether a respondent is obliged to log on. <ul style="list-style-type: none"> - No: respondent is not obliged to log on - Yes: respondent is obliged to log on using his account and password. In this case one has to enter (Via 'Respondents' in the navigation menu of the screen) the account address of the allowed respondents, and to send then an invitation message including their system generated password.
Mail results	If this field contains 'Yes' the final screen(s) will allow to enter an contact address for receiving the results presented on the results screen or final screen.
Maximum allotted time	The maximum allotted time for completing the questionnaire. If one has defined a screen of type 'Time-limit exceeding' this screen will be shown when a respondent exceeds this time-limit. Defining a maximum allotted time enables to show a time progress bar.
Name	Questionnaire name. The name serves several purposes: <ol style="list-style-type: none"> 1. Distinction between questionnaires. 2. Presentation of the questionnaire. 3. Subject of respondent management
Password	Password for the questionnaire. This password gives the designer access to the given answers. He can have a look on them or enter them himself.
Privacy statement	Privacy text, to be entered via Text blocks. After that the text can be linked to a questionnaire. If a privacy statement has been selected this text is shown to the respondent in a small window when he clicks on the link 'privacy statement' in the menu of the screen.
Publish analysis	This attribute allows one to indicate whether and for whom you want to make available a brief response analysis. The analysis concerns a cumulative overview of the given answers on questions, reaction times, and sensor info.

One can choose:

1. None
2. Only available for the respondents themselves
3. Available for selected set of subjects
4. Available for everybody

If one chooses option 2, the final screen will offer the respondent the opportunity to go to the analysis screen. This analysis deals only with the questions asked to this respondent.

If one chooses option 3 the analysis will be available for everybody.

This analysis concerns all the questions in the questionnaire.

If one chooses option 1 one can only see yourself the analysis via a preview of the questionnaire or the analysis screen only.

Random screens	The sequence of displaying the screens in a questionnaire may be fixed or random. Fixed sequence means the sequence as defined by the designer. In most designs the sequence will be randomised. Three options are offered: 'Random' (without putting back!), "Latin square" and "balanced latin square.
Security	Here you define whether completion takes place using SSL.
Show progress	Here one defines whether to show the respondent a progress bar. Progress is calculated on screen level.
Show time progress	This field defines whether a time progress bar is shown during completion. In order to do this a maximum allotted time must have been defined earlier.
Style	From the list of available styles one can make here choices on questionnaire level. (Styles can be defined via 'Styles' in the navigation menu of the screen.) One can overrule your choice at screen level.
Visible	One can define whether the questionnaire should be mentioned after activation in the list of public accessible questionnaires.
Calendar	Here it can be defined on what day and time (hours and minutes) the questionnaire task is to be presented to the subject

Question definition Screen	Design type	Here one defines how from a set questionnaires each questionnaire is presented to the respondent. Options are: fixed sequence, random (without putting back).
	Import Questionnaire	XML import of A2E2 questionnaires can be defined here
Explanation	Explanation, to be presented on a final screen if its screen definition indicates that an overview of questions and answers should be shown. For instance one can give and explain in the explanation the correct answer.	
Id	Short alphanumeric value, used for recognizing the question during the definition of the questionnaire.	
Mandatory	Here it is defined whether the respondent is obliged to fill in this question.	
Number	This is a text, which will be shown to the respondent in a narrow column just before the question text. For instance you can enter here 1, 2a, 2b, etc.	
Random sequence	Presents the answer options in a random sequence. This is only possible for the question types "checkbox list", "radio buttons" or "dropdown". The sequence differs per completion session.	
Sequence number	This number is used in putting the questions in the right sequence on a screen.	
Text	Text of the question to be presented to the respondent. Usage of HTML/Javascript/flex is allowed.	
Question type	<p>The question type must be selected from the following options:</p> <ul style="list-style-type: none"> • Radio buttons. The respondent sees all options from which he can select just one. • Checkboxes. The respondent sees all options from which he can select several. • Integer number. The respondent can respond with an integer number, of which the format is checked. • Real number. The respondent can respond with a real number, of which the format is checked. • Date. The respondent can respond with a date, of which the format is checked. • E-mail address. The respondent can enter an e- 	

- mail address, of which the format is checked.
- Scale. The respondent can choose just one from several options presented in a scale, with at the left hand side the first option text and at the right hand side the last option text. Options can be generated easily using the scale icon in the 'Option bar'.
- Text.
- Dropdown. From an option menu the respondent can select just one option. If you use the same option menu several times you can copy it using the 'magic wand' in the 'Option bar'.

Routing	Routing options can be defined: direct, delayed, dynamic (using combined answers or scores from other questions) Routing can be based on question input, output a score or a sensor value
Weight	From the question weight and the points associated to the given answer the question score is calculated following the formula: score = weight * points.
Virtual Coach	Here it can be defined the verbal text of what the Virtual Coach is saying as well as the intonation. Also can be defined what the Virtual Coach nonverbal expression is for beginning, the ending of the message and for the middle part of the question section. This can be defined for question introduction, - text, -explanation.
Screen Definition screen	List of screens on which the questions can be put. You can recalculate the right sequence of screens in this list by clicking the button 'Calculate progress'.
Footer	If one wants to show on this screen another footer than you have defined at questionnaire level, you can select that footer text here. (Footer texts can be defined via 'Text blocks' in the navigation menu of the screen.)
Header	If one want to show on this screen another header than has defined at questionnaire level, one can select that header text here. (Header texts can be defined via 'Text blocks' in the navigation menu of the screen.)
Help	If one wants to assign to this screen another help text than you have defined at questionnaire level, you can select that help text here. (Help texts can be defined via 'Text blocks' in the navigation menu of the screen.)

Id	Short alphanumeric string that serves screen recognition during definition of the questionnaire.
Question on screen	Select here a question to be put on the screen. Here one can choose from the questions which have not yet been put on a screen.
Random sequence	A number of the questions, which are linked to this screen, can be presented in a random sequence. The sequence differs per completion session.
Random questions	The sequence of displaying the questions may be fixed or random. Fixed sequence means the sequence as defined by the designer. Three options are offered: 'Random' (without putting back!), "Latin square" and "balanced latin square.
Show on final screen	Here it is defined what one wants to show on the final screen. Options are <ul style="list-style-type: none"> - Only questions with given answers? - Also scores
Style	If one wants to show on this screen in another style than you have defined at questionnaire level, you can select that style here. (Styles can be defined via 'Styles' in the navigation menu of the screen.)
Title	The title of the screen is shown to the respondent.
Type	Screen type. The possible options are: <ul style="list-style-type: none"> • Introduction screen: Here introduction information is presented for the questionnaire task. • Question screen: Screen presenting questions. • Final screen: Regular ending screen, that, depending on your definition, will or will not show the results. • Violation screen: screen to be shown to the respondent when the subjects violates requirements e.g. he exceeds the maximum allotted time. • Analysis screen: screen to be shown to the respondent after completing the questionnaire. This screen contains a simple, respondent-oriented analysis of the given answers. • Matrix screen: A matrix screen allows a more compact presentation of similar questions with the same answer options. A matrix screen consists of a number of rows and columns. The first row of a matrix screen shows the option texts. The other rows represent each a question. The first column

of a matrix screen contains the question texts, the other columns the options.

The number of option columns is determined by the number of options assigned to the first question. Their texts are used as column headers. For the rest there is no difference between matrix questions and 'normal' questions: the designer defines per single question its points and its Ids.

All questions on a matrix screen should have the same number of options. This is checked during the consistency check.

Virtual Coach

Here it can be defined the verbal text of what the Virtual Coach is saying as well as the intonation at the beginning and closing of the screen. Also can be defined what the Virtual Coach nonverbal expression is for beginning, the ending of the message and for the middle part of the screen section.

Dimension definition screen

A dimension consists of a logical grouping of questions. This allows the calculation of a score over all the questions contained in the group: the dimension score.

Formula type

Formula used for calculating the dimension score. For each question a weight can be defined, for each answer option a number of points. For a given answer the question score is calculated as weight multiplied by points. Next the dimension score can be calculated following one of the formulas bellow:

- SUM - the dimension score equals the sum of the question scores
- MIN - the dimension score equals the lowest question score
- MAX - the dimension score equals the highest question score
- AVG - the dimension score equals the average of the question scores
- Formula, methodical formula's can be defined here

Id

Unique Id used for identifying the dimension.

Conclusion

Based on a score over a number of questions a conclusion can be drawn

The score over x questions is calculated by the following formula:

$$w(1) * p(1) + \dots + w(x) * p(x)$$

In this formula w means question weight and p means points of the given answer. Routing options can be defined.

Dimension for Conclusion Screen	Contents	Text of the conclusion to be presented to the respondent. Usage of HTML/Javascript/flex is allowed.
	Virtual Coach	Here it can be defined what the verbal text of what the Virtual Coach is saying as well as the intonation for the conclusion. Also can be defined how the Virtual Coach nonverbal expression is for beginning, the ending of the message and for the middle part of the question section.
	Id	Unique value for identifying the conclusion.
	Maximal score	Maximal score for drawing this conclusion.
	Minimal score	Minimal score for drawing this conclusion.
	Score visible	Indicates whether the dimension score should be shown along with the conclusion. Routing options can be selected.
	Screen	Screen on which the conclusion will be presented. The conclusions will be presented immediately after the screen introduction. The presentation sequence is determined by the conclusion Id.
	Title	Conclusion title.
Structure Screen	Print questionnaire	<p>The structure overview gives an overview of all screens with their questions and answer options. Per screen you can see a preview and navigate to a next screen via ">" or to previous screens via "<". Per answer option with a deviant next screen definition you can also navigate to that next screen via ">". The overview can be presented with or without scores and conclusions. The overview can be printed via the print icon. It also provides the overview of when and where sensor and Virtual Coach functions are activated and deactivated.</p> <p>A questionnaire and its structure can be printed.</p>

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Upload files Screen

For the lay-out of your questionnaire files may be uploaded used in the questionnaire: text blocks, Question texts and settings, conclusions texts, and explanations, sounds, pictures, movies.

The file list shows their location and type.

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Style Definition screen

Here one can define the fonts, colours and images to be used.

Fonts and colours

Fonts and colours are defined in a *cascading style sheet*: the css file.

One can download and adapt this file and then (via Files) upload it and choose it as style.

Images

For several fields on this screen you have to make your choice from a number of images, belonging to the standard set of images or uploaded by the designer.

At some field a preferred format is indicated. One is to deviate from the indicated preference.

Images may be transparent. In that case one can define the background within the style sheet.

Analysis icon	Icon, chosen from a list with available images, that serves as link to the analysis screen. Preferred format (w x h): 100 x 14 pixels.
Background	Image, chosen from a list with available images, that serves as background.
Backward icon	Icon, chosen from a list with available images, that serves as link to the previous screen. Preferred format (w x h): 100 x 14 pixels.
Colophon icon	Icon, chosen from a list with available images, that serves as link to the colophon text.
Exit icon	Icon, chosen from a list with available images, that serves as link for leaving the questionnaire. Preferred format (w x h): 100 x 14 pixels.
Forward icon	Icon, chosen from a list with available images, that serves as link to the next screen. Preferred format (w x h): 100 x 14 pixels.

	Help icon	Icon, chosen from a list with available images, that serves as link to the help texts. Preferred format (w x h): 100 x 14 pixels.
	Home	Icon, chosen from a list with available images, that serves as link to the defined home page location. Preferred format (w x h): 75 x 75 pixels.
	Mandatory icon	Icon, chosen from a list with available images, which is shown along with a mandatory question. Preferred format: 10 x 10 pixels
	Style sheet	The style sheet for this style. The style sheet is chosen from a list with available style sheets. (upload style sheets can be put into the set of available style sheets via 'Files'.)
	Title icon	Image to be used as title in the left top of the screens. Preferred width: 106 px.
-		
Text block		Piece of text to be placed somewhere on the pages.
Definition Screen		
	Contents	Contents of the text block. Usage of HTML/javascript/flex is allowed here.
	Title	The text block title is used in the text block list.
	Type	Text block type. The possible options are: <ul style="list-style-type: none"> - Footer: screen footer text - Header: screen header text - Help text: help text - Colophon: colophon text - Privacy: privacy statement - E-mail: text to be included in a mailing. Take into account in which format you want to send the e-mails: HTML or text.
-		
Response analysis		Three kinds of statistics can be produced: <ul style="list-style-type: none"> - aggregated, for the whole questionnaire - per question - per respondent
Screen		For a comprehensive analysis a full export of data can be made.
	Created, but did	The number of created respondents that did not yet start. (Maybe because they have not yet been invited!).

not react	NOTE: If respondents have been invited for a anonymous questionnaire, they will be considered as anonymous respondents. As a consequence there will be no link between the invitation address and the completed data. Therefore it is impossible to check whether a respondent has reacted on an invitation.
Did exceed time-limit	The number of respondents that exceeded the maximal allotted time for completion.
Did finish	The number of respondents that completed the questionnaire up to the end.
Did start, but did not (yet) finish	This gives the number of respondents that did open the questionnaire but did not reach a final screen.
Duration	This is the time lapsed between starting time and final time. This can be longer than the real time spent on completion, because the respondent may have been logged off in the meantime.
End	Here is indicated whether a respondent has reached a final screen or has exceeded the time limit. Also when the respondent navigates back to previous screens the reaching of a final screen remains valid. An exception on this rule can only appear if the questionnaire has a tree-structure (no flat questionnaire). If the respondent, after reaching a final screen, navigates backwards in a tree structure and enters another branch, for consistency reasons his path through the branch, which he is leaving, becomes invalid. As a consequence also his reaching of the final screen becomes invalid.
Final time	This is the point in time on which the latest respondent's action took place.
Number of respondents	This is the number of respondents that did answer the question. This is not necessarily equal to the total number of obtained answers, as some questions allow more than one answer.
Starting time	This is the point in time on which the respondent accessed the questionnaire for the first time.
Statistics per question	This screen presents an overview of the given answers on the selected question. Per answer the number of respondents is given with the corresponding percentages. These percentages are rounded on whole numbers. As a result the sum may slightly differ from 100%. For

questions which allow several answers the percentage can be much higher than 100%.

Statistics per respondent

On this screen you can obtain an overview of the answers of a given respondent.

Optionally you can indicate whether also the scores (in points) and the number of respondents (as a percentage) who gave the same answer should be shown.

Total

The total number of respondents linked to the questionnaire.

Respondent Management screen

E-mail

Respondents e-mail address.

Invalid e-mail addresses may occur when respondents have been imported in a batch. In those cases a warning will be given in the list.

First name

The first name can be included in the e-mails.

Import

This allows importing a list of respondents.

This is useful when many respondents have to be invited.

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Documentation Screen

A collection of help texts, which can be viewed from different screens.

Via:

- Detail screens
- Introduction (for the designer) screen
- Menu item help texts

Text search covers title and contents.

Output Screen

Here output can be downloaded. A questionnaire can be download. Also can be selected what part of the data collection can be downloaded to SPSS, excel, or xml.

Output concerns subjects responses, scores linked to the question texts and labels.



Adaptive Ambient Empowerment of the Elderly

IV Overview Internal Reports

Name of the report	Partner involvement	Date	Remarks
WP3 use cases series 1	VTT	11/11/09	Several updates till March 2010. It concerns several internal documents on activity use cases
-WP3 use cases series 2	VUA/AMSTA	25/11/09	Several updates till March April 2010. It concerns several internal documents on activity use cases
-Activity Scriptings	VUA/AMSTA/HOS	14/01/10	Updates till summer 2010
-Elderly Focus Groups	VUA/AMSTA	21/10/09	
-Survey study Real Coaches	VUA/AMSTA	15/12/10	Works started in 09/09
-WP3 no1 Daily task structure	VUA/AMSTA	18/02/2010	5 updates till March 2010
-WP3 Generic Use Case	VUA/AMSTA/VTT	09/02/2010	3 updates in March 2010
-WP3 Daily activities	AMSTA	15/07/2010	
-WP3 Internal Report on	VUA	30/08/2010	Work started in 02/02/2010
-Separate coach functions			
-WP3 Info Use of Avatar functions	VUA	21/08/2010	Work started in 02/02/2010
-WP3 Comments on Prototype Demo Document (HOS)	VUA/AMSTA	08/10/10	2 updates in October