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PROJECT PERIODIC REPORT

Grant Agreement number: 287624

Project acronym: ACCOMPANY

Project title: Acceptable robotiCs COMPanions for AgeiNg Years

Funding Scheme: ICT-2011.5.4

Date of latest version of Annex I against which the assessment will be made:

Periodic report: 1st ☑ 2nd ☐ 3rd ☐ 4th ☐

Period covered: from: 1 Oct 2011 to: 30 Sep 2012

Name, title and organisation of the scientific representative of the project's coordinator[1]:

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

Declaration by the scientific representative of the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) [3]:

  ☐ has fully achieved its objectives and technical goals for the period;

  ☒ has achieved most of its objectives and technical goals for the period with relatively minor deviations.

  ☐ has failed to achieve critical objectives and/or is not at all on schedule.

- The public website, if applicable

  ☒ is up to date

  ☐ is not up to date

- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 3.2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: .Dr Farshid Amirabdollahian.............................

Date: ...30.../ ...11.../ ...2012...

For most of the projects, the signature of this declaration could be done directly via the IT reporting tool through an adapted IT mechanism and in that case, no signed paper form needs to be sent

[3] If either of these boxes below is ticked, the report should reflect these and any remedial actions taken.

3.1. **Publishable Summary.**

3.1.1. *Overall progress.*

The first year included activities related to formulating acceptance of the basic platform and its functionalities (WP1), requirements for interface design and context aware planner (WP2), memory model requirements and specifications (WP3), relevant literature and context analysis for activity monitoring (WP4), and specification of the required modification to Care-o-bot 3 platform (WP5). These provided the structure and extent by which the project progress beyond state of the art could be further planned and facilitated for the forthcoming years. To support achieving the project milestones, different work packages contributed by providing deliverables and prototypes as can be seen in Figure.1.

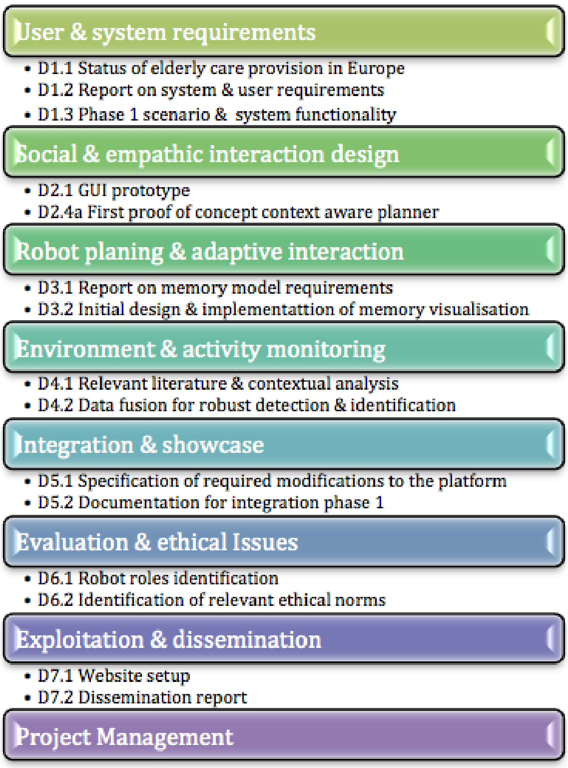

Figure 1. Project work packages and their achieved deliverables

3.1.2. *Progress in WP1 - User Requirement Analysis and Scenario Definition.*

The progress for WP1 included the studies performed towards identifying the status of elderly care in the United Kingdom, the Netherlands, Italy and France. These included literature and desk-based research as well as focus group and expert interviews. In this work package, user panels were formed in order to discuss the needs of elder citizen for remaining independent for a longer period of time at home. The result of this survey and subsequent user panels was reported in deliverable D1.1. Using a second round of user panel meetings in France (MADoPA), the Netherlands (Zuyd) and UK (UH) the results reported in D1.1 were validated and the first preliminary scenario was developed and discussed (D1.3). This led to a set of requirements for the robot system (D1.2) given the basic scenario development. There was a slight delay (2 months) in delivery of this deliverable due to additional time needed to translate user requirements to scenarios and systems requirements.
A task currently continuing in WP1 concerns the progress in detailing project scenarios (year 1, 2 and 3).

3.1.3. *Progress in WP2 - Social and Empathic Interaction Design.*

WP2 focused on Graphical user interface design and implementation. As part of requirement analysis, it was observed that existing robot tray which was also used as a graphical user interface presented a usability problem, due to not providing dual use, use as a tray and also as an interface. This was reported to WP5 partners and resulted in subsequent design modifications in robot tray as reported in WP5 progress. In order to progress the work, an alternative GUI was implemented using a tablet display. The GUI was then programmed with three different action possibilities, user-centred (Figure. 2), care-o-bot centred (Figure. **??**) and overall mode. When the user is located at the same location as the robot, the user-centred mode is active. When robot is at a different physical location, the robot-centred mode allows user to see the world through robots eyes. This would provide a remote control function for performing tasks at a different location. The overall mode offers all possible action possibilities.

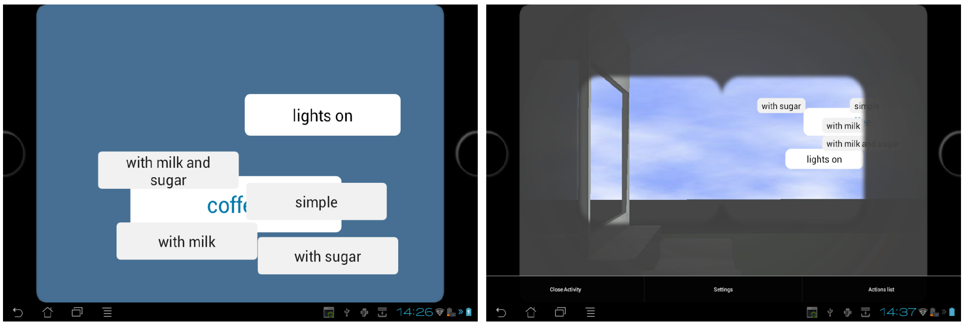

FIGURE 2. Left: User-centred view, Right: Robot-centred view

Additionally, a different strand of work in this WP focused on development and implementation of the context-aware planner and its first proof of concept implemented on care-o-bot using the sensor network at Robot House, UH.

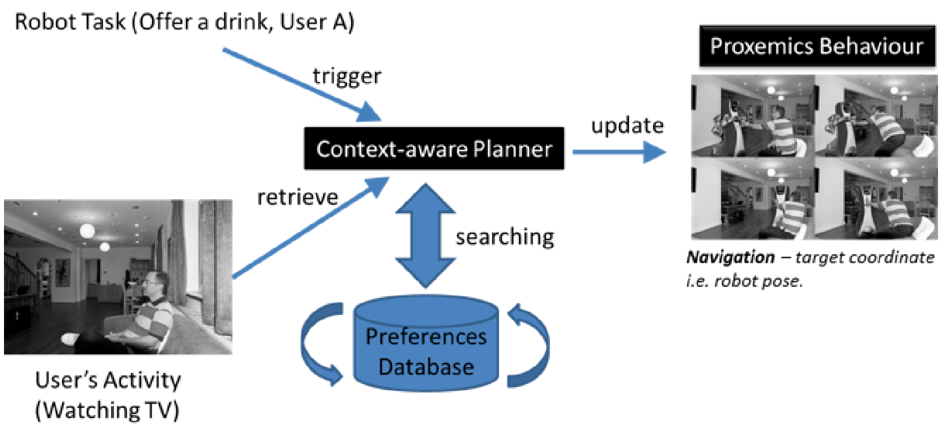

FIGURE 3. Flow diagram of the context-aware planner, showing robot serving a drink while assuming a proxemics behaviour relevant to users position and activity

A simplified knowledge-driven Activity Recognition System utilising the sensor network available at Robot House was developed and tested with participants to evaluate accuracy and reliability. Implementation of the system and results from the user study are reported in Duque et al., 2012 (accepted for ACHI2013)[1]. The Activity Recognition System forms the background infrastructure

[1]For presentation at the Sixth International Conference on Advances in Computer-Human Interactions (ACHI2013), February 24-March 1, 2013, Paris

needed to provide the contextual information related to the user, which is needed by the Context Aware Planner. The first proof-of-concept prototype context-aware planner as currently developed provides appropriate Human-Robot Proxemics target poses for the Care-O-bot 3 robot, so that it can approach a seated person in a friendly manner for interaction (see Figure. 3). Progress in task 2.4 is reported in an iterative deliverable with its current version delivered as D2.4a.

3.1.4. *Progress in WP3 - Robot Learning and Adaptive Interaction.*

In this work package significant progress was made both in the overall design concepts for the memory architecture (as described in deliverable 3.1 and shown in Figure. 4), and in the development and implementation of the first instantiation of the learning architecture which will support the first scenario described in D1.3, together with the design and implementation of the memory visualization and narrative generation modules (described in deliverable 3.2). Additionally a study of the simulation of robot/user activity in UH Robot House was completed and submitted to a conference (Derbinsky et al., accepted for ACHI2013)[1].

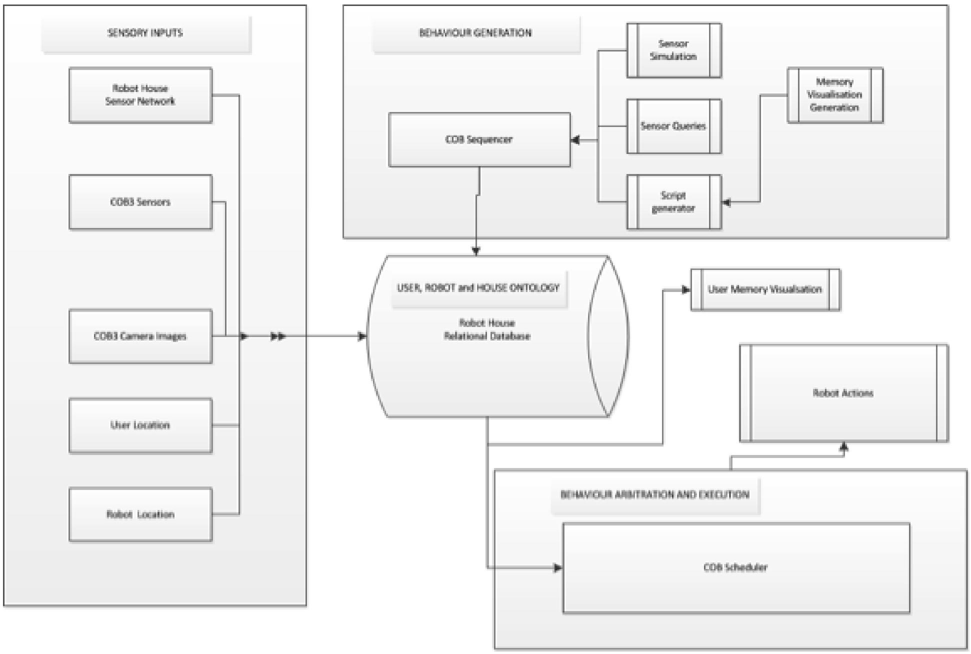

FIGURE 4. The overall project architecture showing house, robot and use sensory inputs (on the left) entering the database (centre of diagram). The top right of the diagram shows the behaviour generation facility (COB Sequencer) and bottom left the pre-emptive behaviour scheduler (COB Scheduler) which provides execution and arbitration services for the system. Memory visualisation is shown centre right

The instantiation of the architecture was carried out by an analysis of the various components and an analysis of the robot house ontology. This analysis led to a design for a centralized relational database which formed the central memory hub for both the robot, the house (including objects in the house) and the users. Additionally the database has been designed to support the behavioural components for the robot including behavioural rules, actions, goals and conditions.

3.1.5. *Progress in WP4 - Environment and Activity Monitoring.*

During this period, WP4 succeeded in setting up the initial test bed while a literature review as well as description of the test bed was reported in D4.1. The test bed consists of a vision system, replicating the care-o-bot cameras; a fish-eye camera mounted on the ceiling of the UvA lab; and the ROS (Robot Operating System) software studied to allow integrating software with other project partners. Figure.

5 shows an image from the fish-eye camera. Developments then focused on a sensor fusion system that allows for detecting and tracking people in a domestic environment. A Bayesian framework sis adopted that fuses the data from Laser Ranger Finder and the fish-eye camera, resulting in robust human detection. This development was reported in D4.2, and was published in IROS 2012 workshop on human behaviour understanding.

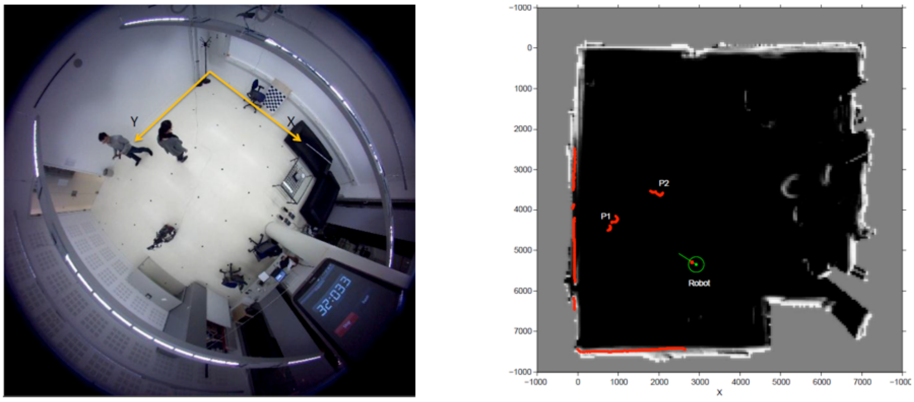

FIGURE 5. Left showing the image from fish-eye camera, right showing the points detected from laser range finder

In parallel, developments also focused on fusion from stereo cameras and the time-of-flight sensors, both obtained from the robot itself. The idea is to combine the two, to provide an accurate 3D point-cloud data within an acceptable computational cost. Additionally, these were used towards object recognition to enable care-o-bot to recognise, localise and grasp objects. Object recognition system uses previously learned models that consist of texture information for outstanding feature points, with 3D location of features. Using clustering techniques, feature points are then reduced by 75% allowing for better storage and more efficient processing. Figure. 6 shows the robot with an object, its colour image and detected features.

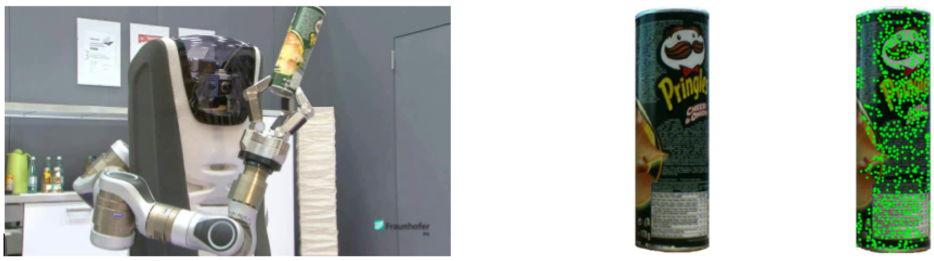

FIGURE 6. Object handling (left), colour image (middle), detected featured (right)

The algorithms used and results from this work are also presented in D4.2.

Another step achieved was to consider project scenarios presented by D1.3 towards extracting the necessary activities and actions related to WP4 and the activity monitoring objectives. Based on the scenarios, pose-estimation plays a major role in activity recognition. D4.3 presents a proposed solution towards recognition of human-pose in this context.

3.1.6. *Progress in WP5 - Integration and Showcase.*

With the introduction of the Care-o-bot platform during the kick-off meeting, WP5 focused on identifying hardware requirements for adaptation and modifications required for this platform. One of the issues identified during requirement analysis was that the tray had a fixed height and was not suitable for use for a patient in a wheelchair. Additionally, the touchscreen which was used for a graphical user interface as well as a tray surface was thought as unintuitive. This resulted in new kinematics for the trey manipulator, with higher flexibility of tray positioning. Also, added ability to utilise both sides of the tray, as well as new feature to remove the tray from its container addressed the issues related from dual use of tray and GUI.

Additionally, WP5 developed an integration framework with software components, and available applications. A web-based collaboration platform, trac, was set up as a central knowledge base for all partners. Using these, as software architecture with a list of pre-existing and new components were developed while also identifying the input and output data as well as communication relations between these components. These are presented in D5.1.

WP5 has maintained a close link with all developmental work packages, maintained via skype or personal meetings, towards the first integration of all project developments.

Deliverable 5.2 of this work package relates to integration phase 1, also constituting Milestone 2. We anticipate delays of about 75 days in delivery of D5.2, due to late delivery of D1.2 and issues faced in integrating WP2 developments in the project prototype 1. Current submitted D5.2 includes all integration documentation which will be updated in due time.

3.1.7. *Progress in WP6 - Evaluation and Ethical Issues.*

Work in this work package progress on multiple fronts. On the one hand, literature review focused on identification of robot roles that are appropriate to care-o-bot responsibilities. An in-depth contextual analysis was carried out with stakeholders towards understanding important activities, roles and challenges of daily life. These resulted in a draft deliverable 6.1, while further on going studies will update this deliverable during the second year of the project.

Additionally, using two international seminars organised by MADoPA, groundwork towards establishing an evaluation protocol started by brainstorming with a large number of experts in the field, scrutinising different evaluation approaches used to-date. Based on the findings from these seminars, a first draft for evaluation protocol has been provided and improved through active discussions with all partners.

Furthermore, work on identifying ethical norms was progressed by WP6 partners, allowing to identify autonomy, independence, enablement, safety, privacy and social connectedness as potential values that should govern the use of robots as companions. These are further highlighted in D6.2.

3.1.8. *Progress in WP7- Exploitation and Dissemination.*

Progress in this work package included the launching of the project website and its continuous update regarding project events and deliverables. Also, the project ID card was generated and a project logo was designed.

Deliverable 7.1 in its current draft present a list of dissemination activities including public engagement and workshops, media activities, invited talks, conference papers submitted/accepted and journal papers submitted.

3.1.9. *Progress in WP8 - Project Management.*

During the first year of the project, management activities included finalisation of the consortium agreement and setting up a decision structure, as well as quality control mechanism for the project deliverables. All deliverables have been peer-reviewed in order to ensure quality. Management activities also included addition of two project partners to the consortium, the University of Twente, the Netherlands; and University of Warwick, United Kingdom.

Four quarterly meetings were coordinated during this period. An external advisory panel was formed consisting of three appointed members that will act as advisors to the project management board, with expertise to advise on exploitation routes, and steering of the project towards positive business exploitation.

3.2. **Core of the report for the period: Project objectives, work progress and achievements, project management.**

3.2.1. *Project objectives for the period.*

The project objectives were divided into two sets of objectives, technology development achievements as well as user-centred design and evaluation (see Figure.6). In order to present progress towards

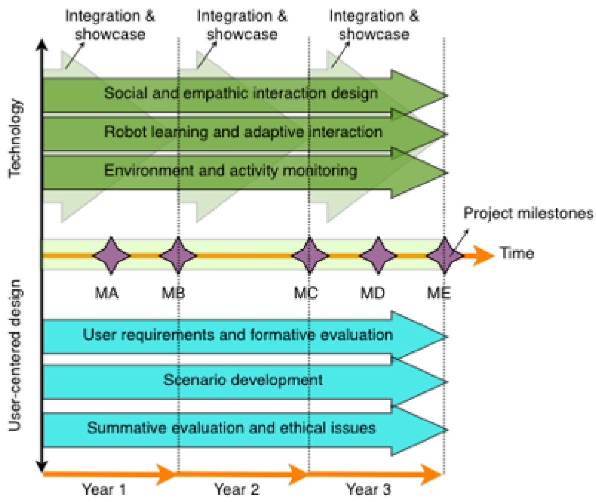

FIGURE 6. Progress of project objectives over its life course

project objectives, Table. 1 presents deliverables and prototypes achieved during this reporting period.

TABLE 1. Project objectives and their progress to-date

Project Objectives	**How they were achieved and progressed during year 1?**
Objective 1 - User requirement analysis and scenario definition	Three project deliverables; D1.1, D1.2 and D1.3 were completed in support of this objective.
Objective 2 - Social and empathic interaction design	A prototype GUI was developed as D2.1, while work on iterative D2.4 resulted in first draft deliverable for the context-aware planner.
Objective 3 - Robot learning and adaptive interaction	D3.1 presents progress in memory model requirement analysis, and first instantiation of the learning architecture, while D3.2 presenting the design of memory visualisation developments.
Objective 4 - Environment and activity monitoring	D4.1 and D4.2 focused on requirement analysis, contextual analysis and development of fusion algorithms for robust detection and identification. (people and objects)
Objective 5 - Integration and showcase	Care-o-bot platform was modified towards achieving system requirement based on user requirement input (D5.1). This included an integration framework for software components. Based on this framework, project-wide integration, integration 1, was made possible. (D5.2)
Objective 6 - Evaluation and ethical issues	D6.1 focused on identifying important activities, roles and challenges of daily life D6.2 identified a series of values, such as autonomy, independence, and enablement, towards next step where these these values will be tested towards developing ethical norms.

3.2.2. *WP1: User requirement analysis & scenario definition.*

Summary:
This work package progress has been made by advancement in four tasks:

- T.1.1 User Needs assessment; Scenario detailing [Completed and reported in D1.1]
In France (MADoPA,) the Netherlands (Zuyd), Italy (UNISI) and the UK (UH) studies were performed into the status of elderly care, what care is being provided on public money and how robots could fit in to the systems for elderly care. The studies were performed by literature research based on the analysis of political, administrative and scientific literature and interviews with experts. Results were reported and combined for the four countries.
- T.1.2 User Panel formation; [Completed and reported in D1.1]
Following the literature studies, focus groups were organized with the formed User Panels in France (MADoPA), the Netherlands (Zuyd) and UK (UH) and Italy. The first round of group meetings focused on the needs of the elderly citizen in trying to remain in their homes independently. The results of the group meetings were reported in D1.1 and also combined with the results of the literature studies. This resulted in a list of prioritized activities to be supported by a service robot.
- T1.3 Formulation of basic system requirements [Completed and reported in D1.2 and D1.3]
By means of a second round of user panel meetings in France (MADoPA), the Netherlands (Zuyd) and UK (UH) the results reported in D1.1 were validated and the first preliminary scenario was developed and discussed. This has led to a set of requirements for the robot system given the basic scenario development.

Figure 7. User panel meeting (Netherlands)

- T1.4 Iterative detailing of scenarios; [In progress]
After the development and validation of the initial ACCOMPANY scenario a more elaborated scenario was developed in which various roles of the robot were outlined. A description and planning for development of these scenarios is given in D1.3. Further detailing of the scenarios will be continued.

Significant results:
WP1 completed the following deliverables:

- D1.1 Status of elderly care provision in Europe, potential for service robotics
- D1.2 Report on user and system requirements and first outline of system functionality

- D1.3 Phase one scenarios and report on system functionality
- *Publication:* J Vermeulen, YP Man, SMA Bedaf. Nieuwe technologie in de ouderenzorg: hoe ouderen en onderzoekers samen producten ontwikkelen die aansluiten op de behoefte van de gebruikers. Tijdschr Gerontol Geriatr 2012:43(4);213-215. (paper in dutch in 11th National Gerontology congress in Ede (NL))
- *Publication:* S.M.A. Bedaf, G.J. Gelderblom, F. Guichet, I. Iacono, D.G. Syrdal, K. Dautenhahn, H. Michel, P. Marti, F, de Witte, L (2012) Functionality of service robotics for Aging in Place: What to build? Proceedings of ISG*ISARC conference 2012. Eindhoven 26-28 june 2012. Journal of Gerontechnology Vol. 11 no.2 pp. 360.
- *Publication:* H. Lehmann, D. Syrdal, K. Dautenhahn, G. J. Gelderblom, S. M. A. Bedaf, F. Amirabdollahian, What can a robot do for you? Evaluating the needs of the elderly in the UK. Accepted for Publication at The Sixth International Conference on Advances in Computer-Human Interactions (ACHI2013).

3.2.3. *WP2: Social & empathic interaction design.*

Summary: This work package progress has been made by advancement in four tasks:

- T2.1 Graphical user interface design and implementation [Completed resulting in Prototype GUI and D2.1]
  According to the DoW, T2.1 was devoted to the development of a GUI integrated in the tray of the robot. Since this solution presented usability problems (e.g. it is not possible to input commands if objects are placed on the touch screen), an alternative solution based on the use of a separated tablet was implemented. The GUI was designed with different layers of interaction according to the action-possibilities that the robot can perform. The GUI consists of 3 interaction modes: the user-centred mode, the Care-O-Bot centred mode and an overall mode. The user-centred mode provides action-possibilities when the robot is co-located in the same room with the user. The available action possibilities are displayed by relevance and appropriateness to the context. The Care-O-Bot centred mode allows the user to see the environment through the robots eyes. This view is accessible when the robot executes commands. Using this view the elderly can control the robot over distance, in order to perform tasks somewhere else. The overall mode describes all possible action possibilities in the whole environment (ordered in a list by location).

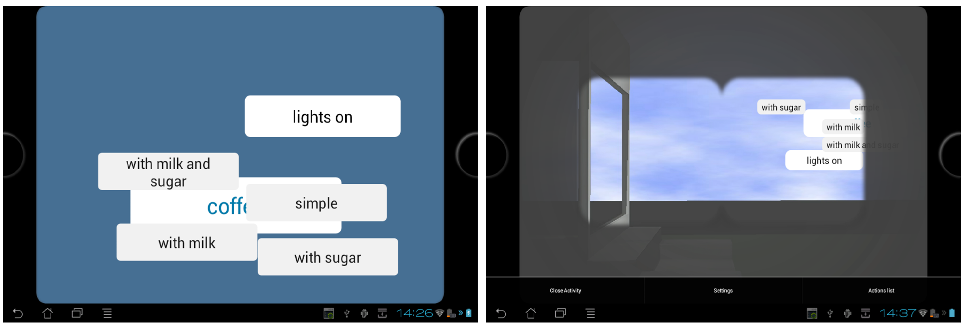

FIGURE 8. Left: User-centred view, Right: Robot-centred view

  Part of the GUI counts on straightforward queues from the system architecture and in particular the world model. The GUI database self-learns the order of these procedures in order for the Care-O-Bot to anticipate them. Likelihoods provided by UVA on specific user or objects states, further inform the GUIs database and weight of relevance in suggesting action possibilities.

  The details of the GUI and the related database are provided in the deliverable D2.1, an internal document delivered according to the DoW in September 2012 and finalised in October 2012.

In addition to the development of the GUI, three different modalities of interaction between human and robot were developed in form of prototypes: *Squeeze Me*, *Call Me* and *I-Suggest*.

The *Squeeze Me* device is a simple (analogue) force-sensing resistor to which we directly map the values of the movement of the robot. The expressions exerted on the mediating device by the human are mapped to expressive behaviours of the robot in the modality of motion in forthcoming interaction. A short pinch results in a sturdy movement, a hard squeeze results in a quick movement and a gentle touch in a slow approach. This direct mapping inherently exhibits a natural relationship maintaining all richness exhibited by the user.

The *Call Me* prototype utilizes expressive auditory messages given by the elderly directly mapped and thereby inherently exhibiting a natural relationship. The expressiveness in a whisper results in a gentle movement while the shout holds more abrupt values demanding rapid attention. Intonation (loudness, length, dynamics, timbre) is continuously mapped to the movement of the Care-O-Bot.

Squeeze Me and *Call Me* are low fidelity prototypes developed to investigate continuous interaction in shared attention scenarios. Both are intended as attention-requesting mechanisms. The prototypes couple the input to how the care-o-bot can respond, exploring interaction and expression dimensions of both input device as robot. The interaction involves squeezable/microphone object, as if the user would squeeze/talk to a robot over distance, the robot would respond expressively. When squeezing/talking softly, the reply of the robot is gentle, while when the robot is squeezed/shouted at harder, it will respond more attentively.

Several types of behaviours have been explored in the movement using the robot Iromec, since Care-O-Bot is not available at UNISI. These behaviours were demonstrated during the technical meeting hosted in Siena in June 2012.

The *I-suggest* prototype concerns the Graphical User Interface (GUI). The prototype is based on the possibility to suggest functions starting from action possibilities available in the environment. In this concept the user is at home, in a certain context (e.g. location, flow of actions, near objects) with a tablet where action possibilities appear.

These action possibilities are the ones that the robot can do with the object or within the context. An example is, while being near an empty coffee cup the tablet will suggest the robot to clean it, refill it, take it away etc. In order to prevent an overload of action possibilities, these will get addressed on their own weight based on the user's use in context, providing a subjective layer.

The main aim of *I-Suggest* prototype will be to develop a self-learning, subjective and growing system as core robot functionality. Currently a GUI-internal database has been developed. It describes objects, their locations, conditions and states properties. It further details the subjective relation the object has with the robot in terms of action possibilities preferred by the user. The GUI-database is being aligned with the system architecture of the Care-O-Bot as a whole.

The GUI was evaluated with a 75 year old person. The evaluation protocol was inspired by the Interpretative Phenomenological Analysis. Different scenarios were tried out using the simulator environment as well as in the Wizard of Oz modality. The results of the evaluation are reported in D2.1.

- T2.2 Perceptual crossing for interaction design [In progress]
  In the reporting period UNISI performed a literature review on Perceptual Crossing and empathic interaction. Scenarios were developed on the basis of this review.
- T2.4 Implementation and integration of context-aware planner [In progress, resulted in interim deliverable 2.4a]
  Work done for Task T2.4 during the first year focused on 1) the development and implementation of background infrastructure needed to support the implementation and integration of the context-aware planner, and 2) the development of a first proof-of-concept prototype of a context-aware planner, based on sensory networks installed in the UH Robot House home

environment, running on a Care-O-bot 3 robot. Within this task, an Activity Recognition System was developed and tested with participants to evaluate for accuracy and reliability. Implementation of the system and results of the user study are reported in Duque et al., 2012 (accepted). The Activity Recognition System forms the background infrastructure needed to provide the contextual information of the user, which is needed by the Context Aware Planner. The first proof-of-concept prototype context-aware planner as currently developed provides appropriate Human-Robot Proxemics target poses for the Care-O-bot 3 robot, so that it can approach a seated person in a friendly manner for interaction. A deliverable D2.4a was submitted which reports the first phase of Task 2.4.

Significant results:
WP2 completed the following deliverable reports:

- D2.1 Graphical user interface prototype: design, development
- D2.4a Implementation and testing of context-aware planner for empathic behaviour generation
- *Publication:* Stienstra, J.T. & Marti, P. (2012). Squeeze Me: Gently Please. Accepted for NordiCHI 2012.
- *Publication:* Stienstra, J.T. & Marti, P. Whats the Difference? A Phenomenological Approach to Designing for Human-Robot Interaction. Submitted to CHI2013.
- *Publication:* I. Duque, K. Dautenhahn, K.L. Koay, I. Willcock and B. Christianson (submitted). Knowledge-driven User Activity Recognition for a Smart House. Development and Validation of a Generic and Low-cost, Resource-Efficient System. Accepted for publication at The Sixth International Conference on Advances in Computer-Human Interactions (ACHI2013).
- *Journal Publication:* Marti, P. & Stienstra, J.T. Exploring Empathy in Interaction: scenarios of respectful robotics. Submitted to the special issue on Emotional and social robots in elder care in Journal of Gerontopsychology and Geriatric Psychiatry.

3.2.4. *WP3: Robot Learning & Adaptive Interaction.*

Summary:
In this work package significant progress was made both in the overall design concepts for the memory architecture (as described in Deliverable 3.1), and in the development and implementation of the first instantiation of the learning architecture which will support the first scenario described in Work package 1 (described below) together with the design and implementation of the memory visualisation and narrative generation modules (described in Deliverable 3.2). Additionally a study of the simulation of robot/user activity in UH Robot House was completed and submitted to a conference (Derbinsky et al., accepted for ACHI2013).

One of the major objectives of work package 3 is the instantiation of a memory architecture encompassing both the Care-O-bot 3 (COB3) robot, the sensor network in the robot house and user activity monitoring. This has initially required a conjunction of efforts from partners in Work package 4 and 5 in order to instantiate and initial architecture (show below Figure. 9).

The instantiation of the architecture was carried out by an analysis of the various components and an analysis of the robot house ontology. This analysis led to a design for a centralised relational database which formed the central memory hub for both the robot, the house (including objects in the house) and the users. Additionally the database has been designed to support the behavioural components for the robot including behavioural rules, actions, goals and conditions.

As part of the Work package 3 development a first set of robot behavioural components were designed and implemented. These are designed to allow non-technical persons to design and implement robot behaviours and form the first stage in generating autonomous behaviour in the robot. Two main components deal with robot behaviours, firstly, the COB Sequencer, which allows rules based on the robot, house sensors, users and goals to be connected to robot actions for behavioural units. Theses behavioural units can then be scheduled to run using a priority based arbitration mechanism called

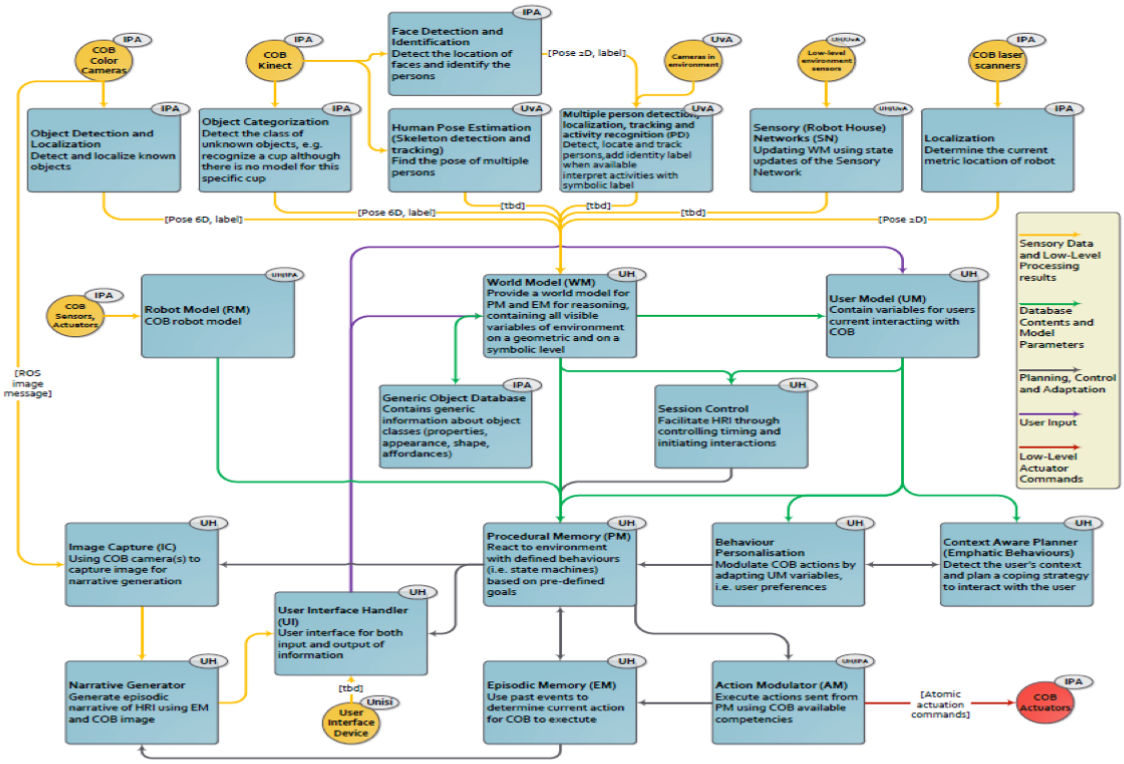

FIGURE 9. Original Concept for Care-O-Bot and Robot House Memory Architecture

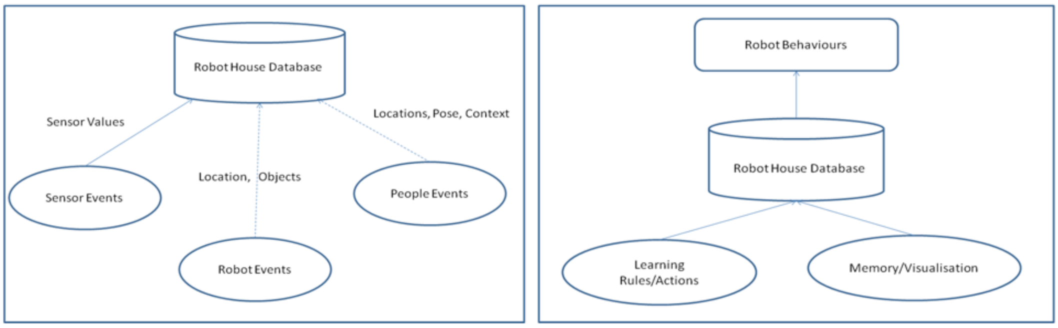

FIGURE 10. Robot House Database containing house/robot/user ontology and robot behavioural rules, actions, condition and goals. The database as a central hub also contain all visualisation and narrative components described in D3.2

the COB Scheduler. Two other components for monitoring and simulating the house sensor network were also designed and implemented (called the Robot House Simulator and the Robot House Sensor Interrogator as shown in Figure. 11).

Figures 12 and 13 present screenshots of the COB Scheduler and COB Sequencer.

A first implementation of Deliverable 3.2 concerning memory visualisation and narrative was achieved and fully integrated into the overall memory architecture of the COB3. The facility allows users and possibly others (carers, relatives) to review the behaviours of the robot both visually and through a temporal narrative of behaviour execution. We believe that such a facility will benefit users by allowing review of past events, allow exploitation of the robot by learning from previous experiences, aiding socialisation between users and carers, and serving as a memory prosthetic. A schematic of the overall memory systems is show in Figure.14.

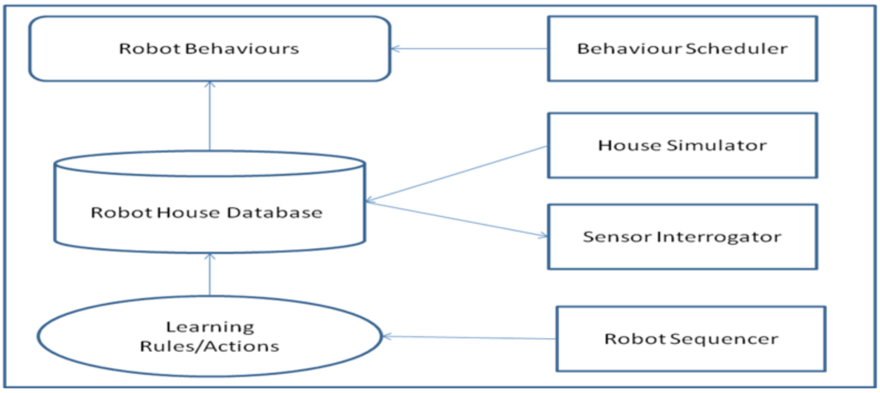

FIGURE 11. Schematic of the components developed to provide user delivered autonomy for the robot and robot house sensory networks.

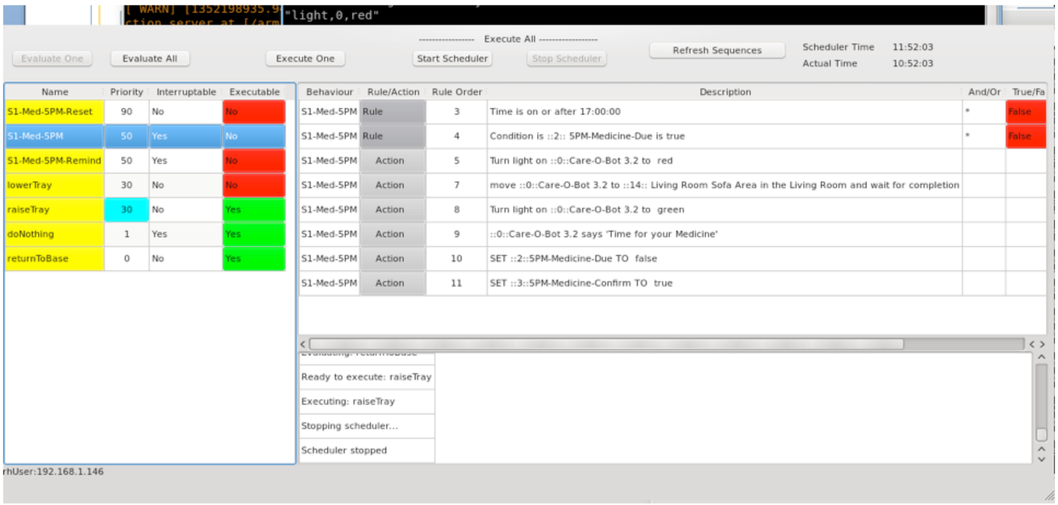

FIGURE 12. The COB Scheduler. This is a priority based arbitration scheduler. Each behaviour/sequence is show (in yellow). Currently executing sequence in shown in Blue. Available behaviours are shown in green. The rule/action sets per behaviour are shown on the right.

Strong links exist between WP3 led by UH and WP2 led by UNISI. The long-term Human-Robot-Interaction history will be stored and used as part of the graphical-user-interface (developed in WP2) in a way that patterns of use shape the likelihoods of action-possibilities. The database infrastructure was prepared for this. In particular the database designed by UH has been modified to be used by the GUI and to show the action-possibilities. Each action-possibility is checked through a set of conditions whether they are met and to what extend (likelihood). The database tables used for these histories are described in the deliverable D2.1.

Significant results:
WP3 completed the following deliverables:

- Deliverable 3.1 Report on memory model requirements and specification
- Deliverable 3.2 Initial design and implementation of the memory visualisation and narrative generation
- *Publication:* N. Derbinsky, W.C. Ho, I. Duque, J. Saunders, K. Dautenhahn Resource-efficient methods for feasibility studies of scenarios for long-term HRI studies. Accepted for publication at The Sixth International Conference on Advances in Computer-Human Interactions (ACHI2013).

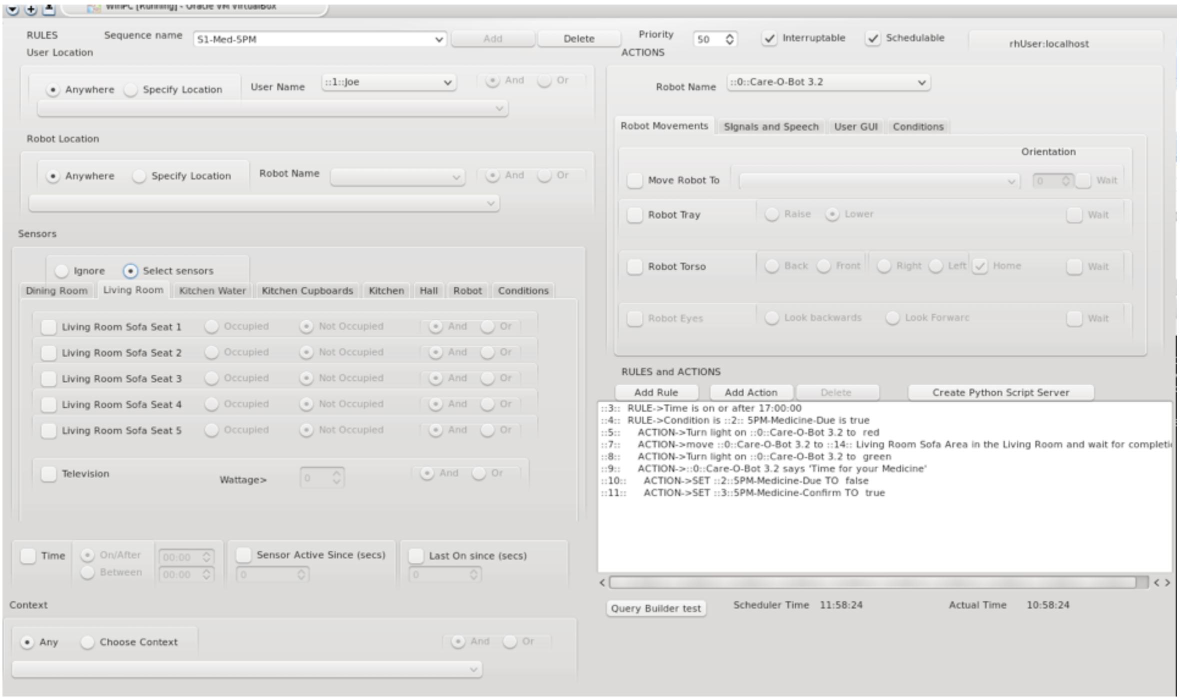

FIGURE 13. The COB Sequencer allows behaviour and sequence generation between rule sets based on the robot house ontology and actions to be carried out by the robot. Rules can be generated based on user, robot, context, sensors, goals or conditions. Actions on the robot can be physical, sensory (light/speech), virtual (setting new conditions/goals) or user generated via calls to the users tablet computer.

3.2.5. *WP4: Environment & activity monitoring.*

Summary:
For the first half of the year of the project, UvA finished a literature study in the field of human activity recognition, and set up the initial test bed for the system in the robot lab of UvA. Both the literature study and a description of the initial test bed was reported in report D4.1. The initial test bed was developed for conducting experiments locally, and the work consists (1) The vision system of the Care-o-bot was reproduced on the robot platform at UvA. (2) The fish-eye camera was mounted in the robot lab at UvA and the camera was calibrated. (3) ROS system is studied to integrate the software with other project partners (see Figure. 15).

In the second half of year 1, UvA developed a sensor fusion system to detect and track people in the domestic environment. The system adopted a Bayesian framework that fuses the data from the Laser Range Finder and the fish-eye camera, and observations from the two sensors were combined to give robust human detection results. The system was reported in D4.2 and was published in IROS 2012 workshop on Human Behaviour Understanding. The video showing our data fusion system is available at http://www.youtube.com/watch?v=3WIj5Xq6QpM&feature=context-cha.

Based on the description of scenarios in D1.3, UvA extracted the necessary activities/actions with respect to WP4-human activity monitoring. According to the scenarios, the human pose estimation is expected to plays a very important role in recognising these activities. After fully analysed our current software as well as the literature research of related topics, we plan to extend the current software in a way that it is able to recognise human pose with the monitoring sensors. The proposed system was reported in D4.3.
Developments using robot sensors:
In the first months Fraunhofer conducted a literature survey on the state of the art on sensor fusion of 3D time-of-flight data and stereo data. The results of this survey were integrated into the deliverable D4.1. Accordingly, a successful approach for the fusion of 3D time-of-flight data and stereo data

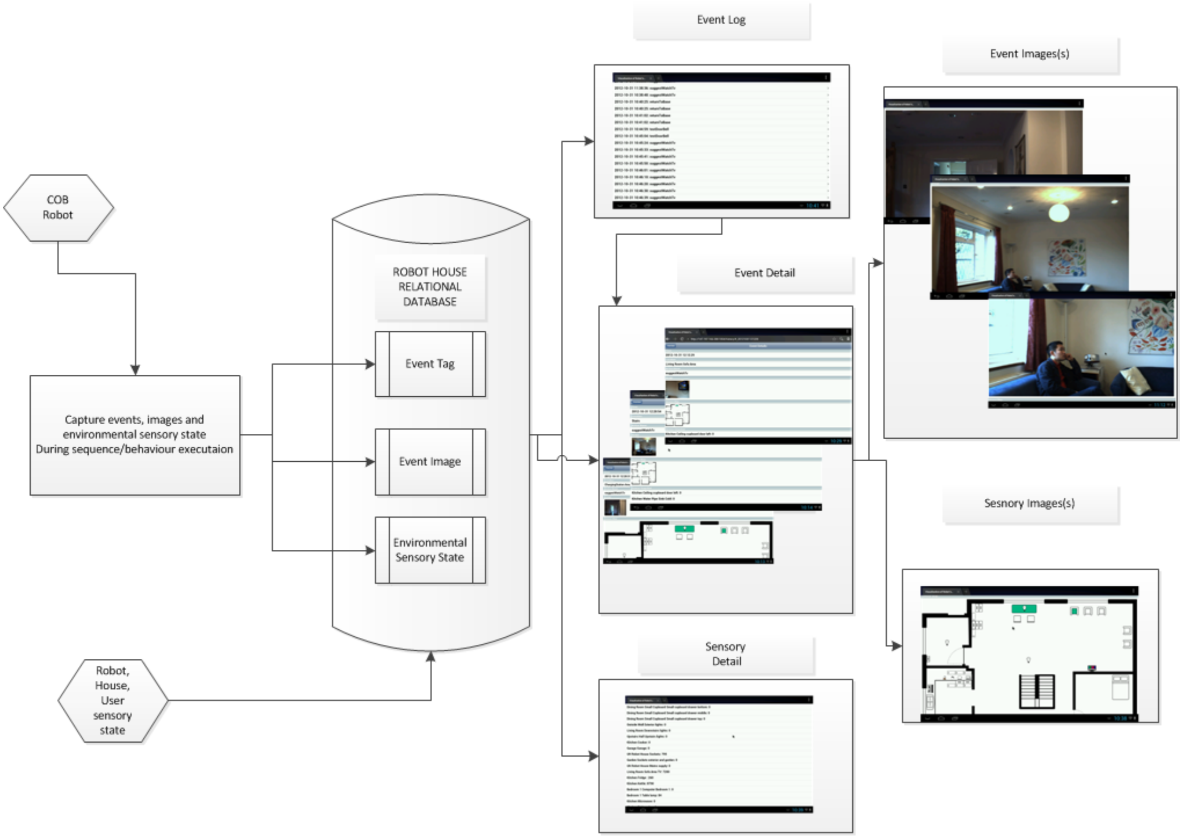

FIGURE 14. The memory visualisation and narrative system integrated into the overall memory architecture.

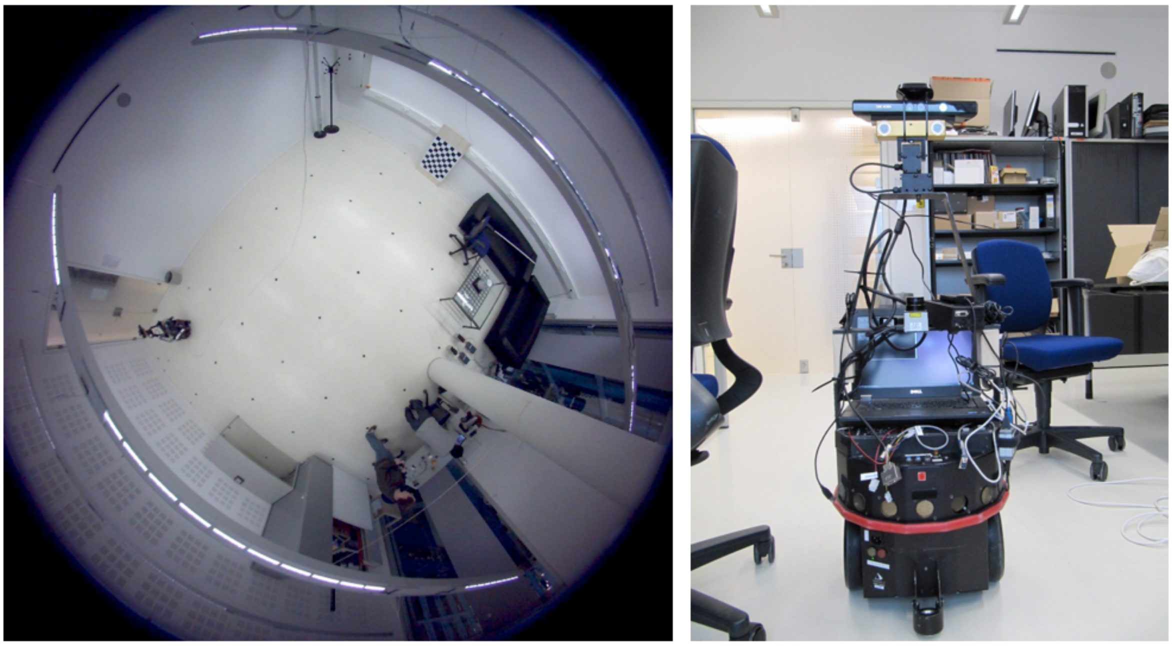

FIGURE 15. An initial test bed deployed at UvA: a sample image of the lab room (left) and the Nomad Robot that possesses similar sensors as the Care-o-bot.

has been illustrated in deliverable D4.2. Based on this fusion algorithm, a framework for object

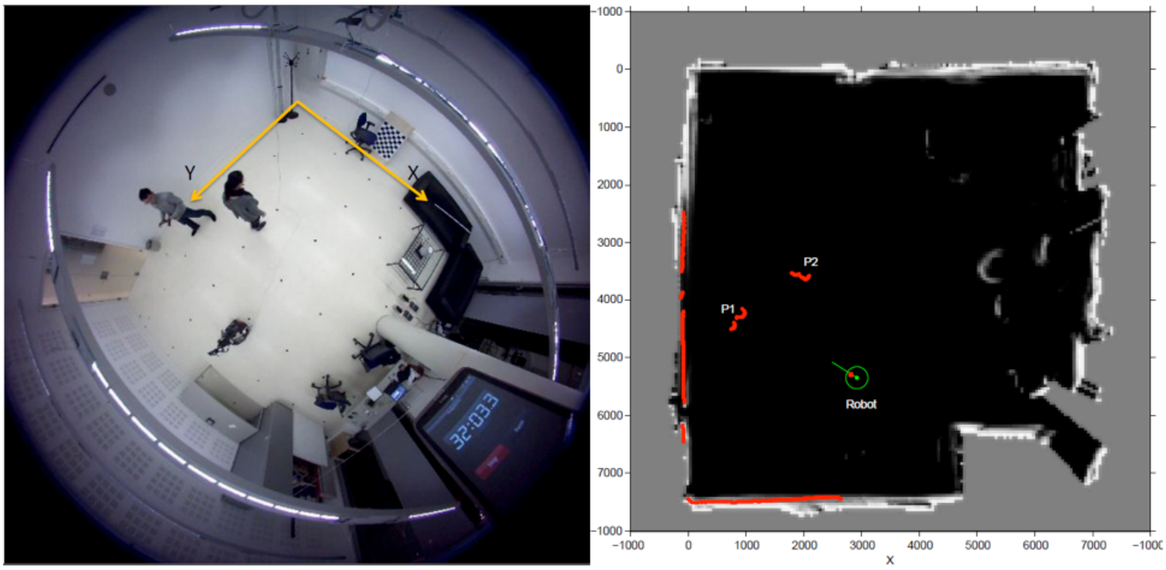

FIGURE 16. An overview of data that are used in our data fusion system. Left: image frame captured by the overhead camera; Right: laser detection points (red dots)

recognition and 6 DOF pose identification has been developed (Figure. 17). The details are reported in D4.2 also. Finally, an approach for the categorisation of objects based on their surface has been introduced in D4.2 and published at two international conferences. The systems for object recognition and categorisation are necessary prerequisites for the robot executing useful tasks. Furthermore, the interfaces for object recognition and categorisation have been defined for a seamless integration into the whole software framework.

FIGURE 17. Object recognition and 6 DOF pose estimation (left image) and categorisation of previously unknown objects (right image)

Person recognition and identification is another important component that has been developed by Fraunhofer in order to allow the robot to act in a user-adapted manner. The person identification is tightly connected to the person tracking module that has been developed by partner UvA. Fraunhofer specified in close cooperation with UvA the interfaces for the integration of the user tracking and the user identification modules. The user tracking of UvA manages to track people with a camera mounted at the ceiling of the room whereas the user identification is realised with the software of Fraunhofer that is running directly on the Care-O-bot. The identification module uses the robots cameras to have a better perspective on the relevant persons and increases the certainty by finding faces in a two-stage procedure which comprises data from a depth sensor and colour cameras. Details about the person detection and identification system can be found in deliverable D4.2.

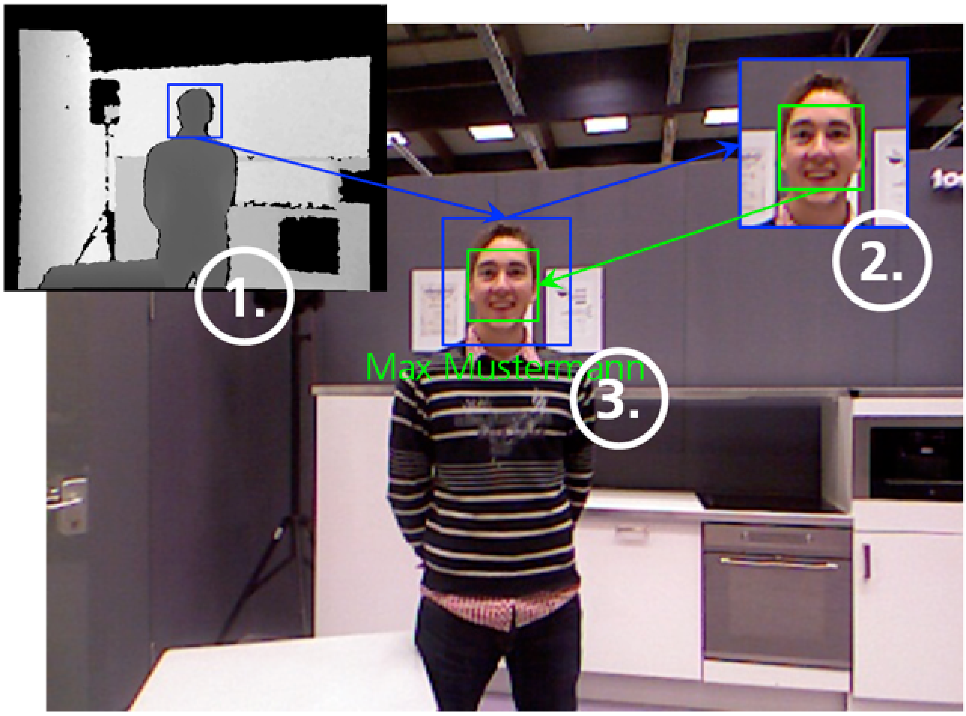

FIGURE 18. Multimodal face detection and identification in three steps

Significant results:
WP4 completed the following deliverables:

- D4.1 Relevant literature and contextual analysis as well as initial test bed
- D4.2 Data fusion for robust detection and identification objects and users
- D4.3 Data fusion and activity recognition in household chores - preliminary report
- *Publication:* Ninghang Hu, GwennEnglebienne and Ben Krse, Bayesian Fusion of Ceiling Mounted Camera and Laser Range Finder on a Mobile Robot for People Detection and Localization, published at IROS2012.
- *Publication:* R. Bormann, J. Fischer, G. Arbeiter, and A. Verl, "Efficient object categorization with the surface-approximation polynomials descriptor," in Spatial Cognition VIII (C. Stachniss, K. Schill, and D. Uttal, eds.), vol. 7463 of Lecture Notes in Computer Science, pp. 3453, Springer, 2012.
- *Publication:* R. Bormann, J. Fischer, G. Arbeiter, and A. Verl, "Adding Rotational Robustness to the Surface-Approximation Polynomials Descriptor," accepted for presentation at Humanoids 2012.

3.2.6. *WP5: Integration & Showcase.*

Summary:
In the beginning of the reporting period, Fraunhofer introduced the project demonstrator, Care-O-bot 3 to all project partners. Furthermore, Fraunhofer collected the requirements for hardware adaptations of the current demonstrator. One major result from the requirement analyses was that the fixed height of the tray would pose problems to sitting persons and persons in a wheelchair. In particular, the integrated touchscreen was not found intuitive as human-robot interface, as the touchscreen served at the same time as tray to place objects on. As a result from this Fraunhofer developed a new kinematics for the tray manipulator that allows for a higher flexibility of tray positioning and separates the user input from object placement through the usage of both sides of the tray: On side contains the user interface in form of a tablet pc that can be removed, and the other side provides

space for object placement along with sensors to detect if the space is empty or occupied (Figure.19).

Figure 19. New Design of the tray with removable tablet PC

Furthermore Fraunhofer introduced the integration framework, existing functionality in terms of software components and the available applications for the for the project demonstrator Care-O-bot 3. The web-based collaboration platform *trac* was setup as a central knowledge base for all partners and to support the distributed development through software engineering tools like ticket systems, source browsing and continuous integration. A *git* repository was created for the project to host all project components of the partners. The repository will be actively managed and by Fraunhofer through project runtime.

A software architecture containing existing components and components that will be developed in ACCOMPANY was created. The architecture includes the component interfaces, involved input and output data as well as communication relations between the single components, such that functional gaps or possible redundancies could be determined.

All gathered information and requirements on Care-O-bot 3 as well as the developed architecture and the integration framework and tools were included into deliverable D5.1.

Fraunhofer actively managed the integration process by organising skype and personal meetings in order to define interfaces between the single project components and create a component architecture. Fraunhofer is in close contact with all software developing partners to implement the phase 1 demonstration scenario. The goal is to have all project components integrated in a first version at this early stage of the project, such the interoperability of all components is ensured and all partners can concentrate on the improvement on the component functionality for the remaining project runtime.

The integration framework proposed by Fraunhofer as part of WP5 was exploited by UH in WP3 (as described in WP3 summary sections above) in order to develop the initial memory architecture for the project. This has allowed the existing robot control software (the 'script server') developed by IPA to be used in WP3 as part of its behavioural arbitration software. In addition the IPA developed ROS extension to this component ('actionLib') has been used by WP3 to provide a common communication base for robot control commands following the ROS standard. By exploiting common components and following standard control and communication structures the memory and control architecture

FIGURE 20. Design Drawings of the new tray kinematics with 3 degrees of freedom that allows height adjustment of the tray and switching between tablet pc and object placement

developed in WP3 can be further integrated and extended by WP5 to include other work package components.

As part of the integration work for WP2 task T2.4, the context aware planner developed by UH follows the integration framework proposed by IPA by making used of the Accompany database for storing and retrieving user preference data. This data are used by the Context Aware Planner to provide appropriate robot proxemic behaviour for the robot to approach the user for interaction. As part of the WP2 and WP4 integration work, the UH Robot House sensory networks have been integrated with the Accompany database to provide sensory feedback and contextual information needed to support the Context Aware Planner developed in WP2 and the behavioural arbitration software developed in WP3.

UvA integrated the software to ROS and installed the human localisation component to the Robot House at the UH. Two types of cameras (Fish-eye camera and Kinect) have been used in the Robot House. Figure. 21 provides an overview of the cameras that were mounted, and Figure 4 gives an overview of how the devices are connected in our localisation system.

Significant results:
WP5 completed the following deliverables:

- D5.1 Specification of the adaptation requirements for the existing integration framework
- D5.2 Documentation for the integration phase 1. *Delays:* This deliverable in its current form is a draft deliverable lacking the integrated GUI from WP2. Delays in this deliverable are due to late definition of technical requirements, as well as technical issues faced in integrating GUI from WP2.

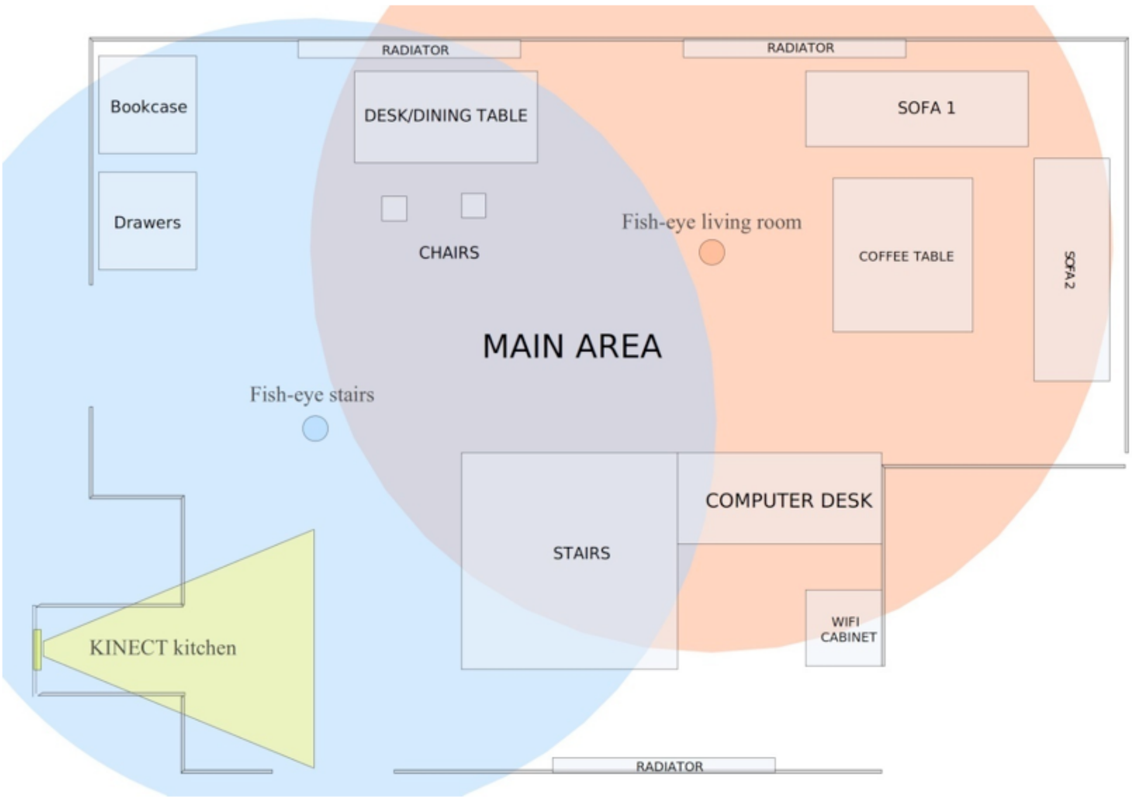

FIGURE 21. Camera Locations in the Robot House

Contingency plan: Additional effort will be allocated to resolve the technical issue remaining, while most of the delay caused by late delivery of D1.2 is now absorbed with least consequences to other work packages due to the structure of this project allowing partners to continue their developments using the integrated system, or on their own platforms.

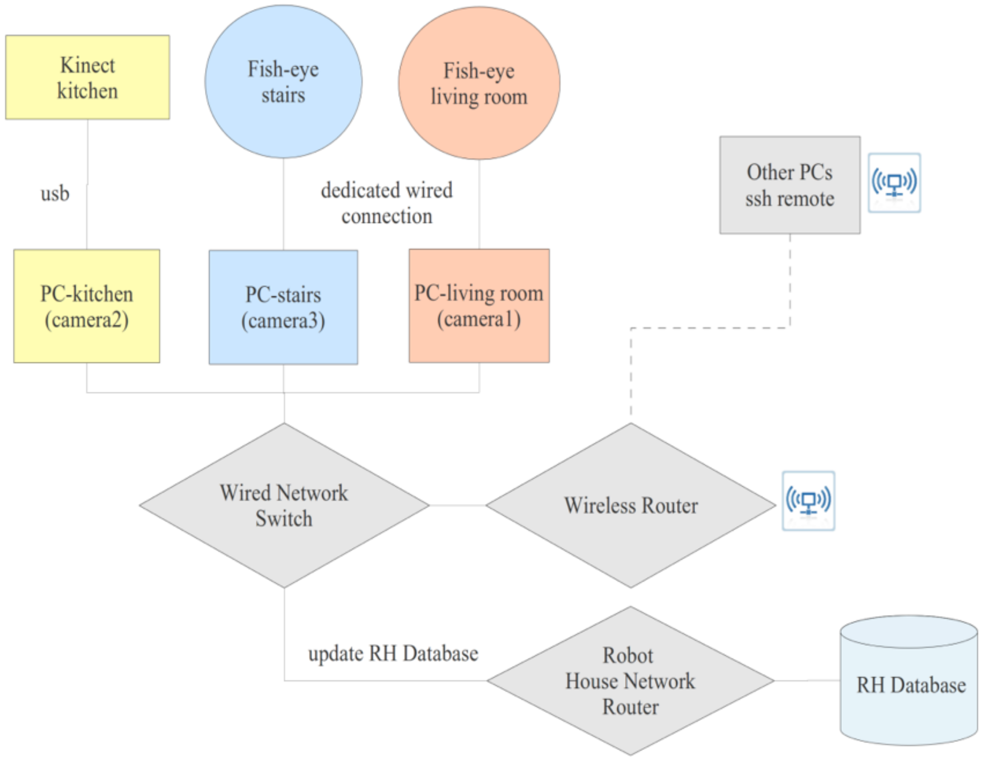

FIGURE 22. Sensory system connection

3.2.7. *WP6: Evaluation & Ethical Issues.*

Summary:
This work package progress has been made by advancement in the following tasks:

- T6.1: Identify robot roles that are congruent to the ACCOMPANY robot responsibilities [Completed, resulting in D6.1] *Note:* D6.1 will be updated as we progress during the project. A literature review on elderly needs and robot roles was carried out to identify robot roles that are appropriate for the responsibilities of Care-O-Bot in ACCOMPANY. This complemented the work of WP1 that was oriented to determining the needs that lead elderly people to give up independence. In addition, an in-depth contextual analysis was carried out with elderly participants that lived independent in Spain. This study aimed to understand important activities, roles and challenges of the daily life of independent living elderly people. Additionally, another study was carried out that researched the influence of task context and robot role on perceived social robot personality. All the above resulted in deliverable D6.1.

  In order to explore and identify roles congruent with the robot's responsibilities in the project, UH analysed data collected as part of a long-term study with the socially interactive Sunflower robot in the context of the FP7 LIREC project (which ended in August 2012). The emphasis here was two-fold, both with an emphasis on how robot behaviour and tasks impacted participants perception of the robot's social role within the interaction, and how perceived social roles impacted subsequent evaluation. The analysis regarding high-level measures is still ongoing, however, results related to how the perceived social role of the robot impacts specific behavioural expectations are being prepared for publication. While the studies were conducted with the Sunflower robot, results will inform our future studies with the care-o-bot 3 in terms of the role in which the robot may present itself to the user.

  Since the interviews from the in-depth contextual analysis yielded qualitative data, no statistics were obtained. However, a relevant finding was the great importance of motivational factors for elderly people as predictors of their ability to cope with their daily life. Self-efficacy interventions aided by robots are proposed.

With respect to the study on robot role and task context, the findings suggest that people have different attitudes toward a robots personality depending on its role. It is therefore relevant that we compare user responses to robot behaviours in a variety of contexts and robot roles.

- T6.2 Identify the factors that strongly influence long-term user acceptance [*DOW correction needed:*]
  Task 6.2 concerns long-term acceptance of the robot's behaviours in the home. This work is planned to start in M12 while incorrectly presented as M2 in the DOW.

- T6.3 Development of the evaluation protocol [In progress]
  A first international seminar organised by MADoPA with the support of the CNR Sant Autonomie Domicile was held in Paris 4 April 2012 on the evaluation protocols of homecare services using technological devices.

  A second international seminar organised by MADoPA with the support of the CNR-Sant was held in Paris 19 June 2012 on the results of the evaluation of homecare services using technological devices.

  On the basis of these two seminars and in relationship with the ACCOMPANY partners, a first draft of evaluation protocol was presented in Siena 21 and 22 June 2012. This draft was then adjusted through skype meetings with the coordinator of the ACCOMPANY project the 18, 25 July and 7th September 2012. A meeting bringing together MADoPA, UH, HZ, UB, University of Twente will be held in Paris on 23 November 2012 to progress this evaluation protocol.

  The evaluation protocol of the ACCOMPANY project is defined in line with the European trend toward a definition of a multidimensional grid for the evaluation of telemedicine (EUnetHTA and MAST grid) and the French multidimensional grid (GEMSA) designed to assess tele-care services.

  This evaluation protocol is currently structured as follows:

  (1) Care objective: homecare services for autonomous elderly in a re-ablement perspective (i.e. assist the user in being able to carry out certain tasks on his/her own)

  (2) 5 Domains of evaluation:

    - Acceptability of the robot by the users (Almere grid / psycho-ergonomic approach of acceptability)
    - Ethics of the device: Norms, Values, Ethical model
    - Effectiveness : Evaluation of the functionalities through:
      * Empathy
      * Long-term Memory
      * Co-learning
      * Activity monitoring
      * Technical reliability
    - Usefulness : Evaluation of the functionalities of the robot from a qualitative perspective:
      * Public health perspective: how does the care o bot contribute to maintaining the autonomy at home of fairly independent elderly? What role does it play in the re-ablement of the elderly?
      * Organisational perspective: what is the possible integration of the ACCOMPANY solution in existing work organisations and within the health and social

system? What benefits does the project bring for cooperation between the professionals involved?

    * Use perspective: To what extent does it act as a relay for professionals? What complementarity and service continuity does it represent for professionals? What benefits does it bring for informal carers? What are the expected and unexpected effects in terms of self-image, autonomy, safety, relations to others, etc. for the elderly?

  – Economic model: What are the costs and savings generated by the Accompany solution? How will it be funded? What economic model is to be used? What is the capacity for the project stakeholders to implement and industrialise the project? What is the impact of the project on the creation of jobs and services?

  An evaluation grid (Figure 23) is being completed by the different partners. The results of this work will be discussed on Paris on 23 November 2012.

- T6.4 identification of ethical norms to guide project development [Completed resulting in D6.2] In depth research in T6.4 resulted in the following findings:
  - Robotic assistive technology should be used alongside non-robotic assistive technology.
  - Many forms of robotic assistive technology that might be useful to the elderly do not necessarily take a humanoid form, as Care-o-bot does.
  - Care-o-bot might have advantages because it provides presence in a sense defined in the deliverable a component of companionshipfooofff
  - The values that should govern the use of robots as companions are:
    * autonomy - being able to set goals in life and choose means;
    * independence - being able to implement ones goals without the permission, assistance or material resources of others;
    * enablement - having or having access to means of realizing goals and choices;
    * safety - being able readily to avoid pain or harm;
    * privacy - being able to pursue and realize ones goals and implement ones choices unobserved; and
    * social connectedness - having regular contact with friends and loved ones and safe access to strangers one can choose to meet

Significant results:

- D6.1. Robot roles, personality and interaction behaviours
- D6.2. Identification and discussion of relevant ethical norms for the development and use of robots to support older people
- *Publication:* Gallego Prez, J., Karreman, D. E., & Evers, V. (2012). Contextual Analysis of the needs of elderly for independent living: is there a role for robot physical therapy? presented and published at the proceedings of IROS2012.

Deviations and delays:
We have not deviated from Annex I. However, the context analysis study described above (T6.1) was added aiming to gain more understanding in the everyday lives and activities of elderly people to complement the work on needs of elderly people done in WP1.

PhD candidate Jorge Gallego Prez was hired 6 months later than planned, this meant a delay in Task 6.1. Even so, important contextual analysis and a first user study was conducted which resulted in Deliverable 6.1 and a publication at a workshop at IROS 2012. If necessary, we will add personnel in the second year to catch up on research activities. Also, we plan to update the D6.1 as necessary.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Definition	Equipment			Countries	Translation	dates	Nb users	Frequency	Duration	Criteria of evaluation Questions	Notes
2	Scenario		Smart home + robot	Smart home	other			M21	69+69+12	Cycle 1 & 2	Scenario 20"		At the start of session, a scenario will be put into play, here we assume it will take 20 minutes
3	1.Acceptability		X	x	x	3+1?	X (M27)	M21	150	once (at the end cycle)	15"	Attitude Trust Social Presence Self Efficacy Anxiety	UT to use their formative evaluation to shortlist some variables covering these aspects. From the chosen variables, some will be discarded while the more influential and useful variables will be selected for the summative evaluation.
4	2.Ethics		X			3	X		tba				We have agreed that ethics can be moved to WP1, so that we can reduce duration for a summative session.
5	3. Effectiveness												Cells under here relate to effectiveness
6	Empathy		X		x	3	X	M21	150	two cycles	?		UNISI's formative evaluation questions? Did the prototype meet design requirements? What could be done better?
7	Memory		X	-	-	3	X	M21	150	two cycles	15"		refine questions We will difvide the parameters to those logged and those needed to be collected by questionnaires
8	Co-learning		-	-		3					?		Question here is if we can measure co-learning or how we would put co-learning into test? Can a measure of performance be used, i.e. how quickly one gets around doing something on the GUI? Similarly for re-ablement.
9	Activity monitoring		x	X		3					?		The question here is if Activity monitoring will be solely measured by logs and video recording or if there will be questionnaires that will need to based from the three user groups towards ascertaining achievements.
10	Technical reliability		X	x							?		This concerns system logs and their use in identifying degree of reliability and fale/safe nature of the device.
11	4. Usefulness		X			3	X	M21	150	two cycles	cycle1=30" , cycle2=1	?	cells under here relate to usefulness
12	Re-ablement												With regards to reablement already in the scenario, how would one evaluate achieving reablement?
13	Use												
14	organisation of home care												
15	5. Economic Model							M30	150				Economic model relates directly to all work here where triad of care and its relations are documented
16													
17		Legend	Capital X with shaded cell		Summative								
18			Lower case x		Supportive								
19			-		not envisaged								

FIGURE 23. Evaluation grid to inform the evaluation protocol

3.2.8. *Exploitation & Dissemination.*
Summary:
This work package has progressed the following tasks:

- T7.1: Web-site and e-Services. [Ongoing]
  The Project Web-site was developed and maintained in year 1. The project web-pages serve as a means for continuous dissemination of information to the public and the results can be seen in more detail in D7.1. A project mailing list was established to serve an important internal role for knowledge dissemination and project communication and sharing among the project participants. In addition we prepared some dissemination material for release to the public which is detailed in D7.2a. Additionally, a twitter account was established for the project, while also project coordinator used his twitter and personal webpage to disseminate project news.

- T7.2: User and industrial forums/workshops [Ongoing]
  Members of the consortium presented and provided in a significantly large number of talks during this period. These included workshops as well as invited talks. A dedicated workshop in support of *Active Year of Ageing and Solidarity Between Generations 2012* was conducted in Hertfordshire with over 60 participants.

- T7.3: Journals, International Conference and Workshop Participation. [Ongoing]
  For external dissemination two major channels are being used. All research will be submitted for publication in the best scientific journals (impact factor, scientific reputation) and peer-reviewed, well-recognised conferences. Participation in workshops, conferences and other forums and events was sought, as appropriate, taking place at a national, European or international level which are relevant for the projects information dissemination activities. Special sessions/workshops will be organised to ensure presence and visibility at major scientific meetings.

  Please see table list of partner dissemination in D7.2a. At month 6 a dissemination plan was prepared highlighting proposed conferences and giving partners an opportunity to share dissemination activities; this will be updated throughout the project and will culminate in the final D7.2 Dissemination report.

- T7.4: Engagement with the public [Ongoing]
  A major press release was coordinated by the project coordinator involving the partner institutions press offices after the project kick-off meeting.

  The workshop mentioned in T7.2 had a wide range of participants and was organised in association with the European Year of Active Ageing. Effort will continue towards aligning our workshops with similar national, European and International initiatives, towards public engagement.

Significant results:
The following deliverables where achieved in this work package:

- D7.1. Web-site set-up & report
- D7.2a. Dissemination report
- *Workshop:* 19th October, Hatfield UK, in support of *Active Year of Ageing and Solidarity Between Generations 2012*

3.2.3. *Project management during the period.*

The project had its start date on 1st October 2011. The Consortium consisted of 7 partners spanning across Europe. The management of work is divided into 8 work packages as outlined in DOW. Two additional partners, the University of Twente (UT) and University of Warwick (UW), have joined the consortium from 01 November bringing the total partners to 9. The role of this work package is to oversee management tasks for the consortium such as contractual matters, maintaining and setting up decisions structures as well as quality assurance and communication flow.

The following tasks were progressed during first year of the project:

- T8.1. Contractual matters [In progress]
  - One of the first tasks undertaken by UH as coordinator was pre-Financing distribution and sending of final signed documents to all partners
  - A deliverable review timetable was planned and circulated. Deliverables were circulated for peer review prior to submission to PO.
  - A deliverable template was created and circulated, as were guidelines on project processes (such as
  - Project procedures manual & project reporting templates, periodic reporting guidance, peer review etc.)
  - A progress report system was implemented (quarterly) by partner, and these reports were checked by the project management time highlighting any issues.
  - We added two partners to consortium UW and UT- Amendments completed.
- T8.2. Setup and maintain decision structure and quality assurance measures [In progress]
  - Coordinate logistics of quarterly meetings with hosting partners, offering admin leadership to project
  - Set-up industrial and external advisory panel
  - Management board established. Coordinator chairs the management board & quarterly meetings
- T8.3. Communication flow [In progress]
  - WebDav set-up for sharing documents between partners; passwords & instructions circulated
  - UH Team set-up one-to-one tele-chats for integration and communication flow between project coordinator and partner contacts.
  - We have done some research on other European projects in the field covering similar themes and we hope to establish a connection with them through our workshops series T7.2. Coordinate with other ICT projects that address topics in the same of relevant area to secure high quality improvement across ICT projects for example work with MOBISERV during dissemination event with them 19 Oct.

Key meetings:
The ACCOMPANY Kick-off meeting took place on 12-14th of October 2011, at Hatfield. The meeting was attended by twenty people from the across the consortium. Quarterly meeting 1.2, took place on 1-2 February , in Amsterdam and was attended by twenty people from the overall consortium. Quarterly meeting 1.3 took place in Siena on 11-12 June and was attended by 20 people from the overall consortium. Finally Quarterly meeting 1.4 took place on 11-12 September in Stuttgart and was attended by 16 members of the consortium. At each meeting the project management team assisted the hosting partner with preparations and planning. The project management team chaired the agenda for the meeting and followed up with an action note to the consortium. Work packages were also encouraged to have additional (smaller) meetings, a list of which is noted below.

FIGURE 24. Project Kick-off meeting at Hertfordshire

Addition of two partners to the ACCOMPANY consortium from 01 November 2012:

- University of Twente (UT), the Netherlands:
  University of Amsterdam (UVA) had two major contributions in Accompany, WP4 is led by Prof Krose while WP6 has contributions from Prof Vanessa Evers. Vanessa who had moved to University of Twente (UT) and her researcher who is also involved in the project is based in Twente. Given that Vanessa is well suited to continue her contracted tasks for ACCOMPANY, while UVA does not have the expertise which Vanessa was offering in WP6, we added a new partner in form of University of Twente. UVA and UT agreed to share the current budget allocated to UVA, thus there was no cost implications for this, and no change of work plan.
- University of Warwick (UW), United Kingdom:
  Prof Tom Sorrel, one of our investigators from University of Birmingham (UB), UK, moved from Birmingham to Warwick University, UK. Tom asked to add University of Warwick as a new partner. The consortium felt it was important that Tom, as one of the few moral philosophers available in Europe, stayed with the consortium. Tom had been involved with the project during its formation and his emphasis on ethical work is one of the distinctive aspects of our project. Also, this transition had no impact on project budget and the funding allocated to UB was divided between UB and UW.

3.3. **Deliverables & Milestones tables & Effort in this period.**
In this section, Tables 1 and 2 show the status of deliverables and milestones during this period while Table 3 presents the effort expenditure during this period. Project deliverables were in general on time apart from the two exceptions mentioned below. Also, as a result of delays in MS1, MS2 has also been delayed. However, partner effort **Delays in deliverables:**

- D1.2 has been slightly delayed due to taking longer time in translating user requirements to scenarios and consequently system requirements.

- D5.2 submitted is a draft deliverable, and its completion has been affected by the integration 1, which is due by 15-12-2012. This deliverable will be updated upon completion of a full integration. The GUI developed in WP2 is the only component missing in current integration. Due to the structure of the project, the delay in this deliverable will be absorbed by all technical work packages, while for the summative evaluation, we have ample time before start of the summative evaluation while partners continue with their formative evaluation activities using own platforms.
- D6.1 This deliverable has been submitted. However, because the PhD student started 6 months later than planned due to problems in the hiring process, the deliverable does not include multiple iterations of studies into personality and roles for the robot. This is carried over to continue research into robot roles and personalities in the next task of 6.2 is long-term research.

Delays in milestones:

- MS1: The final decision on hardware requirements was delayed by the late specification of the user requirement (D1.2). Consequently, this resulted in delays in MS2.
- MS2: This milestone has been delayed because of the late specification of the user requirements, resulting in 2 months delays to MS1.

Table 1. List of submitted deliverables and their status

Del. No	Deliverable Name	Ver.	WP No.	Lead Benef.	Nature	Dissem. level	Delivery date	Actual/forecast date	Status	Comments
D7.1	Web-site set-up	1.2	7	UH	R	PU	3	3	Sub	N/A
D1.1	Status of elderly care in Europe and the potential for service robotics	1.3	1	HZ	R	PU	4	4	Sub	N/A
D1.2	Report on user and system requirements and first outline of system functionality	1.2	1	HZ	R	PU	6	8	Sub	Slight delay
D3.1	Report on memory model requirements and specification	N/A	3	UH	R	CO	6	6	Sub	N/A
D4.1	Relevant literature and contextual analysis as well as initial test bed	N/A	4	UvA	R	CO	6	6	Sub	N/A
D5.1	Specification of the adaptation requirements for the existing integration framework	N/A	5	IPA	R	CO	6	7	Sub	N/A
D1.3	Phase one scenarios and report on system functionality	N/A	1	ZUYD	R	PU	12	12	Sub	N/A
D2.1	Graphical user interface prototype:design,development	Final	2	UNISI	P	CO	12	16/10/12	Sub	N/A
D2.4a	Implementation and integration of context-aware planner	0.6	2	UH	P	PU	12	13	Sub	N/A
D3.2	Initial design and implementation of the memory visualisation and narrative generation	0.2	3	UH	R	PU	12	12	Sub	N/A
D4.2	Data fusion for robust detection and identification objects and users	N/A	4	UvA	R	PU	12	12	Sub	N/A
D4.3	Data fusion and activity recognition in household chores-preliminary report	N/A	4	UvA	R	PP	12	4/11/2012	Sub	N/A
D5.2	Documentation for the integration phase 1	N/A	5	IPA	P	CO	12	15/12/2012	Sub	Slight delay
D6.1	Robot Roles Personality and interaction behaviours	1.0	6	MADoPA	R	PU	12	30/10/2012	Sub	N/A
D6.2	Identification and discussion of relevant ethical norms for the development and use of robots	1.0	6	MADoPA	R	PU	12	12	Sub	N/A
D7.2(a)	Dissemination report	0.2	7	UH	R	PU	12	12	Sub	N/A
D8.1	Periodic report	0.2	8	UH	R	PU	12	14	Sub	N/A

TABLE 2. Milestones for this period and their status

Milestone no.	Milestone name	WP no.	Lead benefi.	Delivery date Annex I	Achieved (Yes/No)	Actual/ Forecast date	Comments
MS1	User & Technical requirement analysis	WP1, WP2, WP3, WP4, WP5	HZ	31/03/2012	Yes	31/07/2012	The final decision on hardware requirements was delayed by the late specification of the user requirement. This has resulted in delays in achieving MS2.
MS2	Phase 1 tasks Completed	WP3, WP4, WP5, WP6, WP7	IPA	30/09/2012	No	15/12/2012	MS2 delayed because of the late specification of the scenarios. Due to contingency plans, no consecutive delays are expected as a result of this delay

3.4. **Effort during this period.**

Total effort during this period was a sum of 143 person-months, with a total effort for project over its three years set as 448 person-months. We have spent about a third of our effort allowance during our first year so gladly we are on target.

TABLE 3. Project effort during this period compared to planned.

Beneficiary	WP1 Person months			WP2 Person months			WP3 Person months			WP4 Person months			WP5 Person months			WP6 Person months			WP7 Person months			WP8 Person months		
	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3	Actual Yr 1	Planned	YR1-3
UH	6	5	10	12	13	34	17	16	36.5	0.2	0	3	6	5.5	15	1	4	15	1	1.3	6.5	5	5	15
ZUYD	14.5	8.5	11	0.05	2.5	3	0	0	0	0	0	4	0	0	0	0	4	18	0	0.2	5	0.07	0.5	2
FRAUNHOFER	0	0	1	0	0	0	0	1	4	9	9	12	10.8	16	45	0	0	0	0	0.2	2	0.6	0.6	2
UVA	0.9	1	2	0	0	0	0	0	2	12.31	13	39	0.514	0.5	2	8	12	33	0.214	0.2	2	0.878	0.7	2
UNISI	2.9	2.5	4	10.15	10.5	51	3	3	4	0	0	0	0	0	0	0	0	0	0.7	0.2	2	0.5	0.5	2
MADOPA	7.3	7.3	10	0	0	0	0	0	0	0	0	0	0	0	0	9.4	7.7	27	0.5	0.5	8	0.5	0.5	2
UB	0.2	0.25	1	0	0	0	0	0	0	0	0	0	0	0	0	1.51	3	10	0.16	0.16	0.5	0.17	0.125	0.5
Total	*11.3*	*11.05*	*18*	*10.15*	*10.5*	*51*	*3*	*4*	*10*	*21.31*	*22*	*51*	*11.314*	*16.5*	*47*	*18.91*	*22.7*	*70*	*1.574*	*1.26*	*14.5*	*2.648*	*2.425*	*8.5*

- UH: The allocation of effort to the work packages generally closely matches the DoW, apart from WP6 where UH spent less effort in year 1 due to increased effort allocated to other WPs, which will be balanced in next periods.
- HZ: had overspending in WP1: This was due to unforeseen additional effort for forming user panels. Publication work has been reported under WP1 while it should have been under WP7, So there has been a transfer of hours from WP7 to WP1 which will be balanced in next periods.
- UVA: Note: actual PM for WP 6 does not correspond with planned PM because the PhD candidate was hired in February instead of October.
- FAUNHOFER: The deviation in person-month expenditure in WP5 stems mainly from the delay of the definition of the system requirements. This led to a delay of requirement collection (T5.3) and also a delay in the implementation of phase 1 (T5.4) resulting in less effort.
- MADoPA: is more or less on track with person-months. slight over-spent on WP6.
- UB remains on track with person months.