Introduction
By 2020, 25% of the EU’s population will be over 65 years introducing several challenges across economic, social and health domains [1]. However, such a situation also provides opportunities for developing new and more accessible ubiquitous computing technologies. Ubiquitous computing technologies will increasingly allow older people to:
1. Stay alive and be productive for a longer period in their life
2. Continue to engage in society with more accessible ubiquitous computing services
3. Enjoy a healthier and higher quality of life
The majority of older people do not yet enjoy the benefits of the digital age. Is it possible to support ambient assisted living by building a Smart Home Environment? The aim of this assignment is to allow students to develop ubiquitous computing systems that would enable an elderly to stay in their home (instead of a health care center) and lead an independent life.

Brainstorming and Specification
Brainstorming can be an effective way to generate lot of ideas on designing and building a smart home environment. Each group should discuss issues like their target group, the target group’s needs, usage scenarios, potential designs, components and materials required, etc. The groups should submit a specification based on the brainstorming session by the 15th of November 2010 before 23:59 hours through email to the course leader (dipak@cs.umu.se).

System Requirements
You are supposed to build a smart home environment and a mobile client to access information from the smart home environment (also refer to Fig. 1).

1. The smart home environment should be physically modeled. The physical environment should include an elderly person (probably with some disabilities) living independently. The minimum size requirement of the physical environment is 60 cm\(^2\) in area. The physical model can be a complete home environment or in parts (kitchen environment, Bathroom environment, living room environment, etc.) based on the usage scenarios.
2. The smart home environment should include a virtual environment (computing system) that is able to show smart behavior based on sensors, actuators and interactive devices embedded within household objects (bed, toilet mirror, fridge, dining table, etc.) and on the building infrastructure (walls, ceiling, floor, etc.). The virtual environment should sense and model contextual information (minimum four different contextual information) and use it in providing support to the elderly within the smart home environment. The smart home should support novel interaction techniques (at least one for the input and one for the output) for facilitating natural HCI. Examples include tangible user interface, embedded LCD display on objects, gesture input, etc. Simple keyboard and mouse based input, and regular visual display output is not accepted. The smart home should provide actuation and automation possibilities (minimum two automation possibilities). Examples include a door that opens automatically in specific context, window blinds that open or close automatically based on context, etc.).

3. A mobile client that can connect to the smart home environment to get information about the events taking place within the smart home. The mobile client might be used by a family member or a doctor depending on your scenario. They are supposed to monitor the well-being of the elderly in the smart home environment from a distance. Note that a desktop PC could be used for simulating the mobile client. You do not have to consider the smaller screen size demands. However, user authentication is required to access information from the smart home environment.

Fig. 1. Smart Home Environment.

Basic building material will be provided in the Ubicomp lab (MC333). If you need additional components and materials, specify them in the specification document to be submitted on the 15th Nov 2010. For this assignment you will have access to Phidget
components like the interface kit, servo motors, motion sensors, accelerometers, temperature sensors, slider, touch sensor, embedded LCD display, etc. Since we only have a limited number of these components, you might have to share some of the components with other groups. Contact the course leader in case you are in trouble.

**Scenario(s)**
All groups should come up with a good scenario or a set of scenarios that describe the design and working of the smart home environment. Note that solutions without proper usage scenarios will not be accepted.

**Demo**
The groups should show a demo of their Smart Home Environment on the 26th of November 2010 between 13:15 and 17:00 hours in the Ubicomp lab (MC333). The groups should first describe their system and then show a demo by enacting the usage scenarios. The demo will be evaluated by considering the following aspects:
   a) Novelty of your concept or application
   b) Physical construction of your system
   c) Implementation and working of your system
   d) Proper addressing of the design challenges
Note that for a group to pass this assignment, the group should pass in all the four aspects.

**Webpage**
Your work should be documented as a webpage which should contain an introduction to your group; an introduction to your smart home environment; your conceptual design with necessary diagrams; implementation details; photos of your prototype; a video for 4 minutes describing your system and its working within relevant scenario(s); a discussion part where you discuss your solution with reference to issues within ubiquitous computing. The webpage should be hosted before the 29th of November 2010, 23:59 hours. One suggestion is to work with both the system development and the webpage development in parallel to avoid last minute hiccups.

**Additional Information**
Information about the Phidget components and useful documentation can be found at the Phidget website http://www.phidgets.com.

**References**
[1] For more information about Ambient Assisted Living, visit http://www.aal-europe.eu/about-aal