Ubiquitous Computing, Fall 2012

Assignment 1: Smart Kitchen

Introduction

Humans spend more time at home than any other environment which is intended to provide a comfortable experience to relax, perform daily activities, socialize with family and friends, learn and be entertained. It is increasingly used as an environment to maintain health and be empowered especially with age. Initiatives like ambient assisted living target home as an important environment that should be revolutionized using information and communication technologies.

However, homes of today are ill suited for exploiting the computing advancements visible in other application areas. Homemakers generally believe that computer devices make life more complex and frustrating than making it easier and relaxing. Aesthetics, form factor and model of interaction among other challenges like design for domestic use and handling uncertainties devoid computing pervading life at home and supporting our activities (both physical and virtual).

Kitchen is an important and integral part of a home where family members socialize and perform a multitude of everyday activities. Also some of these activities like cooking, and dinning are extremely important for everyday living. This assignment is intended to focus on a smart kitchen that is sensitive, adaptive, responsive and personalized to humans, and intelligently support their daily living with its services.

Brainstorming and Specification

Brainstorming can be an effective way to generate lot of ideas and solutions that are “outside of the box” for designing and building a smart kitchen. Each group should discuss about smart application, user needs, usage scenarios, conceptual design, Phidget components (also other components), building material and other requirements. The groups should submit a specification based on the brainstorming session by the 15th of November 2012 (Thursday) before 23:59 hours through email to the course leader (dipak@cs.umu.se). The specification should be between 1 and 2 pages. After further discussion with the course leader on the 16th November 2012, an updated final specification should be sent on the 19th November (Monday) by 23:59 hours.
Smart Kitchen Requirements

• You are supposed to build a smart kitchen application that enhances the everyday life of an individual or a family at home. The smart kitchen application should make use of ubiquitous computing technologies. Example applications include ambient assisted living, social interaction, recipe guidance, health assistant, diet cooking, appliance tutorial, shopping assistant, kitchen games & entertainment, etc.

• The smart kitchen should be a physical-virtual space that is interactive and smart in offering its services. The smart kitchen should be physically prototyped in the Ubicomp lab (MC333). The physical space should be ideal for a couple of persons to experience realistic scenarios. The physical space could cover a part of the kitchen environment like a storage space, dining space, cooking space, mixing/cutting space, dishing space, etc.). It would be good if all groups were not choosing the same kitchen spaces.

• The smart kitchen should include a virtual environment (computing system) that is able to show smart behavior based on sensors, actuators and interactive devices embedded within kitchen/household objects (dining table, chairs, fridge, stove, recycle bin, coffee machine, sink, etc.). The virtual environment should sense and model contextual information (minimum three different contextual information) and use it for providing smart services for your chosen application. Do basic research on context-aware computing on the Internet for more information.

• The smart kitchen should support novel interaction techniques (at least one for the input and one for the output) for facilitating natural, physical, tangible and ambient interaction. Examples include tangible user interface, ambient displays, gesture input, proxemics input, speech interaction, multi-touch interaction, etc. (research on the internet for further information). Simple keyboard and mouse based input, and regular visual display output should not be used for information presentation and for obtaining explicit input.

• The smart kitchen should provide actuation and/or automation possibilities (minimum two actuation possibilities). Examples include a stove that turns off automatically in specific context, a coffee maker that prepares coffee depending on the context, etc.).

Basic building material and Phidget components will be provided in the UBICOMP Lab. Additional Phidget components and building materials that are required for this assignment should be specified in the document to be submitted on the 15th November 2012. Since we only have a limited number of Phidget 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 kitchen. Note that solutions without proper usage scenarios will not be accepted.

Demo

The groups should show a demo of their Smart Kitchen on the 4th of December 2012 between 13:15 and 17:00 hours in the UBICOMP Lab (MC333). The groups should first describe their work and then show a demo with 2 persons enacting the usage scenarios. The demo will be evaluated by considering the following aspects:

- Novelty of your concept or application.
- Physical construction of your system.
- Implementation and working of your system.
- Proper addressing of the ubicomp 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 that contain:

- An introduction to your group.
- An introduction to your smart kitchen.
- Your conceptual design with necessary diagrams that explain your concept clearly.
- Implementation details including for instance specific sensor thresholds used, etc.
- Photos of your prototype.
- A video for 3 to 4 minutes describing your system and how your system works for the 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 5th of December 2012, 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