Web Systems Fundamentals (Grundläggande webbsystem) 7,5 HP

DI4004

VT18

Project

Background

As an extension of home automation, smart homes attempt to integrate different home-based smart objects (e.g. consumer electronics, appliances, furniture) to offer new or advanced functionalities to residents, such as enhanced safety and security, care and comfort, as well as the opportunity to reduce energy use[1].

Home automation can be described as home-based systems that can be remotely controlled by the resident or pre-programmed with fixed rules to function without human intervention. Home automation is characterized by islands of functionalities[2], i.e. separate systems from different vendors control only one aspect of the home, such as safety (e.g. smoke detectors), security (e.g. motion activated alarms) and comfort (e.g. timer activated heating systems, motion activated lighting systems, multimedia entertainment systems). Moreover, there is no single interface to control these systems and no overall view of their operational state.

Smart homes deal with more than the automation of domestic tasks[3]. Smart homes are ideally controlled by an artificial type of reasoning mechanism that takes into account the current and past states of the environment and its occupants to learn and anticipate needs, and perform actions in the environment that are in accordance with the residents' preferences. Such artificial reasoning mechanism acting on behalf of people is not present in home automation.

---

[1] van Berlo, A. (2002). Smart home technology: Have older people paved the way? Gerontechnology, 2(1):77–87.

[2] Bierhoff, I., et al (2007). Smart home environment. In Roe, P. R. W., editor, Towards an Inclusive Future. Impact and wider potential of information and communication technologies, pages 110–156. (OFES) Switzerland.

[3] Gann, D., Barlow, J., and Venables, T. (1999). Digital Futures: Making Homes Smarter. Citeseer.

Goal

In this project, students will design and implement a dynamic web-based graphical user interface for smart homes. Basically, the web application will allow users to:

- Use the smart home, i.e, to control and check the status of devices.
- Manage the smart home, i.e. to add, edit and remove devices and users.

Ideally the end result is also a mobile friendly web application.

Requirements

1. The system must provide a login page.
    a. Only authenticated users can use the system.
2. There must be two categories of users: system administrators and end-users.
3. There system must provide to system administrators pages to ADD, EDIT and REMOVE:
    a. Devices,
    b. End-users,
    c. Other system administrators,
    d. OPTIONAL: rooms
4. There system must provide to all users pages to CONTROL and CHECK the STATUS of devices.
5. There system must provide to system administrators a page containing some analytics of the web site, for example:
    a. From which IP addresses is the web site being requested?
    b. Which users normally use the system, when they do it and which pages they normally visit?

Technical Requirements

- Good and responsive design.
    o Please search for "smart home GUI" at Pinterest for inspiration.
- HTML5, CSS3, JavaScript (or jQuery) standard must be used and validated.
- Please have a look at the templates at
    o https://www.w3schools.com/w3css/w3css_templates.asp
    o https://getbootstrap.com/docs/4.0/examples/
    o https://html5up.net/
- The suggested server-side script language is PHP and the DBMS is MySQL.
    o The use of other technologies shall be discussed with all members in the group and with the course responsible.
- Meaningful comments in the client- and server-side code. Adopt a good naming conventions for variables.
- Graphics must be optimized for the web, e.g. JPG or PNG.
- Use relative links, so the web site is easy to move.
- Forms must be validated.

hh.se

- AJAX, Web sockets or SSE to read data from a web server, to get updates from a server, or to update a web page without reloading the page or to send data to a web server (in the background).
- There must be at least one database table from which you list data in your website. (Any changes in the database should be immediately reflected on the webpage).
  - Perhaps you can have a table containing information about devices. This table could have a structure like:
    - PK for each device
    - Description for each device
    - FK for the location of each device
  - Perhaps you can have one database table containing the status for all devices. This table would have:
    - PK for each entry
    - FK for the device
    - The Status
    - Time stamp
    - FK for the user who modified the state
- Create a data model using a relational model for the whole system database.

Working methodology

Students will work in groups of **3 students**.

- Groups have been already formed. Check in Blackboard.

<u>Students are responsible to contact each other's and manage the work.</u>

Important dates:

- On April 11th, the course responsible will present the project idea as well as the groups.
- On April 17th until 13h, each group will upload, via Blackboard, a report containing the "Project Description".
  - In this first report, students will provide at least an overview of the layout for the web site and describe the main responsibility of each group member.
- In week 16, during the Project Supervision I, the course responsible will discuss and give feedback about submitted project description for each group.
- In week 19, during the Project Supervision II, each group will briefly present the implementation results that have been achieved until the Project Supervision II.
  - In the Project Supervision II, the course responsible will suggest to the group which aspects of the work could be highlighted in the final seminar.
- On April 20th until 13h, each group will upload via Blackboard the final report. The course responsible will assign groups to read each other reports.
- On May 22th, groups will present their project in the seminar.

Project report

The project report should include:

- <u>Project Description</u>
  - Overview
    - A brief description of the web application and how the website is supposed to be used.
    - A sketch for the web application layout.
  - Specification of requirements for the web application
  - Work plan
    - Individual responsibilities
    - Time plan
    - Important deadlines
  - Limitation
    - Eventually some restrictions or constraints are described (what you won't do)
    - Are there any things you may include in the future?
- <u>Project Results</u>
  - For each requirement, the corresponding implementation with details about what has been done.
  - Web application is deployed at ideweb2 server.

Notes:

- *Students will look into existing smart-home or home-based technologies to get inspiration about designing a GUI for a smart home. This will help students to write the "Project Description". Existing approaches are found at http://goo.gl/JOn8l0*
- *Students will look into existing templates for creating web sites, such as the ones found at https://www.w3schools.com/w3css/w3css_templates.asp and http://html5up.net/.*
  - *Students can reuse and modify these templates but describe these in the Project Results. For example, students might want to combine the dynamic left menu of the Striped template with the fixed top menu in Miniport.*
- *A home is divided into spaces or rooms, and these have types (e.g. bedroom, kitchen). A smart home uses sensors and actuators in these spaces to monitor the environment and provide assistance. Perhaps each sensor (temperature, motion) or actuator (light) in the smart home might have its own table in the database. All devices might be described in one table.*

Grading

To receive the grade pass, all requirements (above) must be met. Any supplementary examination is conducted in consultation with the examiner.

A possible blueprint for the smart home