Web Systems Fundamentals and Databases (Grundläggande webbsystem och databaser) 11 HP

DI4020

VT23

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 considers 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.

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

[22] 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 smart home technologies, i.e., control and check the status of devices.
- Manage the smart home, i.e., to add, edit and remove devices and users.
- See web site analytics (administrators only).

Ideally the result is also a mobile friendly web application.

Requirements

1. The system must provide a login page so only authenticated users can use the system.
2. The system must support two categories of users: system administrators and end-users.
3. The system must provide to system administrators web pages to ADD, EDIT and REMOVE:
    a. Devices, including their type (TV, lamp. Motion sensor) and their location in the home (kitchen)
    b. Rooms,
    c. End-users,
    d. Other system administrators.
4. End-users must be able to:
    a. Control devices (turn on/off), and
    b. Check the status (on or off).
5. Administrators must be able to visualize the following analytics of the web site:
    a. A pie chart indicating the most common browsers used to access the site.
    b. A table indicating how many times and the last time a given IP address accessed the site.
    c. A table showing an access log, i.e., which user, ip, page, date, and time.

Students are more than welcome to add more functions and features to the system!

Technical Requirements

- The system is deployed at the School Server Environment.
  - http://ideweb2.hh.se/~user_name/project
  - Ideally, all students in the group have the web site deployed in their accounts.
- Proper database design.
- Valid HTML5, CSS3, JavaScript (or jQuery).
- Responsive web design.
- Please have a look at the templates at
  - https://www.w3schools.com/w3css/w3css_templates.asp
  - https://getbootstrap.com/docs/5.3/examples/
  - https://html5up.net/
- To visualize information in charts and graphs, I suggest you use Chart.js: http://www.chartjs.org/
- Meaningful comments in the client- and server-side code. Adopt a good naming convention for variables.
- Use relative links, so the web site is easy to move.
- Forms validation.
- You might want to use AJAX, Web sockets or SSE to implement CRUD operations without reloading the page or to send data to a web server (in the background).
  - Please, check https://www.w3schools.com/html/html5_serversentevents.asp

Notes:

- Students can investigate existing smart-home or home-automation systems to get inspiration about designing a GUI for a smart home. This will help to write the introduction and motivation. Existing approaches are found at http://goo.gl/JOn8l0
- Please search for "smart home GUI" at Pinterest for inspiration.
- Students can also investigate templates for creating web sites, such as:
  - https://www.w3schools.com/w3css/w3css_templates.asp
  - https://getbootstrap.com/docs/5.3/examples/
  - 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.

Cheating and plagiarism

Halmstad University is taking cheating very seriously and investigates all students who has been reported for this matter. As a student you are liable to follow laws and regulations connected to your studies, and it is your responsibility to make sure you understand the rules. Using prohibited aids during a written exam is considered cheating. Using texts which have been published before, by someone else or yourself, or not citing correctly is considered plagiarism. Halmstad University is carrying out controls continually to ensure the rules are being followed. If you are found to have been cheating you may be suspended for up to six months.

Working methodology

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

- Groups have been already formed. Check in Blackboard.

Students are responsible to manage the work.

Important activities and dates:

- Project Introduction on Feb 28th
  - Purpose: the course responsible will present and distribute the projects.
- Supervision I on March 23rd and 24th
  - Purpose: discuss preliminary system designs, i.e., ER-diagrams and UI sketches.
  - Deliverable
    - "Initial Project Report" on March 21th at 23h via Blackboard.
    - Background, preliminary system design (diagrams and sketches), expected results and time plan.
- Supervision II on April 5th and 6th
  - Purpose: discuss preliminary results.
  - Deliverables
    - Preliminary results are deployed at the School Server environment.
    - "Updated Project Report" on April 3rd at 23h via Blackboard.
    - Background should be finished, preliminary results, and updated time plan.
- Supervision III on May 3rd
  - Purpose: discuss results and which aspects of the work shall be highlighted in the final seminar.
  - Deliverables
    - Achieved results are deployed at the School Server environment.
    - "Draft Final Project Report" on April 31st before 23h via Blackboard.
    - Methods, most of the results, and updated time plan.
- Seminar on May 17th
  - Purpose: present implemented results.
  - Deliverable
    - Final results are deployed at the School Server environment.
    - "Final Project Report" on May 14th before 23h via Blackboard.
  - On May 15th, each group will receive another group's report to read and check deployed results.
  - The group shall elaborate questions concerning the other group's results.

Grading

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

A possible blueprint for the smart home