Intelligent House 4.0 – Smart Light Control

The so-called 4th Industrial Revolution is increasingly changing the control and regulation of technical building processes as well as the maintenance of those systems. This concerns to small apartments as well as large commercial buildings, and this development requires an appropriate adaptation of the competencies of the persons which are educated and employed in the field of building services engineering and home-automation on the qualification level EQF4.
In this project the students will discuss the current possibilities, benefits and risks of home automation. Further on the students will realize simple automation tasks with the help of standard smart-home components.

Students of electronic face the challenge to be able to plan, install and maintain the intelligent house 4.0 which is promoted already for several years. In this module by a simple device possible tasks of electricians and electronic technicians in the craft sector can be simulated. A simple assembling board (e.g. a wall made of wood or chipboard or similar materials) shows the structure of a small building. Various smart home components (sensors, actuators, control unit, …) could be mounted on both sides of the assembling board. On one side you can mount "inside" components, such as lights, switches e.g. and on the other side "outside" components such as doors, windows, video-camera etc. Thus a variety of tasks can be planned and implemented.

Sequences

Scenario means a narrative scenario which is presented in an authentic situation.

Tasks means the development of the concrete tasks, the work plan, (international) division of work, ways of collaboration.

Problem solving means a multidisciplinary or multinational problem solving, implementation of the tasks.

Assessment means an assessment of training success.

Reflectation and evaluation means a meta-cognitive self-reflection and evaluation of the learning process.

Content/ Material

Scenario: Introduction of the learning situation

You are working in a small electro installation company. A long-time customer of you company gives you the order to complement and to expand the existing electrical installation step by step with smart home components.

The existing electrical installation is realized by a conventional installation.

The customer wants to make the transition to smart home components gradually, in order to gain own experience with the new technology. For this purpose, in a first part of the project the lighting control in the living room will be switched to "smart" switches.

Furthermore, the existing energy-saving lamps are to be replaced by LED lamps. With the new LEDs, the colour of the light could be changed via the app.

Also the customer wants to be informed about additional automatization functions that could be realized with the app, and also about the risks of using smart home devices.

Link: 1_Smart_Light_control_students-Scenario-ENG.pdf

Tasks

In the Living room switching of the ceiling lights is done by two-way circuits with conventional switches. Another luminaire is a

floor lamp, which is connected to the power supply via a 230V socket. In a first task the control of the floor lamp and the conventionally constructed two-way circuit should be replaced by smart home devices.

1. Start by planning the required workflow and document your workflow.

2. Discuss your workflow with the other members of your learning group and correct it if necessary.

3. After documenting your planning, please realize the work steps by using the smart wall.

4. Document the working steps you have done.

5. Document the problems during installation and configuration as well as the way to solve those problems.

1_Smart_Light_control_students-tasks-v1-ENG.pdf

1_Smart_Light_control_students-tasks-v2-ENG.pdf

Additional tasks:

1_Smart_Light_control_students-description-Smart-Wall-ENG.pdf

a. Integration of the Phillips Hue LEDs

b. Integration of additional switches

c. Implementation of voice control

d. Network communication in a smart home network

Links:

1_Smart_Light_control_students-additional-tasks-1-ENG.pdf

https://www.bosch-smarthome.com

www.meethue.com

Problem solving

The students will realize the tasks described before by using the "Smart Wall".

After installation and configuration they will test the function of the smart home devices and thy will discuss with the other students the results and the problems that occur.

The Smart Wall is an experimental setting which contains a conventional two-way circuit, Controller for Bosch smart home devices and for Phillips hue light as well as the 230V AC power supply.

Links: 1_Smart_Light_control_students-description-Smart-Wall-ENG.pdf

Assessment

The results can assess by: * Function check: Does the smart home device react in such a way as I have configured with the app?

Video documentation: The students will produce a small video clip that explains the installation- and configuration process. * Answering questions of an online tool: Teachers/trainers formulate questions which must be answered by the students when they will install and configure smart home devices successful and when they have to explaining how smart home systems will work. Those questions will be presented to the learning by an online quiz, like kahoot or quizlet. * Project documentation: The students will write a process-orientated project documentation.

Links: https://kahoot.com/ ; https://quizlet.com/de

Reflection and evaluation

The reflection could be done be an online questionnaire.

Also reflection of the process and the experience of the students will be part of the video documentation or the process-orientated project documentation.

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How to use it

Scenario

Appetiser picture: "[The Smart Wall](#)"

The setting could be realized with the experimental setting "Smart Wall"

Tasks

Depending of the learning group, the task could be formulated open or in narrow steps. The document 1_Smart_Light_control_students-tasks-v1-ENG.pdf is an example for an open formulation of questions, the document 1_Smart_Light_control_students-tasks-v2-ENG.pdf is an example for narrow steps. The best way of collaboration is group work, 2 to maximal 4 students per group.

Depending of the learning group, the first task of the described module needs 4 to 6 h, without a final documentation like the video clip or a detailed process-orientated project documentation.

More detailed information about the tasks teacher and trainer will find in the document 1_Smart_Light_control_student-tasks-information for-teachers-ENG.pdf

Links: [1_Smart_Light_control_student-tasks-information-for-teachers-ENG.pdf](#)

Problem solving

The documentation, for example, could be a video clip or a process-orientated project documentation.

The video clip can be produced with a smartphone and an app like Quik or Adobe Clip

Links:

[1_Smart_Light_control_smart-teacher-description-Smart-Wall-ENG](#)

[1_Smart_Light_control_Component_List_v1-ENG.pdf](#)

https://quik.gopro.com/de/ ; https://www.adobe.com/de/products/premiere-clip.html

https://helpx.adobe.com/de/mobile-apps/how-to/premiere-clip-create-edit-video.html

https://helpx.adobe.com/de/mobile-apps/help/clip-faq.html

Assessment

Both the video clip and the documentation should represent the entire process of the project:

- Description of the target of the project
- The workflow
- The reflection of the workflow
- Possible decisions
- Description of realizing the project
- Occurring problems and the way how to solve the problems
- A reflection of the planning and realizing process of the project

Reflection and evaluation

Evaluation sheet