



Preliminary sketch

Project “STAR”

Student Aid Robot

Project submission for the Smart Campus Herning Prize

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1. Concept idea

Cooperation between people across different geographical locations can today be a significant barrier, despite Skype, Adobe Connect, and other communication platforms. These platforms often don't work particularly well in a teaching or teamwork environment with mixed online and on-campus students. Online students typically experience severe limitations in observation of the on-campus activities and interaction in general may be difficult. On-campus students are not limited in this way, but poor communication may disrupt the learning process and limit input from the online student segment.

Our goal is to facilitate better ways of communication across locations, ways that are more like being in the same room and with fewer barriers.

Our basic idea is to bring online and on-campus students closer together by equipping online students with their own set of eyes and ears on campus, in shape of a small robot. The device is designed for use both in a classroom and lab setting, for ordinary lectures and for teamwork in smaller groups.

The robot is equipped with camera, microphone, loudspeaker, screen and a notification light. The camera is fitted on a robotic arm, thereby allowing the camera to point in any direction, including observing a blackboard in the distance or examining an object on the table near the robot. The robot is also equipped with a USB extension port to allow connectivity to external devices.

The robot is controlled by the online student via a web interface. The primary function of the screen is to show a live feed of the online student or students controlling the robot, but it may also be used for various other information or control functions. The notification light is a way for the online student to attract attention if needed, similar to raising a hand.

We believe that our concept will support AU Herning's strategy of providing online education.

2. Benefits

The STAR robot provides a range of benefits that support integrated online and on-campus learning and education. Below are listed a number of these benefits for both online and on-campus students as well as for AU Campus Herning itself.

Benefits for the online student:

- Provides a physical presence of their own control in the classroom or lab
- Provides freedom of observation by allowing the online student to see in any direction
- Improves possibilities to participate in on-campus activities
- Eliminates dependency on other people providing Adobe Connect or similar access via a laptop computer
- Allow examination of objects like breadboards, charts, meters and other equipment from various angles without continuous assistance from an on-campus person

Benefits for the on-campus student:

- Less time spend on supporting online students, like moving camera angles etc.

- No laptop computer needed for communication with online students
- Improved yield of educational activities due to better communication

Benefits for AU Campus Herning:

- Supports the role of front-runner in mixed online and on-campus education
- Provides an in-house developed product to demonstrate to various stakeholders and others
- Improved yield and attractiveness of AU Herning's educational opportunities

3. Development process

This project is developed as part of the courses "project 3" and "project 4" by Bachelor of Engineering in Electronics students, and 1 year is assigned for the project.

As of January 2019, the first half of the development process is completed, mainly concept development, analysis, design and planning. The bulk of the realization phase will be carried out in the second phase of the project from February through May 2019.

An example of the analysis and design already done is provided in figure 1, showing the project block diagram. The robot will be based on a Beaglebone Black Wireless platform running Linux.

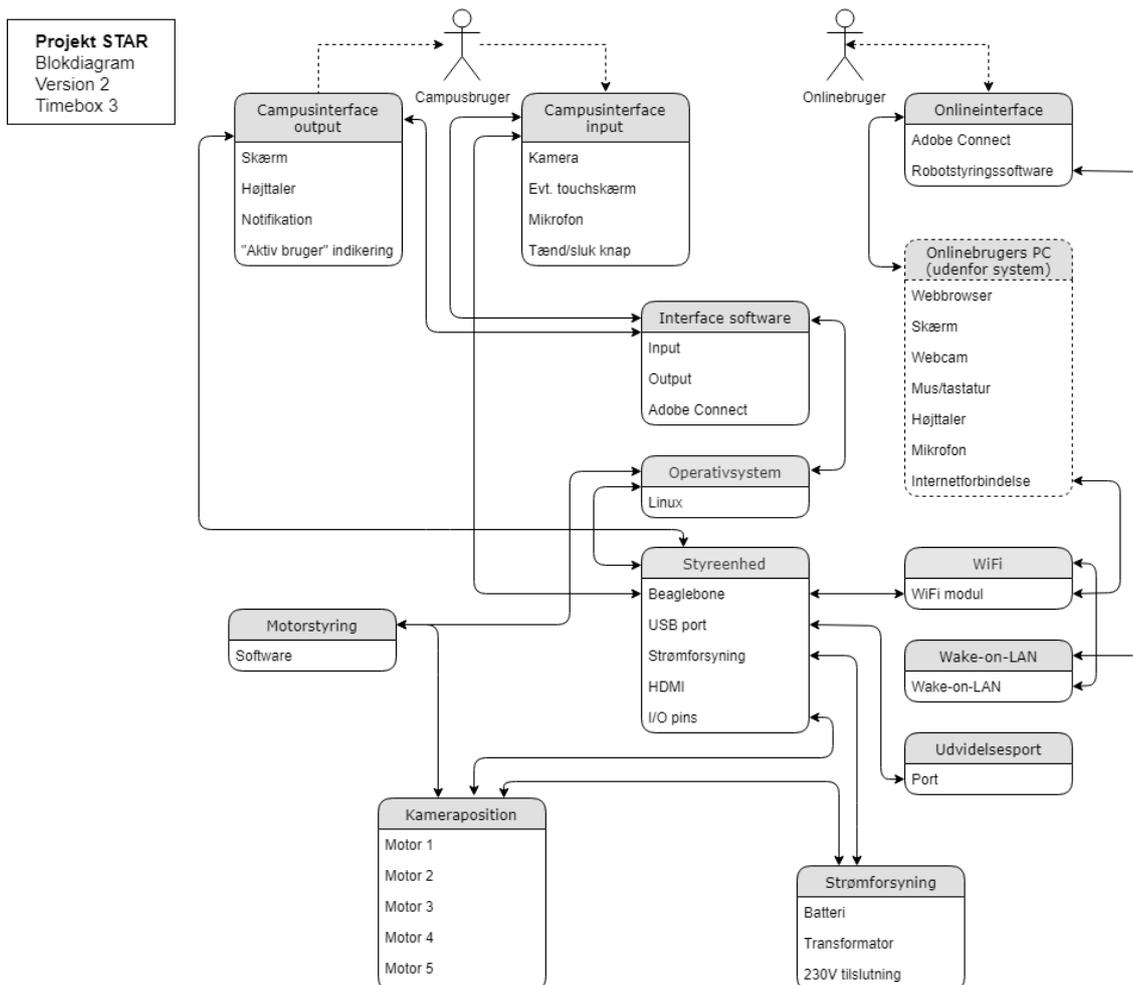


Figure 1 Project "STAR" block diagram

4. Further improvements

The project team envisions possibilities for numerous extension devices and further improvements for the concept. After the completion of this project, a long process of further use, feedback and improvement cycles will likely follow if the prototype is successful, and new ideas for extensions will emerge. The concept may even prove useful in other environments not limited to universities or education in general.

A few examples of further improvements that we have already considered are:

- Wheels for the robot to allow change of position on a desk or possibly the floor
- Laser pointer for on-desk applications
- Implementation of noise filtration and sound improvement technologies
- External expansions connected wireless or via the expansion port, for example various sensors, a support robot to move things around etc.