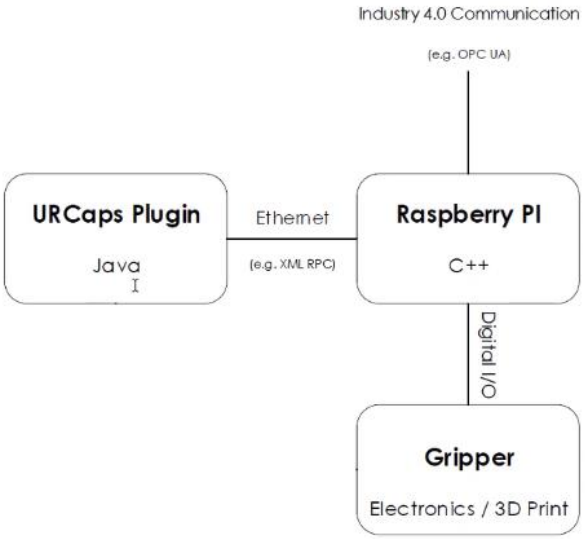
Digital URCaps Gripper

A gripper for the Universal Robots UR5 robot is to be developed during this semester project. An idea could be to follow the block diagram below, but not required.



It is expected that you at least develop:

- A 3D model of a gripper that can be printed or otherwise constructed.
- Electronics to control the gripper
- A URCaps plugin for the UR controller
- Software design of a C++ Program developed on a Raspberry PI, a PC, or possibly both.
- A modern communication interface to the gripper (e.g. OPC UA). Ideas to an interface:
  - The no. of grips
  - Gripper force
  - Gripper distance
  - Etc.

The gripper must fulfil the following requirements

- Supply voltage: 24V (from external supply – **you are not allowed to use the robot controller as power supply**)
- The maximum gripper power use: 600mA
- It is not allowed to use the digital I/O from the UR robot. All I/O must be done through the Raspberry Pi microcontroller. Please remember that the power output from digital I/O is very limited.

Evaluation

The final evaluation will be based on the following:

- Fulfillment of requirements
- Implementation of ideas and innovative solutions
- Documentation and individual examination of the project

Resources

- DevLab http://devlab.sdu.dk
- SDU Library FabLab http://www.sdu.dk/da/fablab
- MMMI PrintLab (contact Cao Danh Do (cdd@mmmi.sdu.dk) for access and instructions)
- Actuators
  - Motors (by request)
  - Push/Pull type electromagnet (JF-0826B)
- RS Online (small components can be ordered by supervisor – within reasonable limits)
- OPC-UA library: http://freeopcua.github.io/ (and a lot of different libraries)
- UR tutorials:
  - Generic tutorials: https://www.universal-robots.com/academy/
  - SDK for developing URCaps plugin (requires login) https://www.universal-robots.com/plus/developer/
    - When logged in go to: http://forum.universal-robots.com/t/release-of-polyscope-3-5-and-sdk-1-2/1365
    - Download the starter-package - a virtual machine with a UR simulator and UR SDK, or the SDK itself.
    - If running Linux, you might just get the SDK and download the UR offline simulator as a standalone software.
      - Simulator https://www.universal-robots.com/download/?option=16451#section16447
      - You might get into problems with newer versions of Linux due to version incompatibility with Java. This might be solved by removing the explicit dependency in the install.sh script.
    - After installation of the SDK, there is a pdf in the "doc" folder with tutorials which we encourage you to study.

Group members

If group members decide to stop their studies or if group members for some reason are excluded, the group has to e-mail Kristian Severin Rasmussen (krsr@tek.sdu.dk). You need to tell which person has dropped out followed by the reason given. Please discuss the case with your supervisor.