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| Project Work 1 - Outline | | |
| **Study Cohort** | | AD22 |
| **Title** | | Process Modeling and Implementation with Blockly, Python, and Node-RED |
| **Confidential** | | No |
| **Specialisation** | | Robotics, IoT |
| **Names** | Students | Kai Aebli  David Senn |
|  | Supervisor | Marco Brunschwiler |
| **Assignment**   * **Initial status** * **Objectives** * **Additional Assignment Modalities** | | Robot arms and other actuators play an important role in the automation of processes in laboratories and production plants. Examples of such devices are available in the department in the form of Dobot Magicians. The Dobot Magician is a 4-axis robot arm that is suitable for various tasks in the laboratory context. Such robot arms and other actuators often work together in strictly defined processes, whereby the process flow considers certain external signals or conditions depending on the context. The semi-formal modelling of such processes plays an important role in the digitization and automation of laboratories and production plants. The robot arms can be programmed using the so-called "no-code" environments Node-Red and Blockly. In a "no-code" environment, functional blocks are arranged in a graphical interface.  Raspberry Pis are single-board computers that are used in various industries such as Engineering, Computer Science, Physics, Astronomy, Biochemistry, Genetics, Molecular Biology, Materials Science, Chemistry, Environmental Science, Mathematics, Robots, Chemical Engineering, Business, Management and Accounting. Looking closer into the field of Robotics there are numerous applications:   * **Multi-Utility/Multi-functionality Robots** can be used in the military to assist and protect soldiers from metal bombs and land mines. In the industry – in combination with Raspberry Pi – intelligent robots can be developed and deployed easily. * **Surveillance Robots** can be used in unrecognized, inaccessible areas. Raspberry Pi enables surveillance technologies with minimal cost and high accuracy. * **Line following robots** are commonly used in hospitals, medical centers, farming, military and factories. These robots follow a given path autonomously by using infrared sensors with the Raspberry Pi to help tracking a line and differentiating it from the background. * **Crop disease detection:** The leaves of plants provide essential information about their health. By using image processing diseases get detected and the farmers can be alerted automatically. Further the cause of the disease and important parameters like humidity, moisture, temperature or the water level of the tank may be delivered and monitored.   There are many more applications like automated billing in supermarkets, mapping of inaccessible tunnels, rescue operations in unknown environments, herbicide spraying, wall painting, fire exterminating etc.  (Mathe et al., 2022)  A further benefit of the Raspberry Pis is their low cost while having relatively high computing power and low power consumption. Additionally they are resilient against power failures or challenging environments such as hot or cold temperatures. These benefits makes the Raspberry Pi 4 optimal for the use as control units of the IoT devices or as edge clusters (Pahl et al., 2016)  Research questions:   * Is Blockly or Python better for the implementation of a process? * How well can a process defined in Blockly be translated to Python? * Are Raspberry Pi effectively usable as edge cluster in the industry?   Preliminary table of content  Zusammenfassung  Abstract  Table of content  Glossary  1 Introduction  2 Theoretical background  3 Methods  4 Results  5 Discussion  6 Conclusion  7 Bibliography |
| **Formal Requirements** | | * All relevant [Guidelines](https://www.zhaw.ch/de/lsfm/studium/studiweb/bachelor/pruefungen-und-studentische-arbeiten/) for student papers * Citation management software: Zotero * Citation style: APA 7 |
| **Timeline** | | *See last page* |
| **Submission Deadline** (12:00 PM) | | *23.05.2024 12:00* |
| **Remarks** | | Submission requirements:  Project report: Uploaded digitally via Complesis (as PDF and original file format)  Code: tracked and documented on a Github repository |
| **Workplace** | | ZHAW Wädenswil |
| **References** | | Mathe, S. E., Pamarthy, A. C., Kondaveeti, H. K., & Vappangi, S. (2022). A Review on Raspberry Pi and its Robotic Applications. 2022 2nd International Conference on Artificial Intelligence and Signal Processing (AISP), 1–6. https://doi.org/10.1109/AISP53593.2022.9760590 |

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