

SUMMARY

Control system of industrial robot is very complex. It has such aspects as high communication speed, high reliability of calculations and fully developed programming language for robot control. For the complexity of the system, manufacturers of industrial robots make it closed box and trade secrets. However, robotics becomes more and more popular these days, and many are trying to reproduce the control system of robots used in industry. In this thesis a possible scheme of such control system was introduced.

There are multiple must have aspects in robot control system. They are kinematics calculations, communication between components of the system, motion planning and high-level programming, and user interface. While first two are low-level control parts of the system, last two are used mainly by user and were inspired by industrially applicable robots.

Kinematics is one of a keystones of successful control system. Kinematics equations should as simple as possible and should require minimum of calculation power to make robot movements fast and precise. Inverse kinematics solutions can be improved because there are still many irregularities which cannot be solved directly anymore. It is possible that Euler angles was not wise and for the future it can be better to use quaternions.

Communication speed is crucial for fast movements. Amount of data send must be minimum and parallel communication should be used when it is possible. It is possible to reduce importance of communication speed by moving some of calculations closer to the servo motor, however it was not possible in the case of SainSmart robot due to computing limitations of Arduino microcontroller.

GUI can be very helpful for visualizing of information, that is why layout and design are important. In the future the robot can be implemented into existing FMS and GUI will have to be improved to visualize not only the robot, but entire manufacturing cell. Additionally, there is no programming of the robot is implemented and should be added. Programming of the robot is also on a user side and therefore it should be easy to understand and use the programming language of the robot.

Even though the complete implementation could not be achieved, most of the features can be shown. There is still a lot to improve and add, so the robot still cannot be fully implemented into FMS. However, result shows that it is possible to use this control mechanism in the future. Additionally, new robot can be built to fully fulfill its task and the same control system can be used.