Designing a Smart-Factory research-platform

Degree programme: BSc in Micro- and Medical Technology | Specialisation: Robotics
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Development of robotic systems is now progressing at a fast pace. With the Internet of Things and new technologies in communication, new concepts in industrial production become feasible. The industrial robots will become more dynamic and autonomous. In future factories these new technologies will become even more important. To follow this trend, a research platform to study these concepts, is required.

Introduction

During the next years industrial production cycles faces a tremendous change. A big part of this change includes the interconnection of robots and their abilities to handle unexpected situations in a completely new way. To understand these new technologies, there is a need for simulations and research platforms. At the robotics lab of the BFH in Biel, the required infrastructure already exists. There are several industrial robots available, including the mobile robotic platform «Youbot» from KUKA. This robot is equipped with a robotic arm and a carrying platform. It can pick up objects and carry them to another place where they are needed.

Goal

The aim of this work is to build a model of a Smart Factory in an lab environment. The ideas of a self controlling production line with the ability to dynamically react on given problems are to be implemented. The whole process should be monitored on a screen to visualize informations about the state of the factory.

Implementation

In a first step the mobile robot «Youbot» has been programmed to fulfill the tasks as «delivery boy» in a modern factory. This includes localization, path planning and obstacle avoidance and to control the robotic arm including the gripper.
To pick up objects he has to recognize them and know their position. To keep that as simple as possible two-dimensional bar codes are used to find the targeted objects and calculate their exact position. As the stationary part of the factory a ABB IRB140 robot is used.
A huge part of the modern factory is the aspect of the machine to machine communication. To become a more robust system, there is no need of a master machine to control the system. Every robot has the possibility of publishing tasks to the whole network of different robots. Every robot inside the network which fulfill the requirements of this task can answer to this call.
All actions are visualized on by a supervisor on three-dimensional models of the Robots. This gives easy to understand information about the state of the robots.

Conclusion

The model of the smart factory contains the most important parts necessary to work as a complete system. This basis gives the opportunity to implement more specific aspects of future industrial concepts and is a strong foundation for further projects. This work is a first step in direction of «Industry 4.0».

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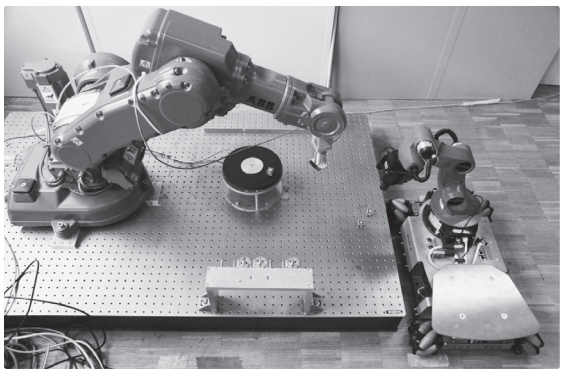
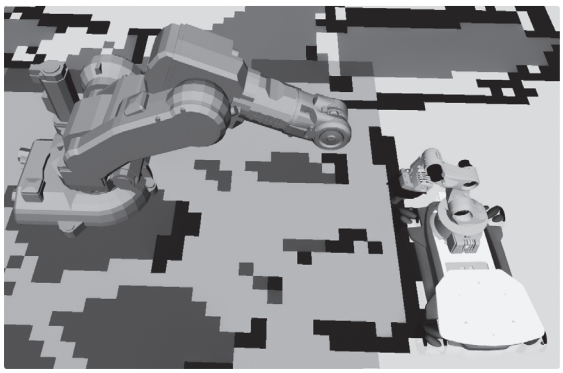


The real robots picking up cubes with two-dimensional bar codes.



The three-dimensional visualization used to monitor the progress of the robots.