SUMMARY

Throughout the work multiple machine vision system parameters were researched. The study outlines the importance of choice of the right optics – the basic understanding of the parameters such as focal length, working distance and field of view is an integral part of the background that allows to partially establish the requirements for the machine vision camera. Furthermore, the work considers the aspect of illumination. It can be certainly concluded that lightning is one of the key components in the system. The multiple experiments have shown that often the incorrect illumination of the inspected object is the reason for recognition inaccuracies. Therefore, as a separate project, the external adjustable light source may be implemented in future to achieve the fully controlled lightning conditions. The final part of the system that this work goes into is the camera fixture. During the project the mechanical camera stand was developed in order to increase the usability of the system. In the educational purposes, it is vital to have an opportunity to change the camera's position based on the application task and size or shape of the investigated object.

The goal of the present study was to test the capabilities of the industrial Cognex camera, understand the components of the machine vision system, and research the integration possibility with ABB robotics. A series of tests were carried out using the Cognex In-Sight 7905c machine vision camera. It is evident that a modern industrial camera is a powerful tool that allows automation of various quality control tasks. The inspection, measurement, identification, and verification-related tasks are all can be done by a single camera. The Cognex camera controlled by In-Sight software with all of the tools included was tested to perform different tasks, which with minor modifications could be applied to the actual production environment. The reading of characters, the detection of patterns, working with color, etc are just a few of the recognition algorithms available for the customers. Furthermore, the study discovered the topic of camera calibration. Calibration of the camera allowed to compensate for the radial distortion of the camera's optics, and to outline the real-world distances. Throughout the work, multiple calibration attempts were made to gain an understanding of the process and how to achieve better results. Although the calibration doesn't impact most of the tools provided by Cognex (e.g., color or pattern tools), it is a mandatory procedure for the camera to robotics integration.

In the last chapter, the work explores how the Cognex camera can be connected to ABB RobotStudio, which can be considered as the first step in the automation and flexibility of industrial robotics. Eventually, the created virtual simulation explains the

communication between the virtual ABB robot and the real Cognex camera that takes in the data from the acquired images in the laboratory. The simulation serves as a proof of concept that the integration of the machine vision camera and robotics opens a whole new area of VGR-oriented research. Further development could include several modifications to the simulation to make the edge between virtual and real more transparent, whereas the next step would be the physical integration of the vision component into the robotic manipulator.