

## I. Personal and study details

Student's name: **Sinchiguano Chiriboga Cesar Augusto** Personal ID number: **464328**  
Faculty / Institute: **Faculty of Electrical Engineering**  
Department / Institute: **Department of Control Engineering**  
Study program: **Cybernetics and Robotics**  
Branch of study: **Cybernetics and Robotics**

## II. Master's thesis details

Master's thesis title in English:

**Part localization for robotic manipulation**

Master's thesis title in Czech:

**Lokalizace předmětů pro robotickou manipulaci**

Guidelines:

The new generation of so-called collaborative robots allow the use of small robotic arms without them being isolated from human workers. Such an example of collaborative robot is the YuMi robot, a dual 7-axis arms robot designed for precise manipulation of small parts and available in our laboratory.

For further acceptance of such robots in the industry, some methods and sensor systems have to be developed to allow them to pick parts without the position of the parts being known in advance, just as humans do.

The aim of the project is to implement algorithms for the localization of known parts. Part of the work will consist in calibrating the camera relatively to the robot and developing methods to obtain the ground truth position of parts. The second part will consist in developing the localization algorithms themselves.

The student's tasks will consist in:

- developing a camera-robot calibration algorithm,
- developing the software and/or hardware to determine the ground-truth position of a single isolated part,
- developing algorithms to localize an isolated part,
- verifying the system experimentally,
- studying the possibility to extend the system to picking multiple isolated part and random bin picking.

Bibliography / sources:

[1] Besl PJ, McKay ND. A method for registration of 3-D shapes. Pattern Analysis and Machine Intelligence, IEEE Transactions on. 1992; Vol 14(2), pp. 239–256.

[2] Point cloud registration from local feature correspondences—Evaluation on challenging datasets  
Petříček T, Svoboda T (2017) Point cloud registration from local feature correspondences—Evaluation on challenging datasets. PLOS ONE 12(11): e0187943. <https://doi.org/10.1371/journal.pone.0187943>

[3] Segal AV, Haehnel D, Thrun S. Generalized-ICP. In: Robotics: Science and Systems V. Seattle, USA; 2009.

[4] Mian AS, Bennamoun M, Owens RA. Automatic Correspondence for 3D Modeling: An Extensive Review. International Journal of Shape Modeling. 2005; Vol. 11(02): pp. 253–291.

Name and workplace of master's thesis supervisor:

**Dr. Gaël Pierre Marie Ecorchard, Intelligent and Mobile Robotics, CIIRC**

Name and workplace of second master's thesis supervisor or consultant:

Date of master's thesis assignment: **24.10.2018**

Deadline for master's thesis submission: \_\_\_\_\_

Assignment valid until:

**by the end of summer semester 2019/2020**

Dr. Gaël Pierre Marie Ecorchard  
Supervisor's signature

prof. Ing. Michael Šebek, DrSc.  
Head of department's signature

prof. Ing. Pavel Ripka, CSc.  
Dean's signature

### III. Assignment receipt

The student acknowledges that the master's thesis is an individual work. The student must produce his thesis without the assistance of others, with the exception of provided consultations. Within the master's thesis, the author must state the names of consultants and include a list of references.

\_\_\_\_\_  
Date of assignment receipt

\_\_\_\_\_  
Student's signature