

I. IDENTIFICATION DATA

Thesis name:	Localization and grasping of objects by a robot arm covered with sensitive skin
Author's name:	Karel Bartůněk
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Gabriele Mario Caddeo
Reviewer's department:	Italian Institute of Technology

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
The thesis tackles a well-known problem in robotics: localization and grasping of simple objects using tactile sensing without the aid of visual sense. Only skin sensors were available which, differently from typical state of the art tactile sensors, are characterized by lower precision, making the task more challenging. Furthermore, the candidate was required to focus on developing a fast method to accomplish the task.	

Satisfaction of assignment	fulfilled
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
<ol style="list-style-type: none"> 1. The candidate clearly familiarized with the UR10 robotic platform and thoroughly explains the pros and cons of the AirSkin. 2. The candidate successfully developed a system to localize objects in each region of interest using only tactile feedback. Personally, I appreciated the way the candidate extended the explanation on why the presented approach represented the best tradeoff. 3. The goal was achieved with reasonable accuracy. 4. The candidate compared a simple approach (Passive grasping) with a more precise one (Tactile grasping), showing a good improvement with a little increase in the time required to successfully complete the task. 	

Method of conception	outstanding
<i>Assess that student has chosen correct approach or solution methods.</i>	
Given that the available hardware (AirSkin) could not provide highly precise tactile feedback, I feel that the proposed approach represents a great trade-off between precision and velocity. The student clearly motivated the design choices by explaining why other solutions were not feasible due to complexity or other limitations.	

Technical level	B - very good.
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
The technical level of the thesis is high, especially considering it is a bachelor's project. The student demonstrated a solid understanding of robotics, particularly in the area of tactile sensing and object localization. Knowledge acquired during his studies was effectively applied, and the thesis shows evidence of critical engagement with relevant literature. Additionally, the student incorporated practical insights gained through hands-on experience with the robotic system, resulting in a well-grounded and technically sound approach.	

Formal and language level, scope of thesis	A - excellent.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
The language was generally correct, with minor errors along the thesis (e.g. 'the material of the material' second line page 11, or 'ts pose' third line page 33). The use of AI Tools is evident, though I am not saying this is a bad thing.	

Selection of sources, citation correctness

B - very good.

Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.

The student correctly cited a good number of papers, although he did not cite relevant state-of-the-art works in detection, pose estimation, and grasping. I did not understand some choices, like talking about random forest in Page 3, as it was never used in the thesis and no comparison with other methods was made. Moreover, I would organize the citations depending on the tasks, like grasping, shape estimation, object localization. I feel this part can be improved, though it seems that the student has a general knowledge on how to treat a "related works" section

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

I would like to give some advice and point out some things that were not entirely clear in my opinion.

- In Fig 3.4 I would use the same length for the Time axis.
- Sec. 4.1 is not explained very well in my opinion, I would suggest making it clearer.
- I would rotate Fig. 4.4.
- Is Fig. 4.6 rotated to match the rotation of the green area in Fig. 4.5?
- In chapter 6 it is written that the objects are placed randomly on the table. What do you mean by randomly? Are you randomly sampling a grid or are you doing this by hand?
- In the text, you should use either "I" or "the author",
- Why 18 samples for cuboid medium and 46 for bottles?

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

- I would ask the student to explain how the 1.5 cm offset was chosen, whether it was entirely empirical or based on other considerations.
- I would ask him to clearly explain why he thinks the bottle should be easier to grasp than the cuboid.
- Moreover, I would ask him to reflect on how the approach should be adapted when dealing with unknown objects of complex shapes.

Overall, the thesis is well-structured, and the student did an excellent job. Considering this is a bachelor thesis, I found the technical aspects and the discussion to be of a high level. Bonus points for releasing the code. The grade that I award for the thesis is **A - excellent**.



REVIEWER'S OPINION OF FINAL THESIS

Date: 7th June 2025.

Signature: