I. IDENTIFICATION DATA

Thesis title:	**Tactile Sensors Based on Graphene Aerogel**
Author's name:	**Tomáš Chaloupecký**
Type of thesis :	Master Thesis
Faculty/Institute:	Faculty of Electrical Engineering
Department:	Department of Cybernetics
Thesis reviewer:	Lorenzo Jamone
Reviewer's department:	Queen Mary University of London (UK)

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	extraordinarily challenging

How demanding was the assigned project?

Very demanding. An impressive amount f work done.

Fulfilment of assignment	fulfilled

How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.

The thesis fulfils the assigned tasks well.
The primary goal of designing and testing a sensor prototype has been achieved.

The additional goal related to robotic application was only partially achieved, which is reasonable given the limited time available .

Methodology	A - excellent

Comment on the correctness of the approach and/or the solution methods.

The approach is excellent.

Technical level	A - excellent

Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?

The work is technically sound and generally very well explained. However, some claims would need further support, and some design choices would need a more clear explanation of the rationales behind.

Formal and language level, scope of thesis	B - very good.

Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?

The thesis is very well organised and presented, and the body of work is quite impressive for a Master thesis. The English is satisfactory, given that the author is not mother tongue; writing style could be improved.

Selection of sources, citation correctness	A - excellent

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The state of the art in tactile sensing is well referenced, and the original work of the author clearly distinguished from previous works. Maybe, review papers that summarise the state of the art could have been referenced as well. The state

of the art of tactile robotic grasping and manipulation could have been extended a little bit (although it relates to a secondary objective of the thesis).

| **Additional commentary and evaluation (optional)** |
| *Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.* |
| Very good work overall, quite impressive for a Master thesis. More quantity than quality maybe, at least judging by the written document... possibly, some aspects could have been analysed in more depth, leaving out some of the tasks. |

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

Overall, the thesis is very good: original, well structured and thorough.

Questions:

PAGE 28: "As we plan to use this device in robotic application, the stream of measured data into the Robotic Operational System (ROS) is mandatory "

Why? What are the implications, i.e. pros/cons of using ROS for e.g. tactile-based grasping?

PAGE 28: ""Complete schematics can be found in the attached files. " What files? Better to explain how/where the additional files are... why not an appendix?"

PAGE 35: "This solution is yet still not sufficient for our cause as it provides only 15 different gain settings".

How many gain settings do you need, and why?

PAGE 53: "Even though an error like this is rather large with respect to the total dynamic range of the sensor, we find this result to be precise enough. " Precise enough for what? What were the expectations? How does this compare to the state of the art?

PAGE 54: "After these experiments, we did not observe any resemblance of breakage " How was this evaluated?

PAGE 55: "As can be seen in Figure 5.12, for sensor "20R" is the minimal confidently detectable force 46 mN and for the other sensor 0.48 N ". Why not using the same units??

PAGE 56: "Moreover, with respect to the full range of measurement, we find this sensitivity to be quite fine. ". Again, this type of evaluations are pointless, unless you explain what "fine" means in this context...

PAGE 56: "For qualitative measurement, a more precise device would be needed. " Do you mean quantitative?

PAGE 61: "We set up an experiment during which the Kinova Gen3 robot uses the robot Robotiq 2f-85 gripper equipped with our sensor to lift the cobblestone 1000 times. " What is the cobblestone? Please explain and/or add an image.

PAGE 62: "Sheer forces", it should be Shear forces. Also, it should be explained what those forces are (i.e. definition).

PAGE 68: "However, we did not have another option than to use the 40 Hz interface." Why?
"It was enough for the testing purposes of our task. ". Why?

PAGE 79: ". In case of paper card the following of setpoint reference was rather bad. " Why? Any idea about the possible causes?

PAGE 79: "All the objects were grasped so that they were not deformed and did not fall out of the gripper. " How did you measure and/or evaluate this, exactly? Are these qualitative or quantitative observations?

Comments:

English is mostly correct, but several sentences are not very elegant, sometimes hindering comprehension.

e.g. "The explanation of every particular component and its purpose would be too exhausting. "

Exhausting? Why? Each better than every in this case... their better than its...

e.g. "Moreover, thermal dependence of resistance of the copper wire, from which cables are constructed, could ruin the temperature properties of the GA sensors. " Ruin not the best word here... affect would be better; articles are not used properly, it should be "the thermal dependence of the resistance". In fact, the entire sentence could have been better structured, as in the current form it is not very clear; e.g. "...changes in temperature modify the resistance of the copper wires, thus possibly affecting the GA sensor measurements."

The grade that I award for the thesis is   **A - excellent.**

Date: 08/06/2023   Signature: Lorenzo Jamone