THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Indoor Robot Localization Using Magnetometer Data**
Author's name:	**Tomáš Fiala**
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering
Department:	Department of Cybernetics
Thesis reviewer:	Ing. Tomáš Petříček, Ph.D.
Reviewer's department:	Department of Cybernetics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **challenging**

How demanding was the assigned project?

The goal was to create several static magnetic field maps from magnetometer data and ground-truth localization. Then, propose, implement, and evaluate an algorithm for localizing the robot within these maps using live measurements from the magnetometer.

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.

Several indoor datasets were collected from which the magnetic field maps were created. The proposed algorithm was implemented and evaluated. The results show improvement over baseline robot odometry.

Methodology **correct**

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

The methodology is sound with the few objections I mention below.

Technical level **B - very good**

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 overall technical level is good, yet, some parts need clarification. The calibration procedure for the magnetometer should be described in more detail and all variables in (2.1) should be defined. It would also be worth discussing which part of the calibration is needed for the proper functioning of the localization algorithm. Later, in equation (3.4), it seems that the reference point should be at time t - 1, as d +Δd measures the distance from that, change in robot movement direction Δθ should also be used here. Also, there may need to be a minus sign in the projection onto the x-axis (angles are measured from the y-axis). If α denotes the absolute orientation in the map frame, as indicated by Fig. 3.6, it is unclear why to use extra θ in (3.5) to rotate the magnetic induction vector.

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 text is well written and easy to read. Some equations, e.g. (3.4), are listed separately from the flow of the main text which makes the text a little harder to read. Also, some figures are not referenced from the text before they appear (see chapters 2 and 3) and some are referenced with wrong names (Figures 3.4 and 3.5).

Selection of sources, citation correctness **B - very good**

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 author adequately references relevant previous work. It would be worth introducing the general problem of localization

within a known map and discussing some previous works using other sensor modalities as well; this would put this particular approach and the outlined future work into a better perspective.

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.

The thesis addressed mobile robot localization using magnetometer data with wheel odometry. It is well-written and technically sound. The proposed algorithm improves over baseline robot odometry.

1) How were the weights in (3.2) chosen and what values were used in the experiments?

2) Could the original interpolation (sometimes possibly extrapolation) from (2.8) be used directly instead of the proposed two-step process consisting of assignment to grid points using (2.8) followed by bilinear interpolation in the grid?

3) How was the relative pose of the magnetometer and lidar calibrated?

The grade that I award for the thesis is **B - very good**.

Date: August 25, 2022 Signature: