

I. IDENTIFICATION DATA

Thesis title:	Rotation speed estimation from videos
Author's name:	Gorbunov Denis
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Computer Science
Thesis reviewer:	Alan Lukezic
Reviewer's department:	University of Ljubljana, Faculty of computer and information science

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The problem which was addressed in the thesis is challenging and seems practically useful. It requires a lot of technical skills (e.g., for Android app design) and domain knowledge (computer vision, image processing, deep learning, etc.). Considering a bachelor thesis, the task's difficultness level is probably above average.	

Fulfilment of assignment	fulfilled
<i>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.</i>	
The thesis addresses the estimation of the rotation speed of the object. Experiments show that the accuracy of the estimation is high for a wide range of rotation velocities. All parameters of the algorithm are experimentally evaluated; thus, their selection is well justified.	

Methodology	outstanding
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The main methodology used in the thesis is optical flow estimation based on deep neural networks (RAFT). This method is used to estimate the movement of multiple points in the video, constructing a trajectory for each point. The remaining of the pipeline consists of filtering of points and trajectories, transforming the coordinate system, estimating camera angle and final rotation speed estimation.	

Technical level	A - excellent.
<i>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?</i>	
The thesis is technically sound. The technical part of the thesis including mobile app design is well described and justified. The methodology is also clear, including all the details and parameters, which are also experimentally evaluated. It is clear what has been done and why.	

Formal and language level, scope of thesis	A - excellent.
<i>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?</i>	
The thesis is well formatted, and the language is excellent. Organization and presentation follows the format and style of scientific papers, which makes the thesis easy to read and to follow.	

Selection of sources, citation correctness	A - excellent.
<i>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?</i>	
References are adequate and the presentation of the related methods is substantial. The work is clearly compared and distinguished to the existing methods. References are well formatted.	

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.

To me, the thesis quality is excellent. The author shows great technical knowledge and domain expertise. In addition, the candidate demonstrates capability of formal, scientific writing. The thesis could be easily converted into a scientific paper.

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 candidate showed excellent technical skills and domain expertise (computer vision field)*
- *The problem, which was addressed in the thesis seems challenging and practically useful.*
- *The thesis is technically well presented, the methodology is well described and justified with the experiments.*
- *Questions for the candidate's presentation:*
 - *Can you discuss the reasons for worse rotation speed prediction at higher speeds? How could it be improved? Would better hardware improve the prediction at higher speeds, or are methodological changes required to address this?*
 - *An important part of the pipeline is flow estimation using RAFT. How resource hungry is RAFT on mobile phones? How would you change the pipeline to be more efficient, especially for mobile devices?*
 - *Consider an additional segmentation step, where the user clicks on an object of interest and the algorithm segments it (e.g., using SAM method). This might detect most of outliers and noise points on the background. Do you think that the proposed method would benefit from such a segmentation step?*

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

Date: **11.6.2024**

Signature:

