CTU
CZECH TECHNICAL UNIVERSITY IN PRAGUE

THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	Visual Prediction of Surface Properties in Complex Off-Road Terrain
Author's name:	David Kraus
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Karel Zimmermann
Reviewer's department:	Department of Cybernetics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment — **ordinarily challenging**

How demanding was the assigned project?

Please insert your comments here.

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.

I am not sure if surface normals are taken into account explicitly, as requested in the thesis assignment.

Methodology — **correct**

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

Please insert your comments here.

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?

Please insert your comments here.

Formal and language level, scope of thesis — **A - excellent.**

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?

Please insert your comments here.

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?

Please insert your comments here.

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.

Please insert your comments here.

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

Student fulfilled the assignment of the diploma thesis. The proposed solution looks correct, robust and easy to tune for a specific scenario, that is very important in any real deployment. The thesis is clearly written, the only unclear part is the Section 3.3.3. about the self-supervised learning (see questions below). Nevertheless, the student demonstrated the ability to perform independent engineering work and opened the space for an interesting future research.

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

Question to be discussed during the defense:

1. The proposed approach learns to detect rigid obstacles that are above the ground plane in the coordinate frame of the camera. Can the resulting method somehow infer the actual roll/pitch angle of the vehicle? What about the cases, where the traversability is determined by the roll/pitch angle of the vehicle, such as ground plane that look like the same in the camera but in one case it has zero inclination and in the other case it has 60 degrees inclination?
2. What are the typical limitations/failure cases? For example, can you go through a ditch (i.e. traversing U-ramp in the U-direction)?
3. Does the self-supervised learning try to replicate the output of geometric segmentation? If so, can this ever be better than the geometric segmentation itself? Consequently, Figure 4.10 with wooden block shows that the self-supervised monocular method can somehow understand that the wooden block is not traversable. Is it just a coincidence or is there any intuition behind it?
4. Have you tried to run some kind of greedy navigation that navigate the kart towards the most traversable part of the scene?

Date: **31.5.2023** Signature: