

Review of Master's Thesis

Student: Minárik Martin, Bc.

Title: Detection of changes in the scene captured by the drone at different times (id 23294)

Reviewer: Bambušek Daniel, Ing., DCGM FIT BUT

- 1. Assignment complexity** **more demanding assignment**

The assignment requires an understanding of non-trivial computer vision algorithms, in particular structure-from-motion for reconstructing 3D representations of the environment from drone photos, working with pointcloud representation, geo-referencing, acquisition of custom datasets, etc. Apart from the data processing itself, the author had to create a GUI that would mediate and automate this processing for the user.
- 2. Completeness of assignment requirements** **assignment fulfilled**
- 3. Length of technical report** **within minimum requirements**

The technical report contains about 41 standard pages of text and about 12 standard pages of figures and easily meets the required minimum.
- 4. Presentation level of technical report** **70 p. (C)**

The technical report is well structured, follows a standard format and is very easy to read. The individual chapters are logically linked to each other.

The vast majority of the figures are unnecessarily small. Then the description of the implemented GUI, including screenshots, is completely missing. The core parts of the thesis - the changes detection pipeline and the actual evaluation of detected changes - are described somehow, but there was room for improvement, especially in the "Implementation" chapter.
- 5. Formal aspects of technical report** **85 p. (B)**

The thesis is written in English and is of an excellent language level. In terms of typography, there are occasional missing references to a picture from the text or the use of a hyphen instead of a dash.
- 6. Literature usage** **80 p. (B)**

The author cites 11 quality literary sources and 14 online sources (documentation and online articles), some of which could have been put in footnotes.
- 7. Implementation results** **60 p. (D)**

Mr. Minárik used and connected a number of non-trivial existing tools into a single pipeline that can process input photos or video taken from a drone, create a 3D representation of them in the form of a point cloud, and compare this representation with previously captured data to detect changes. He integrated this processing into a simple web-based GUI. However, the result is rather basic and lacks a better presentation of the change detection results to the user (e.g. in the form of a heatmap embedded in the image) and a more completed GUI. I see a big reserve in the testing that could have been done on a larger number of datasets and in some final evaluation that would tell to what extent the implemented solution is reliable, when it correctly detected the change and when it did not.
- 8. Utilizability of results**

The work has potential and can certainly be used as a basis for a robust change detector with a high quality user interface.
- 9. Questions for defence**
 1. Which values of heights from point cloud differences can be considered as a change and what is just a noise?
 2. What would all need to be done to present the results of the work in a more readable form to the user (e.g. using a heatmap embedded into a photo)?
- 10. Total assessment** **70 p. good (C)**

Mr. Minárik created a basic solution for detecting changes from drone flight records using the state-of-the-art methods. The resulting solution is well on its way to becoming a useful tool, but unfortunately it lacks a number of shortcomings, in particular a better representation of the results, a better GUI and proper testing of the entire tool on multiple different datasets. The work itself is verging on D-C. Due to the higher difficulty of the assignment, I suggest a grade of C.

In Brno 2 June 2022

Bambušek Daniel, Ing.
reviewer