

## Review of Bachelor's Thesis

**Student:** Tabernero Diego  
**Title:** Optical Flow Methods for Video and Image Segmentation (id 22103)  
**Reviewer:** Španěl Michal, Ing., Ph.D., UPGM FIT VUT

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

This bachelor thesis deals with video and image segmentation what is a challenging topic. Many approaches and research papers exist in the field. The student had to study optical flow estimation methods, understand basics of machine learning and feature classification and how these can be combined together.
- 2. Completeness of assignment requirements** **assignment fulfilled**

The student focused his work on video stabilization and his particular goal was to realize and evaluate an approach for video segmentation into stable and non-stable frames. Unfortunately the final solution is not capable to classify stable frames rather frames with/without motion. A stabilized, or stable, video is not the same like a video without motion!
- 3. Length of technical report** **in usual extent**

The second chapter with the background and description of existing methods contains almost 3 pages about crowd segmentation what is not relevant for the goal of video stabilization. On the other hand, there are just two short paragraphs about the video stabilization itself.
- 4. Presentation level of technical report** **60 p. (D)**

The major weakness of this thesis is its presentation level and language. Description of existing algorithms is usually too brief and ends suddenly before the whole algorithm is described. Some figures are of terrible quality. Chapter 3 mixes description of the proposed solution with basic theory like the principle of cross-validation.
- 5. Formal aspects of technical report** **55 p. (E)**

The dissertation thesis is written in English at the level so it is understandable. But there are many typos and grammatical errors that could be removed by proofreading. Sometimes, it is very difficult to understand details of the proposed solution because there are complex sentences with incorrect structure. The author uses two terms "module of vector" and "magnitude of vector". Sometimes it looks like the meaning is different, sometimes like the same.
- 6. Literature usage** **75 p. (C)**

The literature covers the necessary topics. Some confusions in the description of the methods show that the student has not fully understood everything.

  - E.g. there is no need to run cross-validation to find an optimal threshold to classify frames based on sum of magnitude. You might just evaluate classification error for different thresholds on whole the data set...
- 7. Implementation results** **65 p. (D)**

The technical solution has the character of Python scripts and Jupyter notebook that implement the proposed solution experimentally.

  - The code lacks better structuring and some kind of API definition - a set of functions or classes that one can use to segment a video or classify a video frame. All the parameters are hard coded.

There is no description of the CD content and the data set used in experiments is missing as well.
- 8. Utilizability of results**

The final solution uses just trivial features extracted from estimated motion fields - either a sum of optical flow magnitudes, or a histogram of magnitudes. It would be more convenient to use more advanced features to describe the motion in classified images, and/or divide the frames into smaller blocks and combine feature vectors from the blocks, and/or concatenate features extracted from several subsequent frames.  
Data set used for the experiments is not well described. Detailed information on the ground truth annotation is missing.

**9. Questions for defence**

- Have you considered of concatenating histograms extracted from smaller image regions into a larger feature vector? Would histograms of flow orientation improve the precision?
- What subjective metric has been used to annotate a frame as stable or non-stable?

**10. Total assessment**

**68 p. satisfactory (D)**

The student has obviously gained basic knowledge of image processing and machine learning methods and he demonstrated that he is capable of using this knowledge to design, realize and evaluate a functional solution.

In Brno 31. May 2019

Španěl Michal, Ing., Ph.D.  
reviewer