

Supervisor's statement of a final thesis

Czech Technical University in Prague

Faculty of Information Technology

Student: Bc. Jan Blažíček
Supervisor: Ing. Libor Přeučil, CSc.
Thesis title: Multicamera 3D Image Reconstruction in Dynamic Scenes
Branch of the study: System Programming

Date: 29. 1. 2017

<p><i>Evaluation criterion:</i></p> <p>1. Difficulty and other comments on the assignment</p> <p><i>Criteria description:</i> Characterize this final thesis in detail and its relationships to previous or current projects. Comment what is difficult about this thesis (in case of a more difficult thesis, you may overlook some shortcomings that you would not in case of an easy assignment, and on the contrary, with an easy assignment those shortcomings should be evaluated more strictly.)</p> <p><i>Comments:</i> The thesis topic assignment comprises issues concerning SW design and its' optimization towards suitable performance as well as issues addressing hard problems from the field of computer vision. Both the given classes of problem are rather demanding on knowledge from diverse areas to attain practical usability of the thesis outcomes.</p>	<p><i>The evaluation scale: 1 to 5.</i></p> <p>1 = extremely challenging assignment, 2 = rather difficult assignment, 3 = assignment of average difficulty, 4 = easier, but still sufficient assignment, 5 = insufficient assignment</p>
<p><i>Evaluation criterion:</i></p> <p>2. Fulfilment of the assignment</p> <p><i>Criteria description:</i> Assess whether the thesis meets the assignment statement. In Comments indicate parts of the assignment that have not been fulfilled, completely or partially, or extensions of the thesis beyond the original assignment. If the assignment was not completely fulfilled, try to assess the importance, impact, and possibly also the reason of the insufficiencies.</p> <p><i>Comments:</i> The author fulfilled the assignment with negligible deviations imposed by some intermediate results during the thesis accomplishment. The thesis still targets and fulfills the original goal - to elaborate on SW design and optimization towards resolution of reconstruction of 3D scenes from multiple (two) static cameras - a problem, which belongs to the most computationally demanding ones in the field of computer vision. The submitted thesis has correctly focused to conduct the study, implementation, and verification of the methods in question on well selected and proper setups. Nevertheless, the quantitative evaluations were performed on public available data test-sets from neighboring domains instead. This slight deviation from the original setup has been implied by a need and availability of ground-truth information for these test-data sets. Nevertheless and still the presented findings can immediately be reused for solution of the originally addressed problem. In this aspect, the thesis has provided very valuable study of preexisting algorithms and methods for 3D scene reconstruction from multiple cameras, their comparison and statistical featuring, possibilities of speedup and other implementation aspects, which is well in line with the topic original assignment.</p>	<p><i>The evaluation scale: 1 to 4.</i></p> <p>1 = assignment fulfilled, 2 = assignment fulfilled with minor objections, 3 = assignment fulfilled with major objections, 4 = assignment not fulfilled</p>
<p><i>Evaluation criterion:</i></p> <p>3. Size of the main written part</p> <p><i>Criteria description:</i> Evaluate the adequacy of the extent of the final thesis, considering its content and the size of the written part, i.e. that all parts of the thesis are rich on information and the text does not contain unnecessary parts.</p> <p><i>Comments:</i> The thesis extend and structure corresponds to given criteria for a regular Diploma Thesis.</p>	<p><i>The evaluation scale: 1 to 4.</i></p> <p>1 = meets the criteria, 2 = meets the criteria with minor objections, 3 = meets the criteria with major objections, 4 = does not meet the criteria</p>
<p><i>Evaluation criterion:</i></p> <p>4. Factual and logical level of the thesis</p> <p><i>Criteria description:</i> Assess whether the thesis is correct as to the facts or if there are factual errors and inaccuracies. Evaluate further the logical structure of the thesis, links among the chapters, and the comprehensibility of the text for a reader.</p>	<p><i>The evaluation scale: 0 to 100 points (grade A to F).</i></p> <p>85 (B)</p>

Comments:

The thesis exhibits good logical structure and sizes of dedicated chapters are proportional to the complexity of the approaches and problems used and described. Some of the chapters presume a reader with slightly higher preexisting knowledge than standards in the application domain of computer vision, specifically in 3D vision, which is basically not a drawback. The work conclusion is slightly too short and missing any outlook for further development. Moreover, the author does not mention in any detail any further 3D reconstruction method suitable for real-time use.

Evaluation criterion: *The evaluation scale: 0 to 100 points (grade A to F).*

5. Formal level of the thesis **95 (A)**

Criteria description:

Assess the correctness of formalisms used in the thesis, the typographical and linguistic aspects, see Dean's Directive No. 14/2015, Article 3.

Comments:

The thesis is nicely written, readable and understandable. Used English is good with minor mistakes and typos. Formal structure of the thesis is standard and meets the requirements.

Evaluation criterion: *The evaluation scale: 0 to 100 points (grade A to F).*

6. Bibliography **100 (A)**

Criteria description:

Evaluate the student's activity in acquisition and use of studying materials in his thesis. Characterize the choice of the sources. Discuss whether the student used all relevant sources, or whether he tried to solve problems that were already solved. Verify that all elements taken from other sources are properly differentiated from his own results and contributions. Comment if there was a possible violation of the citation ethics and if the bibliographical references are complete and in compliance with citation standards.

Comments:

Bibliography is very complex and well related to the topic. The aforementioned resources were mainly acquired by the thesis author himself, with minor assistance of the supervisor only. The author of the thesis overtook and/or compiled the preexisting approaches from these references in a standard way, referring original sources and building his own work and elaborations on the top of these. No violations of citation ethics or other author rights were identified.

Evaluation criterion: *The evaluation scale: 0 to 100 points (grade A to F).*

7. Evaluation of results, publication outputs and awards **75 (C)**

Criteria description:

Comment on the achieved level of major results of the thesis and indicate whether the main results of the thesis extend published state-of-the-art results and/or bring completely new findings. Assess the quality and functionality of hardware or software solutions. Alternatively, evaluate whether the software or source code that was not created by the student himself was used in accordance with the license terms and copyright. Comment on possible publication output or awards related to the thesis.

Comments:

The results evaluation has been performed with a public test data-sets. Due to the availability of the data and corresponding ground-truth information for these, the tests were performed with data from neighboring domain only. Description of the final experimentation and the way of comparison of the results to the ground-truth is explained in a shallow way in the thesis.

No publications or awards are related to this thesis.

Evaluation criterion: *No evaluation scale.*

8. Applicability of the results

Criteria description:

Indicate the potential of using the results of the thesis in practice.

Comments:

The major contribution of the thesis stands in figuring out the performance and complexity of selected methods for 3D scene reconstruction, studying their behavior under noise, in various scenes and comparing their computational intensity for elaboration of possibilities of their optimization. The ultimate target application, in line with the aim of the thesis, is future usage of a selected, or own, method for real-time reconstruction of 3D model of undercarriage of vehicle driving over a set of cameras. The thesis in this stage provided valuable initial study, first suggestions for optimization and experimentation for proper targeting further R&D in the domain of 3D reconstruction of fast moving scenes and practical application of these approaches.

Evaluation criterion: *The evaluation scale: 1 to 5.*

9. Activity and self-reliance of the student

9a:
1 = excellent activity,
2 = very good activity,
3 = average activity,
4 = weaker, but still sufficient activity,
5 = insufficient activity

9b:
1 = excellent self-reliance,
2 = very good self-reliance,
3 = average self-reliance,
4 = weaker, but still sufficient self-reliance,
5 = insufficient self-reliance.

Criteria description:

Review student's activity while working on this final thesis, student's punctuality when meeting the deadlines and consulting continuously and also, student's preparedness for these consultations. Furthermore, review student's independency.

Comments:

Very self-standing and motivated approach. The supervisor was required to provide consultancy only.

Evaluation criterion: *The evaluation scale: 0 to 100 points (grade A to F).*

10. The overall evaluation **80 (B)**

Criteria description:

Summarize the parts of the thesis that had major impact on your evaluation. The overall evaluation **does not** have to be the arithmetic mean or any other formula with the values from the previous evaluation criteria 1 to 9.

Comments:

Demanding thesis assignment - the thesis comprises a complex approach to SW design, optimization and evaluation issues together with a need to become familiar with specific computer vision methods serving as a test-bed. The student had to address broad set of diverse topics, conduct computer-vision algorithms design and (re)implementations, their optimization and evaluation. He has proven excellent abilities to work independently, deliver reliable and serious results, which do target a prospective practical application. The thesis quality, shape, structure and contents corresponds to the standards and recommendations.

Signature of the supervisor: