Review report of a final thesis

Student: Askar Kolushev
Reviewer: doc. Ing. Jan Janoušek, Ph.D.
Thesis title: Algorithms and data structures for hashing on GPU
Branch of the study: Computer Science

Date: 30. 1. 2021

### Evaluation criterion:
The evaluation scale: 1 to 4.

1. Fulfilment of the assignment

   - 1 = assignment fulfilled,
   - 2 = assignment fulfilled with minor objections,
   - 3 = assignment fulfilled with major objections,
   - 4 = assignment not fulfilled

Criteria description:
Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment’s fulfilment and the way it affected your final evaluation.

Comments:
The student has learned principles of programming GPU with the use of CUDA platform and with the use of TNL library. He has learned hashing algorithms Cockoo and HashGraph, which are used on GPU. In the thesis several versions of these algorithms are implemented using TNL library. The implementations are tested both on GPU and on CPU. Further, the thesis contains comparisons of the speed of these algorithms with the speed of a standard STL class std::unordered_set implementation.

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

2. Main written part

   - 100 (A)

Criteria description:
Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies? Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean’s Directive No. 26/2017, Art. 3. Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.

Comments:
The thesis is written in a well-structured way and with a sufficient amount of details of the text.

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

3. Non-written part, attachments

   - 85 (B)

Criteria description:
Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.

Comments:
The software part of the thesis is fully functional. However, tests against implementations of suitable corresponding algorithms from library [1] https://github.com/alokpathy/hashgraph, which is required in the assignment of the thesis, are missing.

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

4. Evaluation of results, publication outputs and awards

   - 85 (B)

Criteria description:
Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

Comments:
The thesis contains experimental results that demonstrate the speedup of the implemented algorithms against a standard STL container class. Moreover, the speedup of using GPU instead of CPU is demonstrated. More tests comparing the results also with other implementations ([1]) would result in improving the thesis.
### 5. Questions for the defence

**Criteria description:**
Formulate questions that the student should answer during the Presentation and defence of the FT in front of the SFE Committee (use a bullet list).

**Questions:**
Without questions.

### 6. The overall evaluation

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

**Comments:**
The thesis is well written. It could have contained also other experimental tests.

88 (B)

Signature of the reviewer: