CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of Transportation Sciences
K618 – Department of Mechanics and Materials
Na Florenci 25, 110 00 Prague 1, Czech Republic

SUPERVISOR'S REPORT ON THE BACHELOR'S THESIS

Bachelor's thesis title ..... **Automated Image Processing Methods for Impact Dynamics Experiments**

Author (including degrees)..... **Bc. Jan Stoklasa**

Bachelor's thesis supervisor (incl. deg.) .... **Ing. Tomáš Fíla, Ph.D.**

Ing. Jan Šleichrt

Evaluation criteria and their classification

Fulfilment of the bachelor's thesis requirements and goals.....A (excellent) ... 1,0

Self-action and own initiative
during the bachelor's thesis elaboration .....A (excellent) ... 1,0

Application of knowledge gained
by self-study and from professional literature.....A (excellent) ... 1,0

Usage of groundwork and data from practice.....A (excellent) ... 1,0

Professional level and contribution of the bachelor's thesis .....A (excellent) ... 1,0

Formal aspects of the bachelor's thesis.....A (excellent) ... 1,0

Further comments to the bachelor's thesis:

The bachelor's thesis is aimed at the automated evaluation of high-speed camera images taken during impact dynamic experiments using split Hopkinson bar. The key task of the thesis was to develop a semi-automatic software tool that can be used to track pseudo-random black-white speckles used in impact experiments as position markers. By reliable tracking of the markers, position, velocity, and even force present during the impact can be evaluated. The author employs methods of image processing, particularly pattern recognition and registration, by using methods available in MATLAB Image Processing Toolbox as well as his own functions. The author developed a tool allowing for automatic recognition of the speckle pattern, its tracking using image recognition, and two other methods of digital image correlation. Performance of the developed tool is demonstrated on several datasets from real experiments in split Hopkinson bar showing very good results and significantly improved throughput. Moreover, the results are compared with standard strain-gauge data exhibiting very good correlation and only minor differences.

The thesis is well-written, complex, easy to follow, and has no significant downsides. Its content and related framework can be considered far beyond the scope of a standard bachelor's thesis. The student worked on his own under general supervision and independently solved the problems including the development of the algorithms and implementation of the individual methods. The thesis represents an attractive solution for

impact dynamic experiments that are used in material science as well as in the aerospace industry. The objectives of the thesis were fulfilled.

I **recommend** the bachelor's thesis for the defence.

Summary classification of the bachelor's thesis .....A (excellent) ... 1,0

Ing. Tomáš Fíla, Ph.D.; Ing. Jan Šleichrt

bachelor's thesis supervisor´s name

bachelor's thesis supervisor´s signature

In Prague ..... August 28, 2023