THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis name:	Stereo Camera FPGA Interface and Processing for Zynq Based Systems
Author's name:	Albert Bezděk
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Ing. Martin Meloun
Reviewer's department:	Apple Inc., Cupertino, California, USA

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment — **extraordinarily challenging**

How demanding was the assigned project?

The topic necessitates an understanding of Linux kernel drivers, Xilinx FPGAs, the low-level operation of camera modules on the hardware side, and the principles of stereo cameras in the realm of computer vision. Acquiring a sufficient level of knowledge in these areas demands a substantial investment of time and effort in order to deliver satisfactory results.

Fulfilment of assignment — **fulfilled**

How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.

The thesis successfully fulfilled the assignment and extended its scope by implementing the stereo block matching algorithm in the FPGA. However, it is unclear from the work that the FPGA components have been thoroughly tested for mathematical correctness. It would perhaps be more beneficial to improve capabilities of the hardware rather than spending time in moving the block matching into FPGA.

Methodology — **outstanding**

Comment on the correctness of the approach and/or the solution methods.

The student leaves no stone unturned when it comes to solving problems inside the Linux kernel or the shortcomings of Xilinx IPs and is able to design the system to a fully operational state. Great achievement!

Technical level — **A - excellent.**

Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?

The thesis employs a very high technical level. The student understands the concepts and peripherals used to transfer the data from the camera sensor all the way to the user-space application and concepts of computer vision. The provided source code is complete and includes pertinent tests.

Formal and language level, scope of thesis — **B - very good.**

Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?

I find the text of high quality, but the English language could be improved. I would expect the student to use proof reading tools to make adequate corrections.

Selection of sources, citation correctness — **A - excellent.**

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The student specifies numerous citations and their relevance throughout the thesis.

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Additional commentary and evaluation (optional) *Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.*
While it's out of scope for this thesis, stereo cameras are very sensitive to their calibration. I would recommend first validating custom FPGA components (rectification and block matching module) with publicly available image sets from stereo cameras with validated calibration to ensure their mathematical correctness. It is otherwise very difficult to tell if the any depth map error is coming from bad calibration or issues with the algorithm.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

The thesis fulfils the assigned task and provides adequate documentation. I have a few questions for the student:

- You have presented a depth map in the thesis taken from the custom hardware – can you describe which parts of the depth map are correct? Have you verified that the depth is correct in absolute numbers?
- Can you describe why attempts to stream YUV failed?

The grade that I award for the thesis is **A - excellent.**

Date: **2.6.2025** Signature: Ing. Martin Meloun