THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Unconventional Techniques for Computational Holography**
Author's name:	**Arda Ozdogru**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Radioelectronics
Thesis reviewer:	Lukas Krasula
Reviewer's department:	Netflix, U.S.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **challenging**

How demanding was the assigned project?

The field of holography requires understanding of many complex concepts from electromagnetic field, optics, signal processing, etc. The assignment itself is broad and covers the entire pipeline from encoding to display and performance evaluation.

Fulfilment of assignment **fulfilled with minor objections**

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 student provided a review of state-of-the-art and implemented a workflow allowing display of open-source holographic images on a commercial light-field display. An attempt for encoding framework implementation has also been made. Although it was not successful, a theoretical plan and integration of a few blocks of the pipeline were achieved. On the other hand, no performance evaluation was provided or suggested.

Methodology **partially applicable**

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

The theoretical part of the thesis is on a high level. The reasonings and derivations are well justified. The unsuccessful attempt for encoding of holograms using Spherical Harmonic Transform (SHT) is documented and the point of failure is identified. Nevertheless, the specific steps towards mitigating the problem or possible lines of investigation are not concretely described or proposed. Furthermore, no formal way of evaluating the performance of the implemented solutions is discussed.

Technical level **B - very good.**

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?

As mentioned above, the thesis builds on a solid theoretical background in various fields. Student demonstrates familiarity with many relevant subjects and coherently discusses the thesis plan. The experimental part of the thesis could be improved though.

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?

Overall, the language and organization of the thesis are very good. There are some slight issues complicating the reading, such as notation in figures adopted from different sources, or inconvenient placement of relevant figures. Some unnecessarily complicated phrases and typos can also be found, nevertheless, the level is generally high.

Selection of sources, citation correctness **D - satisfactory.**

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 citations are generally well formatted and placed. My main concern is the section 3.2 discussing the state-of-the-art in display technology and volumetric displays. Here, absolute majority of citations are papers from 1998 to 2008, which, considering the recent technological progress in the display field seems insufficient. This is arguably not the most important part of the thesis but a considerable space is dedicated to it.

Even though there is a section specifically focusing on the thesis contributions, it is still not trivial to distinguish between what has been adopted and what has been directly contributed. As an example, the Hol2LFD function is at some places presented as a novel contribution, while it sometimes seems more like a wrapper around an existing package. A more explicit explanation would be beneficial.

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.

Given the challenging nature of the assignment and the theory behind the thesis, it can be expected that the student will have limited time for the experimental part. The solid theoretical description and framework for displaying publicly available holographic images on a light-field display will be useful for further research explorations in the domain.

The biggest shortcomings are the vague formulation of what has been and can be done in the future to overcome the problem the student encountered during encoding holograms using SHT, together with the absence of the performance evaluation or comparison of the proposed solution(s) to the existing ones.

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.

As mentioned above, the thesis deals with a challenging topic. The theoretical and experimental parts of the work are somewhat unbalanced. Nevertheless, it can still be considered a solid effort, useful as a stepping stone for further research.

The grade that I award for the thesis is **C - good.**

Questions to be answered:
1. What would be your next steps in tackling the problems with SHT encoding of holograms?
2. Imagine you would manage to successfully encode the available images. How would you evaluate the performance of your solution and compare it to other possibilities?
3. What would it take to make your displaying pipeline more automatic and compatible with more input formats or images from different sources than the BCOM database?

Date: **27.8.2023** Signature: