Tampere University

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Characterizing holographic displays via numerical simulations - Report

Faculty of Information Technology and Communication Sciences (ITC)
Laboratory Report

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Abstract

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The abstract is a concise 1-page description of the work: what was the problem, what was done, and what are the results. Do not include charts or tables in the abstract.

These instructions are intended for students of Computer Sciences at the Tampere University. They cover questions of writing a thesis, such as use of the literature, structure of the thesis and style, the external appearance of the thesis and the use of tools. These instructions do not cover the scientific content of the thesis.

Keywords: M.Sc. thesis, layout, writing style.

Contents

1 Introduction

In this report we describe our work with the ‘Characterizing holographic displays via numerical simulations‘ exercise, for the Advanced Signal Processing Laboratory Course.

In this project we familiarized ourselves with the basics of holographic display, by implementing a part of a holograpics display viewing simulation. We implemented two holographic synthesis methods and a retinal image formation model, by contributing code to a MATLAB codebase given by the course faculty.

1.1 Hologram synthesis

Hologram synthesis describes the method for forming holographic images in 3d space from a given image. In this assignment, instead of using entire 3d space, the analysis can be simplified by considering only a cross section of the 3d space. The hologram is now represented as a 1D array of complex values. This simplification eases the computational load and also makes the process easier to handle.

1.2 Retinal Image Formation

2 Methodology

2.1 Implementing Hologram Synthesis

Our implementation of the holographic image viewer included three different methods of holographic image synthesis, one of which was provided in the code base given to us. The ready made synthesis method was holographic stereograph synthesis (HSS), [TODO: explain hss here]. The first synthesis method we implemented was a Fresnel hologram synthesis which is based on the Fresnel diffraction kernel. The second method we implemented was Rayleigh-Sommerfeld synthesis (RSS), which uses Rayleigh-Sommerfeld diffraction kernel. This formula is similar to the Fresnel but has some differences in calculating the hologram.

2.2 Field Propagation

3 Results

In this section we anaylze the images produced by the implemented model.

4 Conclusions