

Greater San Diego Science and Engineering Fair

2015 PROJECT SUMMARY

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Project Title: Spinning Mirror Hologram

Abstract

Objectives/Goals

The objective of the experiment was to use an inexpensive mirror with an anisotropic holographic diffuser, rotating at 10 times a second by being mounted on a 600RPM motor synchronized with the projecting tablet, to display a non-flickering 3D image, viewable from 6 different angles without correcting for parallax and other visual artifacts.

Hypothesis

An inexpensive mirror with anisotropic holographic diffuser, rotating at 5 times a second by being mounted on a 300RPM motor synchronized with the projecting tablet, will display a non-flickering 3D image viewable from 4 different angles without correcting for parallax and other visual artifacts.

Methods/Materials

The experiment involves using a system that consists of a spinning mirror, a tablet display, and a synchronized stepper motor. The tablet produces 60 frames per second showing the object from 4 different angles, forming 4 different viewing angles. The mirror is placed at a 45 degree angle on a motor which spins synchronized relative to the images displayed by the tablet. As the mirror rotates up to 60 times per second, persistence of vision creates the illusion of a flickering object at the center of the mirror.

Results

The experiment procedures had to be corrected due to the difficulty in designing the setup which became an experiment in itself. The original procedure included testing different mirrors to see which one created the best-looking image. Instead a simple mirror was used due to unavailability of an anisotropic filter. The focus of the experiment was the synchronization process. Even though the experiment had to be modified, it was successful in demonstrating a low-cost synchronization method for a spinning-mirror 3D display.

Conclusions/Discussion

This experiment proved to be surprisingly effective in exploring new ways of displaying images specially, in three-dimension. It was accomplished by using a regular off-the-shelf tablet with a synchronized rotating mirror. This exercise has demonstrated that with rarely available consumer tablets and simple electronic components one can implement a volumetric display at a very low cost. Mass production and fine tuning of such a low-cost device will bring in a new age of displays. Viewers would be able to inspect, observe, and interact with an image in live space from any angle. Clearly these technologies can be deployed widely and cheaply today instead of remaining in the realm of science-fiction.

Summary Statement

The image can be seen from four different angles around the apparatus creating the impression of observing an object in real space. The setup consists of an off-the-shelf tablet and a spinning mirror mounted on a synchronized motor. The display is set to render a video at 40 frame-per-seconds (fps) with an effective display rate of 5fps for a viewer positioned at one of the four viewing positions.

Help Received

My Dad guided me with his expertise throughout the project. My Mom helped with supplies and organization.