

Development of a 3D Display

Summary

Goals

The aim of this project was to build a working prototype of a volumetric persistence of vision display.

Methods

The display consists of a two-dimensional arrangement of LEDs that rotates at about 60Hz. A microcontroller controls the LEDs such that they produce a volumetric image that can be viewed from any direction. Using a hall effect sensor and a magnet, the display measures its rotational speed and adjusts its timing accordingly, so that the image stays in place despite the rotational frequency slightly varying.

Because the rotational period is smaller than the flicker fusion threshold of the human eye, the image appears to be steady and the observer sees the whole image at all times, even though at any given time only $\frac{1}{100}$ of the pixels are illuminated.

A python program makes it easy to insert simple geometric shapes or plots of a user-given function into an image, and it can convert the generated images to programs for the microcontroller that display the image.

Conclusions

The initial goal has been reached and the display works as planned. Possible applications include advertising, education and video games. My display could be improved by incorporating wireless data transmission, so that images can be changed at runtime, or by replacing the loud and inefficient slip rings with inductive power transfer. Another worthwhile addition would be a program that converts 3D models in a popular format to the format used by my display, which is nothing but a 3D bitmap.