CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
S1415

Project Title
Complete 3D Projection Using Head-Tracking and Stereoscopy

Abstract

Objectives/Goals
The objective is to construct a virtual image display system that incorporates head-tracking, stereoscopy, and other depth cues, as well as 360 degrees of viewing to create a superior 3D viewing experience.

Methods/Materials
A laptop, webcam, Arduino microprocessor, motor shield, stepper motor, and bearing were used in this project. The viewer#s head location was estimated by a face-tracking program based on the webcam#s video. With my C# code, the data was filtered and a 3D model was projected onto the screen via a projection matrix to simulate motion parallax and head-tracking. My programs, written in C# and Arduino programming language, also control and coordinate the image shown on the monitor using Unity, as well as the rotation of the monitor using a stepper motor so that it faces the user. Stereoscopy, the effect used in movie theaters, was added by using anaglyphs filter to simulate parallax as well.

Results
The multiple parts of the project, including the face-tracking program, the Arduino, and the anaglyphic view, in concert such that the effect is a completely virtual, hologram-like projection from the screen. Overall, the project is superior to many current technologies in that it is cheaper, incorporates more depth cues, has a larger viewing range, and allows for more interaction.

Conclusions/Discussion
3D technology is the next step in virtual display, giving it a lot of future potential in many fields. Although the most obvious applications are in entertainment and computer graphics, it is also usable in medical diagnostics, flight simulations, education, biomechanical studies, scientific visualization, weather diagnostics, chemistry, and many others.

Summary Statement
Several 3D depth cues are mimicked using a variety of techniques in order to create a hologram-like projection that is both innovative and superior to current technology.

Help Received
Father helped arrange the poster and buy the materials