

VIRTUAL GUITAR SYSTEM

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Abstract: This study surveys the field of *Augmented Reality* (AR), in which virtual 3D objects are integrated into a real-world environment in real time. The goal is to explore how to interact with these virtual objects. An application is introduced that displays a virtual guitar which is playable with real hands and a camera. This paper provides an explanation of how this prototype is used, and explores the richness and technical problems of developing AR applications.

1. INTRODUCTION

These days many areas come in contact with *Augmented Reality* (AR), some examples include simulators, entertainment systems, industry and other applications. In particular interacting with virtual objects, like moving virtual objects with only a hand gesture, is very exciting and was a good incentive for this study. This techniques is of interest for making music without using a real instrument and without any special preparations.

To experiment with these ideas, some different systems have been tested. The technology which is used is AR, which adds virtual objects to our real world. Unlike many other AR applications, this project doesn't use a special marker to display a virtual guitar. This prototype has some different sound effects and detects real finger position by using color as a reference and can be used by people with a webcam.

To create results in a short time this software was developed with an open-source platform for virtual and augmented reality called *Goblin XNA*, which is based on the *XNA Game Studio* for *Microsoft Visual Studio*.

2. BASIC PRINCIPLE

The idea is that a user is recorded by a camera and sees himself on a screen. In front of him is a virtual guitar which is playable with his hands.



Many webcams have a low resolution like 640*480 pixels or less and don't allow a detailed detection. For this reason this prototype has only five different frets and one guitar string to play.

3. SOUND SYSTEM

XACT was used to include realistic sounds. XACT is a tool in the *DirectX framework* that allows developer to create a wave sound bank. This prototype uses the sound bank of Dan Waters *GuitarMatey*, a 3D game for the Xbox that allows you to improvise guitar music.

4. 3D MODEL

For a realistic look the virtual guitar is modeled in 3D and includes texture. *Autodesk* provides a free tool called *Softimage Mod Tool* which supports *XNA GameStudio*. The exported .fbx file can easily be imported into this program.

In addition to the guitar Model some colored frets and a pick field for interaction were added.

5. LOOKING BACK

The most difficult question was how to interact with the virtual guitar. This prototype detects finger position based on their color. Certain people have different skin color and different cameras so it's not easy to determine a color.

Users can select a color that matches their own skin color by clicking on the screen. To get a good detection result a colored hand like green or red would be the best.

REFERENCES

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