

Guitar Hero: *Fast Fourier* Edition

6.111 Final Project - Mitchell Gu, Ryan Berg

ABSTRACT

Guitar Hero, a musical game concept pioneered at the MIT Media Lab, brought the dream of rockstar-dom to kids and adults worldwide by presenting popular song scores as a waterfall of combinations of five notes, scrolling intuitively in the time domain. Our Fast Fourier Edition aims to reinvent the genre by capitalizing on FPGA hardware to use an actual guitar's analog output as the game controller. Instead of expecting some combination of button presses on a traditional controller, the FF edition performs a fast fourier transform on the analog signal from a guitar's pickups to determine what the fundamental tone being played is. From the FFT results, the game logic will award the player points depending on their pitch and timing accuracy compared to what was supposed to be played. This way, the game can teach a player how to play their favorite songs and learn some actual guitar along the way.

The base functionality of the game will include recognition of slow-tempo, single notes played on the guitar, along with a basic video scrolling display of upcoming notes and the player score. From there, further goals include recognition of faster note sequences at common song tempos and more sophisticated graphics on the interface. Players could receive bonuses for streaks and solos as well. Among the two team members for this project, work can be loosely divided into audio recognition and game logic at the beginning, which can evolve into advanced recognition and improved graphics in the later stages of the project.