

GUITAR HERO

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Overview

For our final project, we are proposing that we build the guitar hero game. For those of you who haven't experienced the joys of playing "Barracuda," here is how the game works: you use a five-button guitar to play rock songs.



The core gameplay revolves around three essential peripherals: a monitor, speakers, and the controller. As a song starts, notes appear on the screen and move towards the "play line." The notes are an oversimplification of the current song, but are decently synchronized to the music. The player has to strum their guitar while holding down the right note(s) when they reach the play line. If they time it correctly, their score will increase. If they miss, their score will decrease. If time allows, this can be connected to the music, with the song's guitar track playing or silent/playing sour notes for misses, as in the original game (see [Potential Milestones](#)).

Implementation

- The FPGA displays the notes to play on the monitor using VGA
- The FPGA plays the song on the speakers using the audio jack
 - Our MVP goal is to have the song play in sync with the notes being displayed/played
 - If we have time, we would like to implement a “two-track” audio system, as in the original games. A track of the music without the main guitar would always play in sync with the music. As the player correctly/incorrectly times their inputs, a separate track with the guitar would/wouldn’t play. More research would have to be done into this and this is not essential to the core gameplay, so we’ll treat this as a “nice to have”
- Controls:
 - MVP Controller: USB Keyboard communicates with the FPGA
 - Nice to have: Wii Remote. For Guitar Hero on the Wii, the [guitar controller](#) was not actually a controller. Instead it was an accessory that would be plugged into a Wii remote, meaning its buttons and inputs must be mapped into standard Wiimote inputs that we could interpret. Wiimotes can be paired to computers using Bluetooth, so our ideal end product, if we have enough time to R&D it, would communicate with the Wiimote in the guitar wirelessly ([related DE1-SOC work](#)). Another option could be the [raphnet USB adapter](#), which, after some protocol reverse engineering, could be used to connect the guitar accessory directly to the FPGA via USB.

Potential Milestones

1. Milestone 1: general graphics on the VGA; able to demonstrate a short series of notes flowing down the screen to the play line
2. Milestone 2: implement input processing and timing. Using the keyboard, players can try to hit the notes at the right time, and the game can determine if they hit or missed and update their score appropriately. Perhaps some graphical feedback for hit/missed notes?
3. Milestone 3: able to demonstrate that the notes on the screen and the audio can be synchronized for a short series of notes.

4. MVP Complete: keyboard, notes on screen, and audio are all synchronized. Players can play through a full song and are scored properly.
5. (Nice to have): Wiimote Guitar accessory replaces USB Keyboard
6. (Nice to have): “two-track” audio system
7. (Nice to have): long notes that have to be held down, not just short notes that are strummed once
8. (Nice to have): song selection/multiple songs