LED Matrix Music Game

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Overview

Inspired by popular mobile music games, we intend to design a falling-type music game, in which players catch the falling notes defined by a chart (like a music score) corresponding to the rhythm of playing music when the notes reach the bottom line. The charts are pre-designed to match the music. Notes are displayed on the LED matrix. The score players receive are based on the hit accuracy. The hit accuracy, based on the time difference between hit and note, is divided into (from high to low) excellent, good and miss. The score and the hit accuracy of the current note will be printed in real time on an LCD screen.

O2JAMU, a Similar Music Game on Mobile Platform

Peripherals

1. Generic LED Matrix
2. Push Buttons (peripheral extended push buttons)
3. LCD Display Screen (to display scores)
4. I^2C Voltage Sensors (along with potentiometers, to determine falling speed and do other scrolling functionalities)

5. SD Card (to store music files and charts)
6. External Speakers (to play music)

Software Design

Before the software implementation, all the peripheral parts need to be connected to their respective ports. The LED array is connected to the Expansion Connector. The LCD is connected to the LCD Expansion connector. The External Speaker is connected to the Audio interface. The music notes and their frequencies will be hard-coded into the code. The Game will load this hard-coded file and the music file stored in the SD card plugged in. The beats and the notes in the hard-coded file are matched to the exact point in the music file. The push-down of a button will trigger an interrupt that will be handled in a function which compares the time the interrupt triggered and the expected push-down time of the certain note. The time difference will be calculated to compare with predefined time intervals to generate the “missed”, “good” and “excellent” signals. The LED matrix will be controlled by GPIO pins. Each pin will control several LEDs on one horizontal “pixel” on one of the four falling rails of the game. When a note falls, two of the “pixels” will light simultaneously and the lighting pixels will gradually move downwards based on the set falling speed until it reaches the bottom or hit (probably too early) by player. A timer will determine when to switch lighting pixels. The entering time for a note will be determined by another timer and synchronized with RTC.

Goals

1. Ensure the game is playable and stable
2. Display game score based on hit accuracy
3. Enable falling speed adjustment
4. Enable music selection (if time permits)
5. Record local (on each startup) and global (on all startups) high scores (if time permits)
6. Add holding notes to charts (if time permits)