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SE Lab Project Proposal

Description

Drawing inspiration from the arcade game Dance Dance Revolution, the goal is to build an Arduino controlled dance pad music video game. Users will be asked to select music and challenged to tap to the pattern of the rhythm presented to them. The greater the accuracy of the taps, the greater the score. All navigation, selection, and results will be displayed on a computer monitor.

Software Breakdown

This project's software can be broken down into two parts: the control system and the game. The input will be controlled by the Arduino while the game will be run on a computer.

I. Game (written in C#, using Unity as the graphics library)
    a. Implement collection of and interpretation of dance pad events from serial port
    b. Implement GUI for selecting songs and custom song uploading (optional feature)
    c. Implement game play interface, scoring system and high score storage
    d. Implement processing of music into expected dance pad events (based on the frequency of the music)
II. Arduino (Written in C/C++)
    a. Takes input from dance pad through high electrical signals when user presses on pad
    b. Outputs dance pad events to computer through serial port

Hardware

There are three components of hardware required for the project:

I. Arduino UNO R3 (Brand: Elegoo)
II. Custom-built dance pad (Refer to diagram on the right):
    a. Covering (1) – Plastic Sheet and Painted Arrows
    b. Metal (2) – 18 Squares of Iron (Backup: Aluminum)
    c. Wires and Springs (3) for Conductivity and Sensors
    d. Wood (4) – 1 Square Sheet, 6 Big Rods, 6 Small Rods
III. Computer
    a. Connection from computer to Arduino through USB

Prototype Plan

An evolutionary prototype will be created to demonstrate the feasibility of the project. This prototype will include one fully built dance pad button that sends electrical signals to the Arduino when someone presses the pad and a program which signals the users button press from the pad on the laptop display. This prototype will serve to test the reliability of the conductive connection on the pad, as well as test the stability and delay of the connection between the Arduino and the computer.

Anticipated Challenges

Several significant challenges span the areas of performance and quality assurance. Because the dance pad must be built to handle weighs up to and over 150 lbs, this requires repeated stress testing and construction sturdiness. Another challenge will be ensuring that the wires attached to the dance pads don't detach or short the circuit under the movement of the pads. Furthermore, there might be challenges to maintain consistent real-time communication between the Arduino and the computer when playing the game.