Project Proposal

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14 February 2022

1 Overview

This document describes our project proposal in detail.

Name: MicroArcade

Website: iika.re/micro

1.1 Goals

The aim of this project is to design an interactive game using the STM32 as the microcontroller. The game is based on the concept of arcade shoot-em-up (think Space Invaders). The user controls the playable character using the Nunchuk, and the output of the game is displayed on the LCD. Game music will be played through the speaker using PWM, and will be loaded from the SD Card Adapter.

2 Peripherals

This project uses both SPI and I^{2}C. The list of peripherals and the corresponding serial interface protocols is below.

1. ILI9341 LCD Display

   This uses SPI protocol.

2. Wii Nunchuk

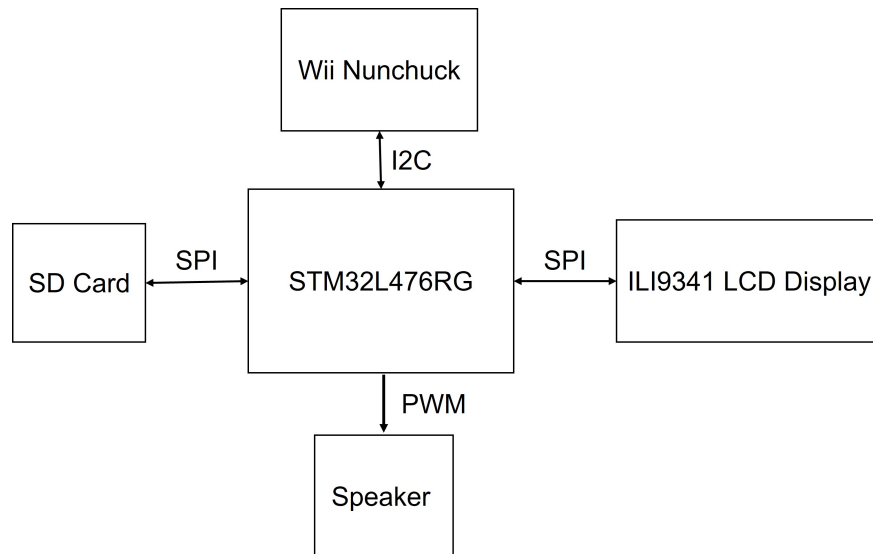   This uses I^{2}C protocol.

3. SD Card Reader

   This uses SPI protocol.

4. Speaker (PWM controlled)

   This only uses PWM.

3   Block Diagram

A block diagram is provided below:

```
                        ┌──────────────────┐
                        │   Wii Nunchuck   │
                        └──────────────────┘
                                 ↕ I2C
┌─────────────┐   SPI   ┌──────────────────┐   SPI   ┌──────────────────────┐
│   SD Card   │◄───────►│   STM32L476RG    │◄───────►│  ILI9341 LCD Display │
└─────────────┘         └──────────────────┘         └──────────────────────┘
                                 ↓ PWM
                        ┌──────────────────┐
                        │     Speaker      │
                        └──────────────────┘
```

4   Responsibility List

1. Rahul

   - Wire Nunchuk to the STM32 board.
   - Interface with the Nunchuk using I^2C.
   - Wire the ILI9341 display to the STM32.
   - Interface with the ILI9341 using SPI.

2. Hyun Kyum

   - Wire the SD Card Reader to the STM32.
   - Interface with the SD Card Reader using SPI.
   - Wire the speaker to the STM32.
   - Interface with the speaker using PWM.

3. Shared

   - Write game code.
   - Perform tests on the other's code.

5   Software Structure

All coding will be done in C. Communication to the Nunchuk will be done through I^2C, and SPI will be used for both the LCD and the SD card adapter. The entire game is a finite state machine, of which the only input is through the player interacting with the Nunchuk. All user functionality depends on the input from this device. The speaker and LCD display are simply outputs, and do not have any innate interactivity. The SD Card is there to facilitate the running of the game. There is a main game loop in which all game-related code executes, and is the basis of the state machine.