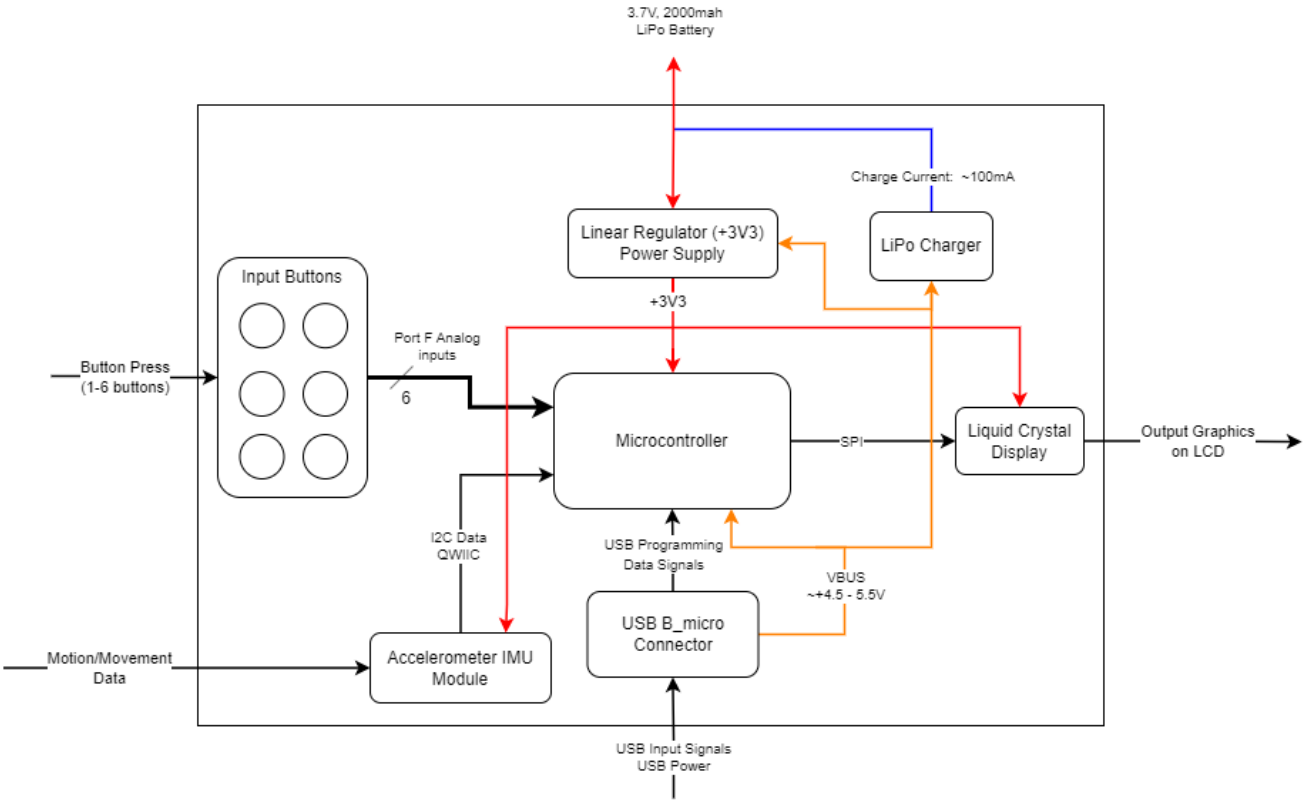
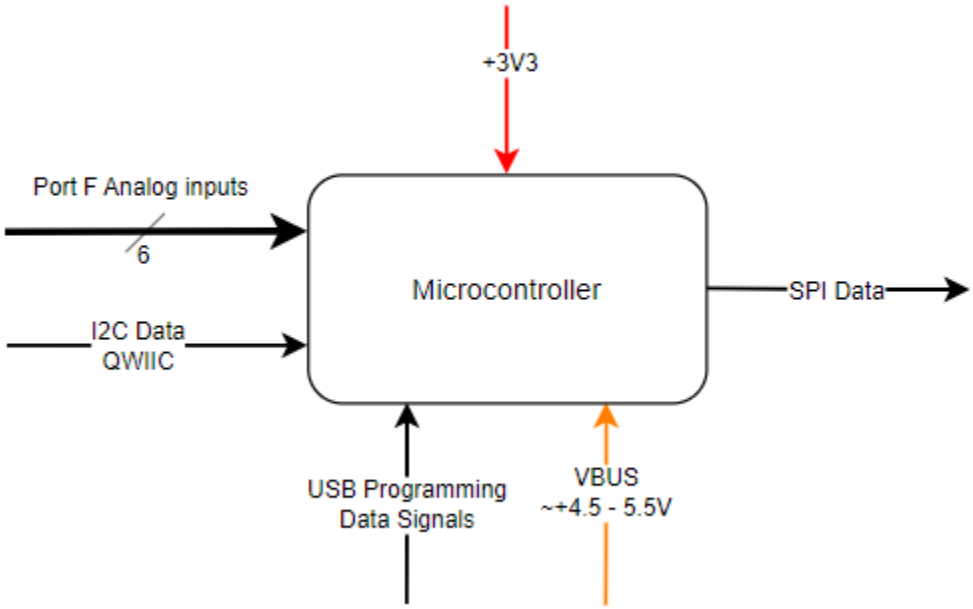
# Hand-held Video Game Console: Level 1

Team: G11
Team members: Anthony, Cesar, Charles

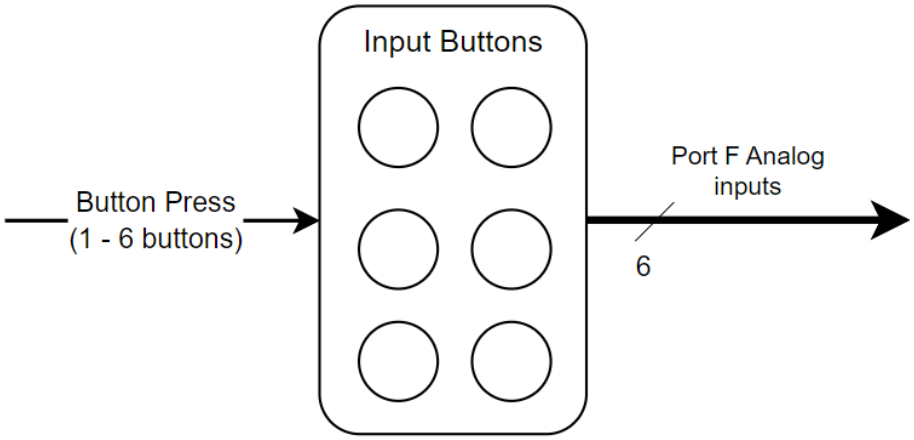


# Microcontroller: Level 1



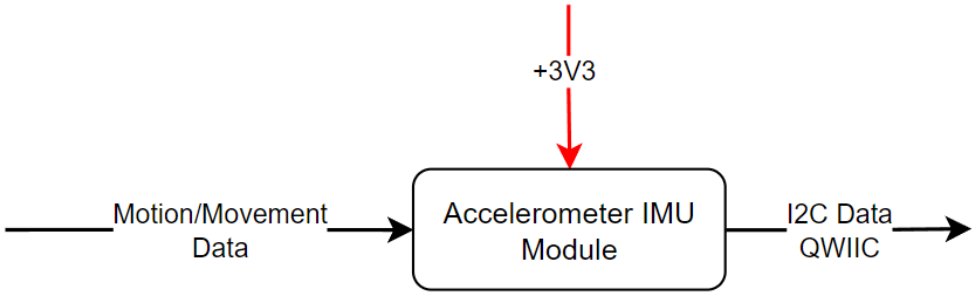

| | |
|---|---|
| ***Module*** | Microcontroller (ATmega32u4) |
| ***Inputs*** | Port F Analog inputs: 6 analog inputs (pullups) to microcontroller's ADC<br><br>I2C Data (QWIIC): 6 DoF IMU data in I2C communication protocol from accelerometer/IMU module. QWIIC is Sparkfun's I2C interface connection system for prototyping.<br><br>+3V3: +3.3V DC power for Microcontroller<br><br>USB Programming Data Signals: USB D+/D- programming signals to program the microcontroller behavior.<br><br>VBUS (+4.5 - 5.5V): Supply from USB for programming, supplying the microcontroller |
| ***Outputs*** | SPI Data: SPI communication protocol data for graphics and animation on the Liquid Crystal Display module. |
| ***Functionality*** | Microcontroller block is the small computer that converts inputs from buttons and accelerometer module into output game graphics and animations on the LCD screen. It is the processor of the system. |

## Input Buttons: Level 1



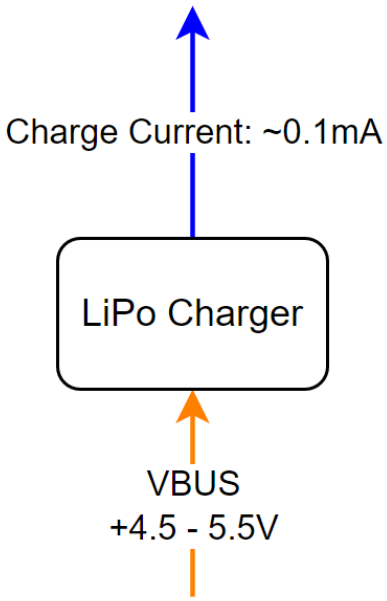

| | |
|---|---|
| ***Module*** | Input Buttons |
| ***Inputs*** | Button Press (1-6 buttons): 6 tactile (pullup) buttons pressed by the user. User presses 1 of the 6 buttons. |
| ***Outputs*** | Port F Analog inputs (to microcontroller): 6 analog inputs (pullups) to microcontroller's ADC |
| ***Functionality*** | User presses 1 of the 6 tactile buttons which acts as analog input to the microcontroller's ADC on Port F. These buttons are pulled up (high) and the active input is low. |

# Accelerometer IMU Module: Level 1



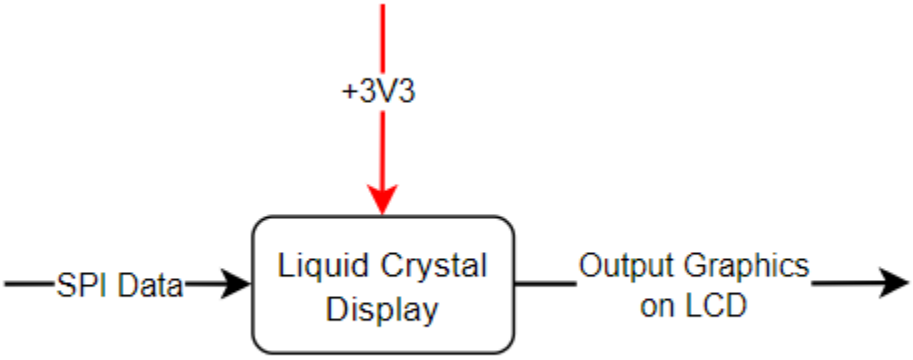

| | |
|---|---|
| ***Module*** | Accelerometer IMU Module |
| ***Inputs*** | Motion/Movement Data: Data that is generated by physically moving and orienting the Accelerometer module in 3D space. Captured by the Accelerometer module.<br><br>+3V3: +3.3V DC power for the Accelerometer IMU module |
| ***Outputs*** | I2C Data (QWIIC): 6 DoF IMU motion data in I2C communication protocol (acceleration, orientation, etc.). QWIIC is Sparkfun's I2C interface connection system for prototyping. |
| ***Functionality*** | Moving the accelerometer IMU module around in 3D space will capture motion data (acceleration, orientation, etc.) and output this data to the microcontroller using I2C communication protocol. |

# LiPo Charger: Level 1



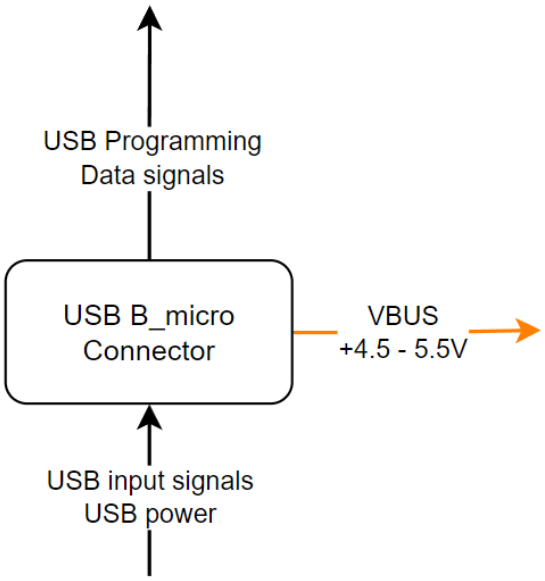

| | |
|---|---|
| ***Module*** | LiPo Charger (MCP73831) |
| ***Inputs*** | VBUS (+4.5 - 5.5V): Supply from USB VBUS supplying the LiPo charger and charging the LiPo battery. |
| ***Outputs*** | Fast charge current: ~0.1mA<br>$I_{REG} = \frac{1000V}{R_{PROG}}$ *where* $R_{PROG} = 10k\Omega$ |
| ***Functionality*** | Charges the LiPo battery in the system. The fast charge current is around 0.1mA. |

# Liquid Crystal Display: Level 1



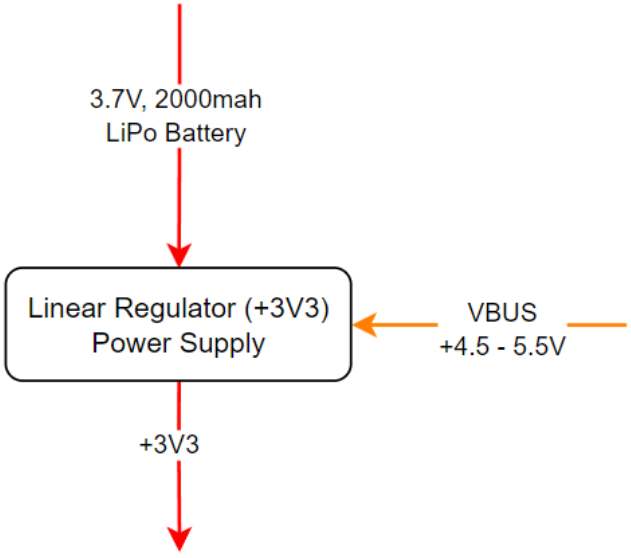

| | |
|---|---|
| ***Module*** | Liquid Crystal Display (2.8" TFT LCD from adafruit) |
| ***Inputs*** | +3V3: +3.3V DC power for LCD module<br><br>SPI Data: SPI communication protocol data from the microcontroller to the Liquid Crystal Display module. |
| ***Outputs*** | Output Graphics on LCD: The game console's graphics and animations displayed to the user on the LCD's pixels. |
| ***Functionality*** | This LCD displays the video game console's graphics and animations. The I2C data is sent to the LCD and the LCD controls the pixels on the LCD based on this data sent. |

# USB B_micro Connector: Level 1




| | |
|---|---|
| ***Module*** | USB B_micro connector |
| ***Inputs*** | USB input signals/USB Power: USB communication protocol and power supply. USB input signals and power come from a Desktop or laptop running Arduino IDE with USB driver. |
| ***Outputs*** | USB Programming Data Signals: USB D+/D- programming signals to program the microcontroller behavior.<br><br>VBUS (+4.5 - 5.5V): Supply from USB, supplying the microcontroller, charging the LiPo Battery, source for Linear regulator |
| ***Functionality*** | This is the connector for the USB communication protocol. The connector takes USB D+/D- to program the microcontroller. The connector also fans out the VBUS supply to the microcontroller, LiPo charger, and Linear regulator |

Linear Regulator (+3V3) Power Supply: Level 1




| | |
|---|---|
| ***Module*** | Linear Regulator (+3V3) Power Supply |
| ***Inputs*** | VBUS (+4.5 - 5.5V): Supply from USB, supplying the microcontroller, charging the LiPo Battery, source for Linear regulator (+3V3)<br><br>3.7V, 2000mah LiPo Battery: Lithium Polymer battery source for the hand-held game console. Charged using LiPo Charger component |
| ***Outputs*** | +3V3: +3.3V DC power for LCD module, Microcontroller, accelerometer IMU module. |
| ***Functionality*** | This is the power supply for the hand-held game console. It regulates the power by delivering a steady +3.3V DC supply to the microcontroller, LCD module, and accelerometer IMU module. |