Practicum PDS - Project Design Specifications

Team 11: Anthony, Ryne, Charles, Cesar

Executive Summary (Concepts of Operations):

Our device is a handheld video game console. This device displays interactive games where the user interacts with the device (and the game) through a button interface. Users of our device are beginners in electronics who want to code their own games. Users interact with the device through a button system where they can make selections and navigate through the menu. User inputs are output to the display (and possibly a speaker). We have noticed that although there are existing devices, these devices are either discontinued, outdated, sold-out, expensive, or aren't designed for user-created games. We want the freedom to design our own games that can be run on an open source hardware platform at an affordable cost.

Brief Market Analysis:

- Intended Customers:
  Our device is intended to be an open-source handheld game platform for electronics beginners who want to design/program their own games and play them on a portable device. Ideally, this device allows users to code their own games into it. So our users are those who enjoy open-source hardware and playing/creating handheld games.

- Competition/Differentiation:
  The competition in this area is somewhat competitive. There are very high-end systems, such as the Nintendo Switch or Steam Deck, but also low-end systems that are open-source hardware, such as the ArduBoy or Evil Mad Scientist Meggy jr. RGB. However, high-end systems are very expensive to own and don't offer the ability for users to create their own games (or at least not without a difficult process). Many of the low-end systems today are cheaper but are either sold-out, discontinued, or outdated. Some of them are open-source hardware but creating your own games is not intuitive to the casual observer.

- Estimated Selling Price: ~$25 after mass manufacturing since the individual electronics components are cheap

Requirements:

Must:

- Be a handheld device that is portable.
- Be battery powered (swappable batteries).

- Have a user interface for the user to interact with the device
- Have the device display respond to a user's action or input to the device.
- Have a menu for the user to navigate through and make selections.
- Be programmable → The user should be able to upload their own games to the device.

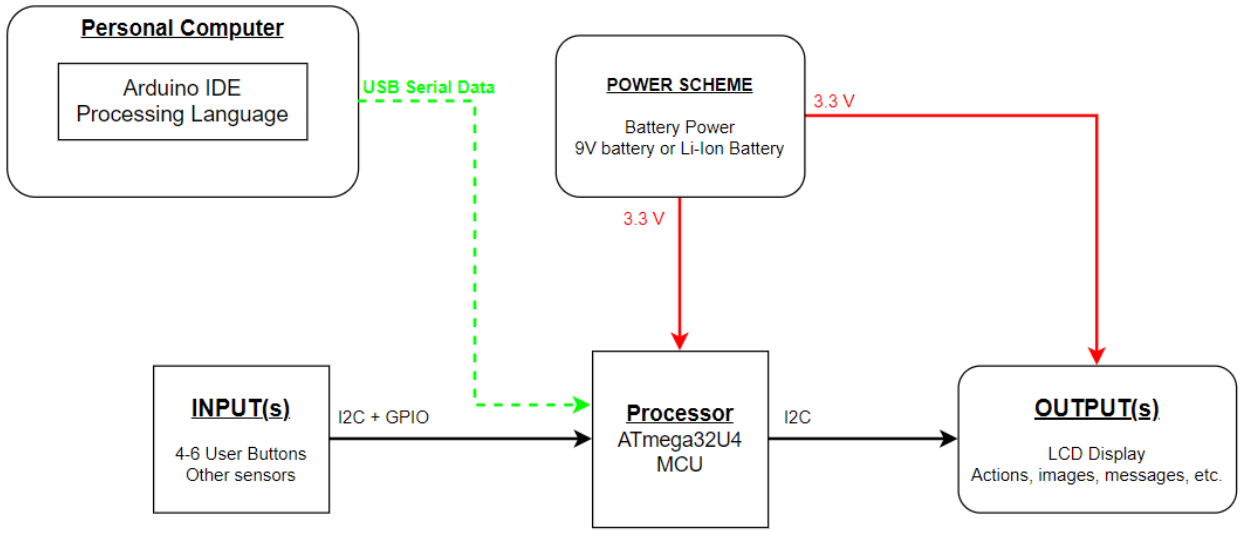
Should:

- Have non-button user input (motion control, computer vision, etc.)
- Have a 3D Printed enclosure to hold the device electronics and act as a handheld form factor for the device.
- Have non-LCD output such as vibration or a speaker for sound.
- Inexpensive for the user to build their own.
- Have battery charging circuitry

May:

- Be used on PC using the Arduino IDE Serial Monitor for display
- Use a keyboard for input to the device.
- Have memory for saving user custom device settings or status of game.
- Have other LEDs in design to act as Battery level indicator.
- Have a rechargeable battery and recharging circuit scheme.

System Architecture (L1 Block Diagram):



Design Specifications:

- Sensor(s)(input): Buttons and motion controls (6-axis IMU)
- Processor: Arduino → ATmega32U4 (Microchip)

- Actuator(output): LCD and haptics (vibration or sound)

- Power Scheme: Battery Powered (9V battery, Li-Ion, LiPo, etc.)
- Mechanical Designs: 3D Printed enclosure
- Firmware (Arduino? Development Environment?):
    - Processing (Arduino C++/C)
    - Arduino IDE