Practicum Project: Team 2

ECE 411

10/20/22

Project Description Specification

Executive Summary / Concept of Operations

Our device is a calculator that has the basic functions of addition, subtraction, multiplication, and division. It will be able to do these calculations through binary and decimal and hexadecimal. With our kind of classes in computer engineering, we do a lot of work with binary and hexadecimal, so we can use it in our classes. In order to use it, you will use the buttons, and depending on the setting, will need to type it in binary, decimal, or hexadecimal. From there, you hit the equals button and it will output onto the screen the answer.

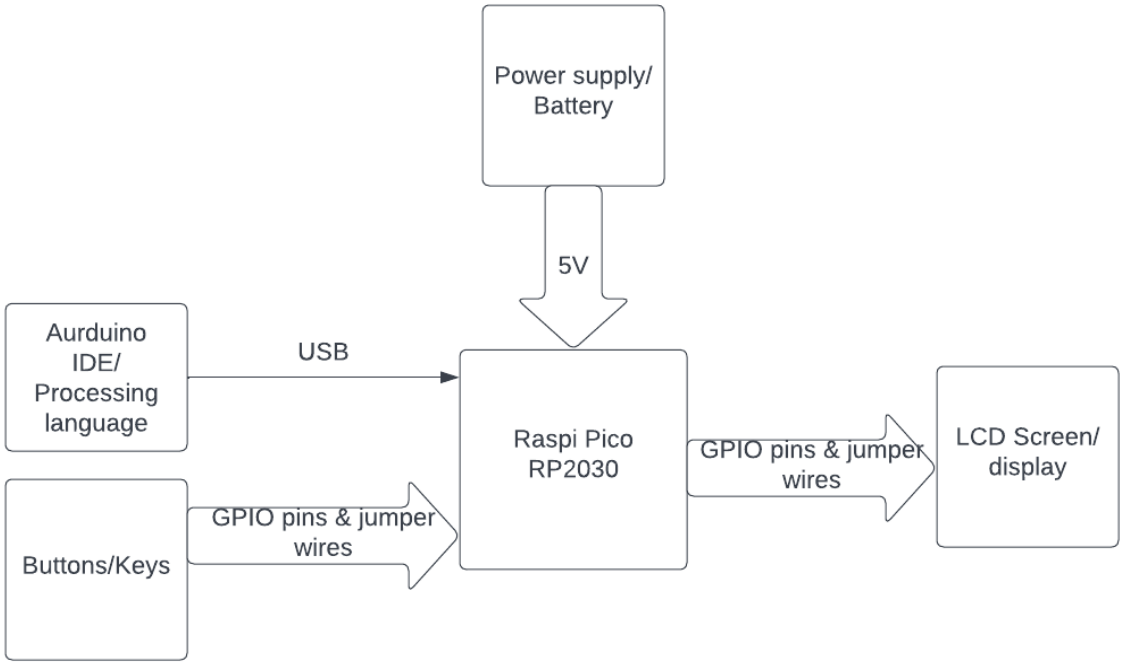
Brief Market Analysis

We want to target customers that have a need for doing binary, decimal, and hexadecimal calculations. This target group includes, but is not limited to, computer engineering professionals and students. The other products are calculators such as the TI-30XIIS, but how our calculator differs is that it comes with the ability to do basic calculations in hex and binary. Compared to the price of the TI-30XIIS, which on amazon is listed as 13 USD, we can estimate ours to be around 15-20 USD. This can be accredited to our inexpensive processor and other electronic components. We would see our 3D printed parts costing the most.

Requirements

Our calculator must have keys that will reflect the following: integers 0-9, the 4 basic operators, equals to, negative, clear all, on/off, A-F, and a button to alternate between Binary, Hex, and Decimal. The calculator must have the ability to remember the past result, must have a display, must have a delay of less than 1 second after each key press, and must be portable. We would also like to incorporate other functions that a standard calculator has as well. Such as, our calculator should be able to handle decimals and parentheses. Then, we will have a stretch goal for our calculator device that may include exponents, trig calculations, and constants (i.e pi and e).

System Architecture



Design Specification

Sensor:

- Push buttons for each respective key

Processor:

- Raspberry Pi Pico RP2040

Actuator:

- LCD screen

Power:

- 5 Volt battery

Mechanical Design:

- 3D-printed keys for each button
- 3D printed enclosure w/ cutout for LCD screen

Firmware:

- UF2 Bootloader
- Processing language

Development Environment:

- Arduino IDE