Week 4: Product Design Specification (PDS)

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Concept of Operations

Our project is a 3-in-1 counter, stopwatch, and gaming device. The counter will keep track of a number and increment as needed. The stopwatch will act as a timer and start/stop the clock as needed. There will be the ability to toggle through the menus/functions as well as reset the counter and stopwatch. We are also incorporating a game mode in our device for entertainment purposes and to add additional services to make our product more appealing to consumers.

The choice of our project was to develop a device that could be fun and practical to use. It can be used by consumers in various professions, is portable/pocket-sized, and is simple to use. The interests of our teammates involve gaming devices and jobs that require timed measurements, which ultimately lead us to the creation of this 3-in-1 Thingamabob.

This product can be utilized by everyone from any age range, although it might need to be kept away from toddlers due to the incorporation of some small components (such as buttons). The learning curve is also not that difficult - the user may need to refer back to the manual for instructions on how to switch between the three modes if they forget, but other than that, everything is pretty straightforward.

The main button's functionality depends on the mode the user is on. For example, in the counter mode, clicking the button will increment the current number by one. In the stopwatch mode, the timer will start/stop a clock that starts at 0.00s. For both of these modes, holding the button for two seconds will reset the counter/timer. The gaming mode will present a classic Flappy Bird game, where pressing the button will make the bird jump. There are also two smaller buttons - one to power the device on/off, and the other to mute/unmute the device.

To switch between modes, the user will need to hold down the main button for three seconds to pop up the main menu. Clicking the button will alternate between the three modes, and holding down the button on the current selection for two seconds will allow the user to go into the selected mode.

Brief Market Analysis

We intend to market our device to customers that may utilize timing devices in their day-to-day life. For example, a flight attendant needs to count the number of passengers that board an airplane. With the help of our device, the flight attendant will be able to accurately count the number of passengers boarding the plane and kill some time with the gaming mode during their downtime. Some other professions involve classroom teachers, PE teachers, or sports-related trainers who use stopwatches/counters frequently.

The competition for basic counters and stopwatches is pretty high. There is also a close competitor: Team 11's Handheld Video Game Console. However, the incorporation of our three modes along with a sleek, modern design, will give us an advantage that combines practicality and entertainment into one.

A generic counter/stopwatch goes for about $5 to $10 alone. Since we also have a game mode and more technology is involved, this could probably go for about at least $20 per unit.

In the future, with more investments, this device can also be upgraded to where the user can connect the device to a PC and install various firmware applications to add to their device so they can switch up the types of games to play on the device (ex. Crossy Road). Allowing the customer to install games will then enable us to increase the price of the product.

Requirements

- The user **must** be able to switch between the three modes
- The user **must** be able to select a mode
- The device **must** last for a full workday
- The battery **must** be able to be easily swapped out for a new one
- The device **must** turn on/off

- The screen **should** present color for the gaming mode
- The device **should** produce sounds for the gaming mode

- The user **may** increase/decrease the brightness of the screen
- The user **may** increase/decrease the volume
- The device **may** be rechargeable via micro-USB port

System Architecture

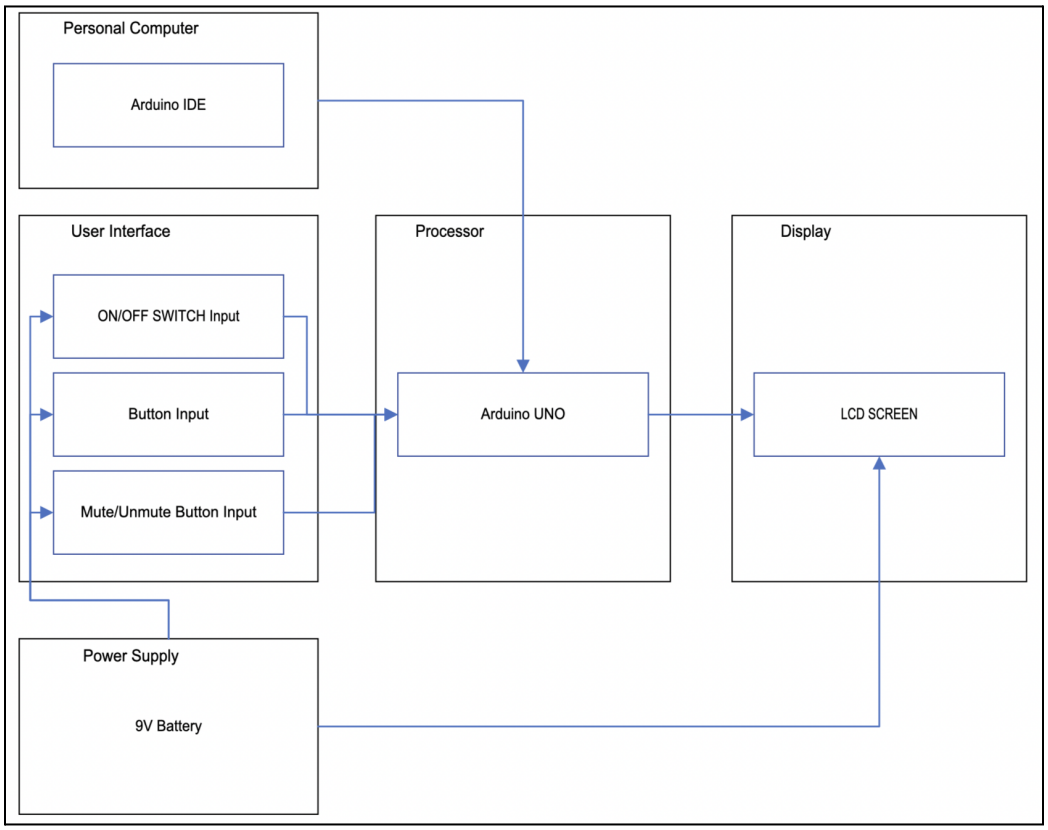

Figure 1.1. Initial level 1 block diagram.

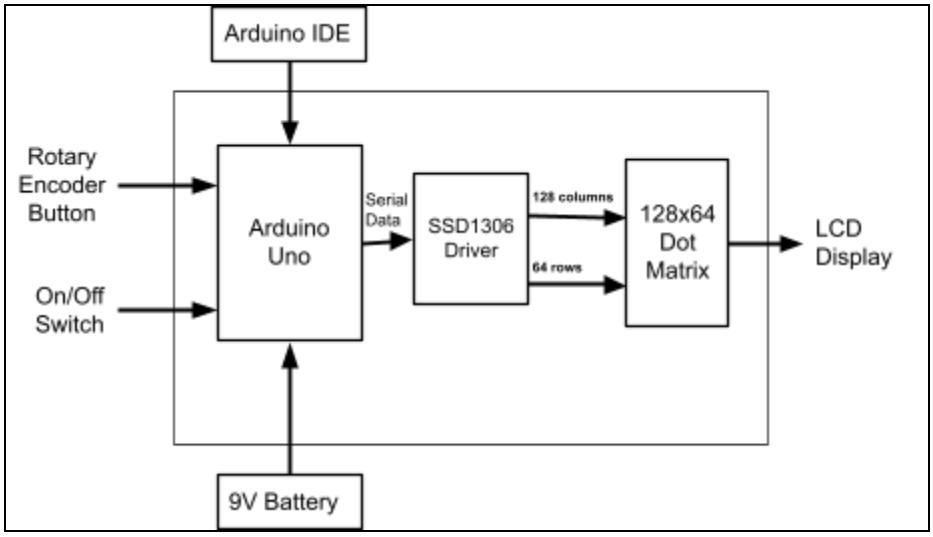

Figure 1.2. Updated level 1 block diagram.

Design Specification

Component	Item Name
Processor	Arduino
Actuator	LCD Screen
Power	9V Lithium Battery
Firmware	Arduino bootloader

Table 1-1. Technical details of the design

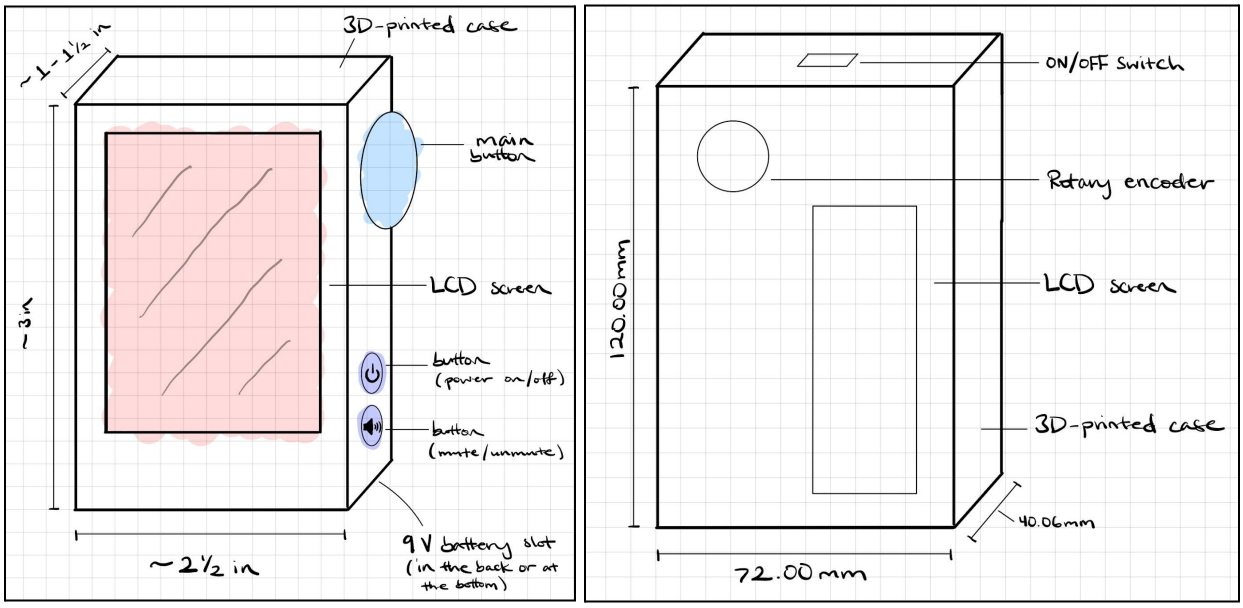

Figure 1.3. Initial sketch of design (left). Final sketch (right).