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Team #5

Keyless Door lock

Executive Summary/ Concept of Operations

We are designing a digital door lock from scratch, with buttons for the user to enter a pin code that gets stored in memory. The door opens if the user enters the correct code the next time around. This device is useful in many cases. Now the user doesn't have to worry about forgetting their keys or if other tenants are staying with them temporarily, (for example Airbnb, CouchSurfing, etc.) they can create an access pin that can be given to that guest without giving them a physical key.

We want to use an LCD display that displays the PIN number as it's being entered and possibly a short message like "welcome home" if the code is correct and "wrong code" if the code is not correct.

Typically, we also want a guess-proof mechanism that disables the lock completely for a few minutes if the incorrect pin was entered a certain number of times. (5 for example). We could possibly include an alarm (small peeping speaker) that turns on when there are too many failed attempts. This lock could be used to create a lockbox as well.

Brief Market Analysis

The device is targeting all house and condo owners with a focus on those who use services like Airbnb and CouchSurfing, since they usually need to set and reset multiple temporary pins for their tenants.

There are multiple door locks in the market. We are hoping to make an affordable, trustworthy design and we will try to integrate additional features, such as an alarm and multiple pins.

We're thinking the product's final price should be $50 or less because we want this to be an affordable option due to the competition's prices, which means our cost must be much less than this to be profitable.

Requirements

<u>Our product must: -</u>

1. have one or more input sensors.
2. have one or more outputs or transducers.
3. have one or more microcontrollers/processing modules to control/generate the output.
4. be safe.
5. use components that can be hand-soldered.
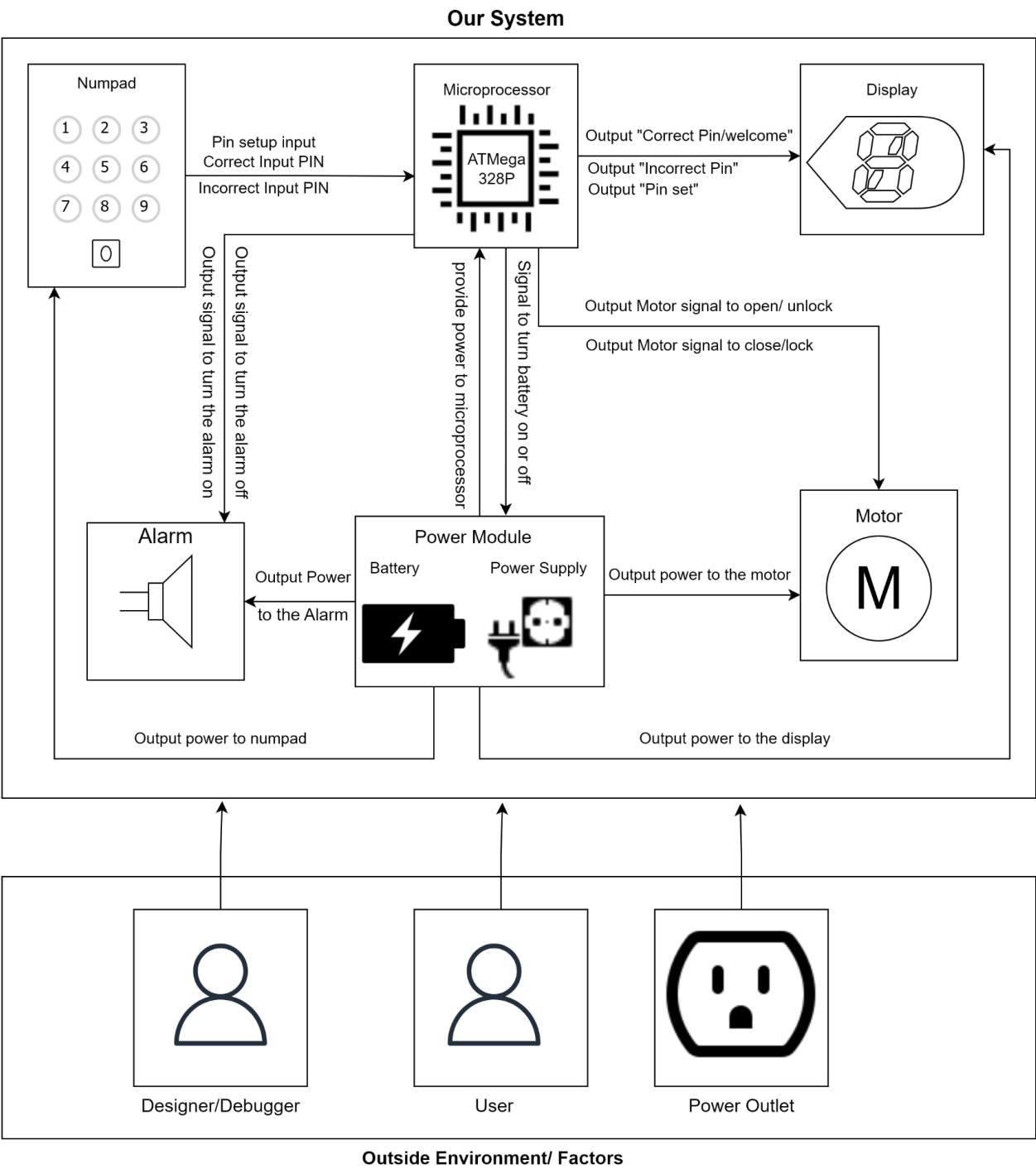6. use two layer PCB.

<u>Our product should: -</u>

1. be packaged in an enclosure.
2. have a display to signal unlock, lock, and errors.
3. be lightweight.
4. have a battery for operation if the power goes out.

<u>Our product may: -</u>

1. be novel and add new features to current designs/competitors.
2. be portable.
3. include an alarm/buzzer that turns on after multiple failed attempts.

System Architecture

Our System

Numpad

```
1  2  3
4  5  6
7  8  9
   0
```

Pin setup input
Correct Input PIN

Incorrect Input PIN

Microprocessor

ATMega 328P

Output "Correct Pin/welcome"

Output "Incorrect Pin"
Output "Pin set"

Display

Output signal to turn the alarm on

Output signal to turn the alarm off

provide power to microprocessor

Signal to turn battery on or off

Output Motor signal to open/ unlock

Output Motor signal to close/lock

Alarm

Output Power to the Alarm

Power Module

Battery   Power Supply

Output power to the motor

Motor

M

Output power to numpad

Output power to the display

Outside Environment/ Factors

Designer/Debugger

User

Power Outlet

<h1 align="center">Design Specification</h1>

Sensor	Processor	Outputs	Power
Keypad buttons (Switches on and off for each button 0 – 9)	ATMega328P, the microcontroller found in Arduino.	1. A servo or step motor that moves the door lock to open or lock. 2. Display (LCD or LED) 3. Speaker for the alarm	5-volt dc power supply

- We plan to use the Arduino IDE and its environment with the possibility of utilizing other tools and IDEs as needed.
- We plan to utilize Arduino firmware.
- We plan to design the PCB in KiCAD.