ECE 411
Homework #3 3 concepts/ideas

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Team #5

Concept 1 Parking Garage available spots tracker

In airports and other tower-like parking lots, there are sensors and lights that show if a spot is taken. Nothing like that at the PSU parking deck, but this year the deck seems packed and tougher to traverse. We could also include a display that would show how many spots are available on each floor, but this is possible feature creep, and we should keep it simple. If we just get a single space to work as a proof of concept, it can be expanded on in a write-up to factor in the scale of a floor or the whole structure.

Sensors and Components: -

Possible sensors: IR sensor (might not work well on vehicles in cold weather) or ultrasonic sensor (we would need to establish average distance between placement and vehicles)

Microcontroller: ESP32

8x8 led display (possibly larger display might be necessary)

Concept 2: Door lock (We picked this one)

We are thinking of building a digital door lock from scratch, with buttons for the user to enter a pin code that gets stored in memory and the door only opens if the user enters the correct code the next time around.

We want to use an LCD display that displays the PIN number as it's being entered 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 in that case as well. This lock could be used to lock boxes as well.

 Inputs: -

Buttons.

Outputs/Actuator

LCD Display.

Motor movement to lock/unlock the door.

Possible alarm speaker.

Microcontroller: -

ATMega328P (or any comparable readily available microcontroller) **

Idea we are going with is the door lock. Though we are open to any suggestions regarding the feasibility of this idea and/or our other ideas.

Concept 3 Light sensor and control device

A sensor control device that is to be used in outside dining spaces, especially around sunsets. It senses the outside light and as it gets darker it sends a signal to the light bulbs connected to it to gradually raise their luminance/brightness. When it gets really dark, the light bulbs should be at their highest luminance/brightness.

This device can also sense sunrises and dim those light bulbs in the same exact way.

Sensors and Components: -

Inputs: - We need a light sensor to get information about the brightness/luminance level outdoors. We would want to use at least 2 light sensors to complement each other's, we'd average their inputs.

Outputs/Actuator : - The brightness/luminance of the light bulb/bulbs.

Microcontroller: - ATMega328P (or any comparable readily available microcontroller) **

Honorable Mentions

Concept 4 USB Hub

We want to design a USB-HUB. Typically, USB-C and with at least 4 ports (we'll decide this when we make the schematics and see the power levels we're working with).

As some added features if we have time, we can implement an LCD that shows how much power is going through the HUB. We also want to look into limiting/controlling the wattage through each port.

Sensors and Components: -

Inputs: - Each USB Port will use a serial bus that should typically be duplex (Transfer in the two directions at the same time). We could use I2C thought this would limit our commercialization prospective if we decide to do that since we'd need an I2C license that could be expensive. (Need to check!)

Outputs/Actuator

- The same USB serial bus would serve as an output.

- Light indicator for when the Hub is connected to a device.

- Possibly LCD display showing the wattage.

Microcontroller: -

ATMega328P (or any comparable readily available microcontroller) **

Concept 5: Cat water fountain with motion sensor

There are many cat water fountains out in the market but almost none of them have any motion sensors and their motors just work day and night.

We are contemplating making a motion sensor controller small pet water fountain that would serve just as a water bowl when no motion is detected but would turn a motor on when motion is detected and remains on while the close is close to it (proximity sensor)

Sensors and Components: -

Inputs: -

Motion Sensor

Proximity Sensor

Outputs/Actuator

PWM to turn the motor on when motion is detected, or an object is close.

Possibly a light indictor for when the motor is working.

Microcontroller: -

ATMega328P (or any comparable readily available microcontroller) **