EECS 2210 Final Project Report: Visual and Auditory Alarm

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Table of Contents:

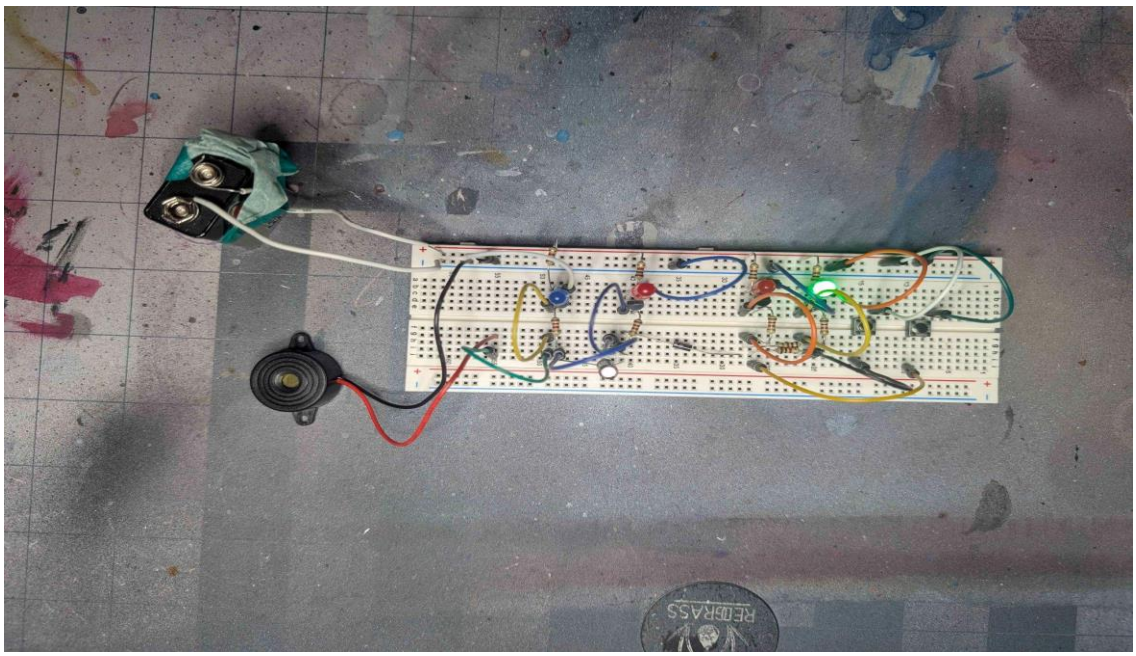
What is our project?

Our project is an alarm system, where a buzzer will play if you press the push button and depending on which button you press a different LEDs will light up.
The circuit in our project has been built by several different components. The core components are resistors, transistors, a capacitor, and diodes. By using the properties of those components, the circuit has been set to two different parts. One part is the control unit and another part is the function unit. The control unit can be used to turn the function unit on and off. While the function unit has been turned on, the led bulbs will flicker alternately and the buzzer will make a periodic beeping sound..
In our design, we decided to use the push button to control the circuit. However, This project also can be modified with different components to create different scenarios. For example, the push button can be replaced with a photocell or thermistor resulting in the circuit operating off light condition or temperature. While our system is a manual alarm, using a photocell or thermistor we can change our alarm to a light sensitive alarm or a temperature sensitive alarm. Everyday examples include oven alarms and motion activated security alarms.

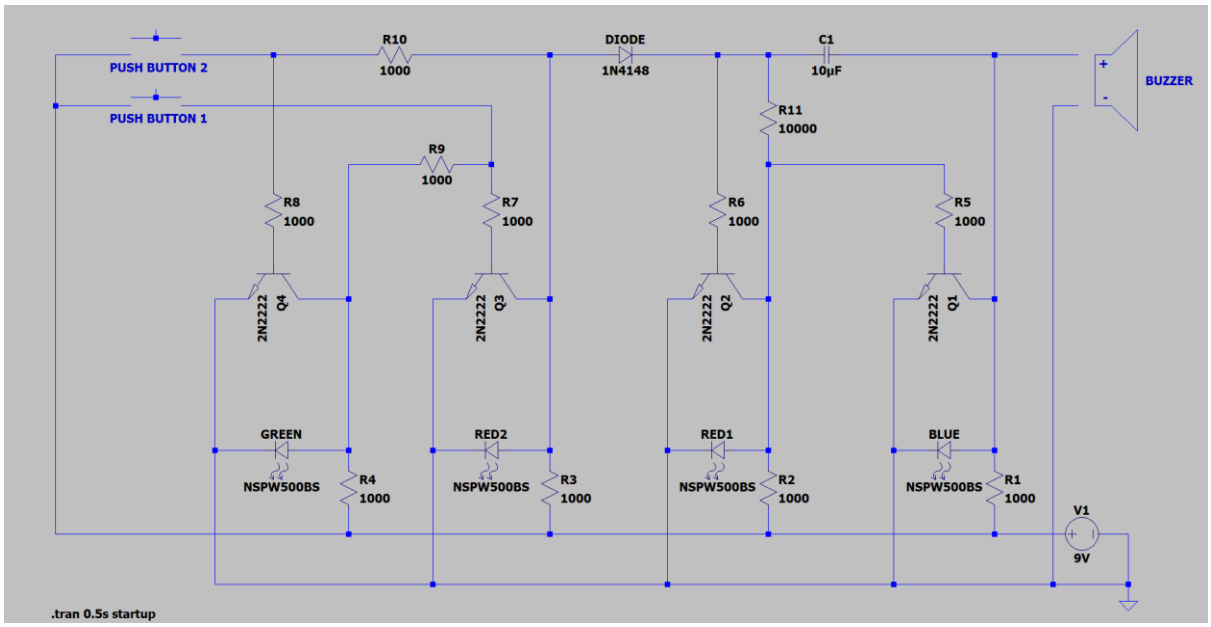
Component Use:

- Two Push-buttons
- Ten 1k ohms Resistors
- One 10k ohms Resistor
- Four LEDs (2 red, 1 green, 1 blue)
- Four NPN Transistor
- One 10uf Capacitor
- One Buzzer
- One 9V Battery

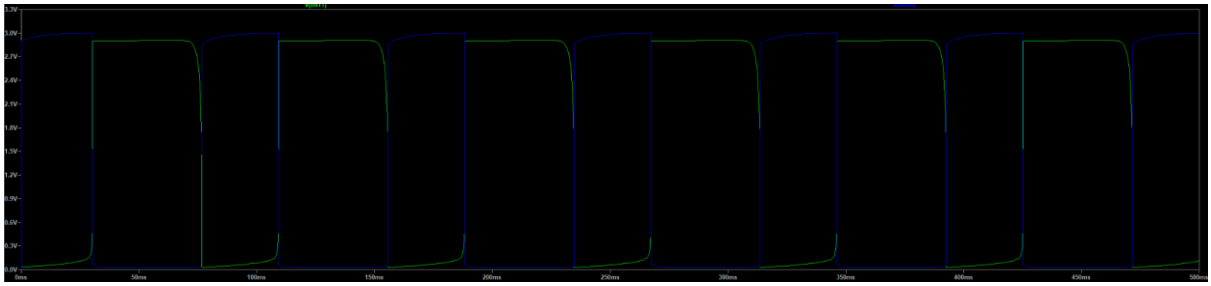
Picture:



Circuit Diagram:



Wave Diagrams:



How does it work?

As a transistor based circuit, the property of the three pin transistor is the core component to make everything happen. In the circuit, there are 4 leds, and each of them are parallel with a transistor. When the base pin of the transistor has been powered on, the left pin and right pin will be connected. Then it will short the led, and this how the circuit to turn on and off the leds. One led and one transistor will be seen as a set, and two sets will be used as a group. The left group is the core of the control unit, and the right group is the core of the function unit.

In the control unit, the output of transistor Q4 has been connected to the input of transistor Q3. And the output of transistor Q3 has been connected to the input of transistor Q3 and Q2.(Transistor Q2 is part of the function unit.) In this design, only one transistor of Q4 and Q3 can be activated in the control unit. When push button 1 has been pressed, the transistor Q3 has been activated and the led RED2 will be turned off(shorted). The current following to the function unit is also shortened. At this moment, led GREEN will be turned on. And the loop in the function will start looping, the led RED1 and BLUE will start flashing and the buzzer will start beeping with a fixed rate. When push bottom 2 has been pressed, the

transistor Q4 will be activated and the led GREEN will be shorted and turned off. The led RED2 will be turned back on, and the current will flow to the function unit through the diode. At this moment, the transistor Q2 will be active and the led RED1 will be shorted and turned off. The transistor Q1 will be turned to deactivate and the led Blue will remain turned on. The buzzer will keep the sound on.
The capacitor in this circuit has been used to make the delay. This delay makes the led RED1 and BLUE flash when the function unit has been turned on. The beeping rate of the buzzer has been set based on this capacitor also.
The diode is a one way trip door of the current. It makes the current flow only to the function unit from the control unit. This is the key point to make sure the function unit will run properly when the current is flowing in the loop.
All the resistors in this circuit are being used to protect the other components.

Explaining cap trans and diode:

The capability of the capacitor decides the rate of the buzzer beeping and led flashing. When the capacitor has a larger capability, it will take more time to charge the capacitor. And the rate will become low. Therefore, when the capacitor has a smaller capacity, the rate will become higher.

The diode will make the current flowing to the designed direction only. It will make sure the current will flow to the function unit from the control unit only.
The transistor that has been used in this project is a three-pin transistor. The base pin is the control terminal. When the base pin has been applied a small current, the collector pin and emitter pin will be connected to each other like a power cable.

Video:

Will be posted alongside with the report on eclass.