Quiz Buzzer
by
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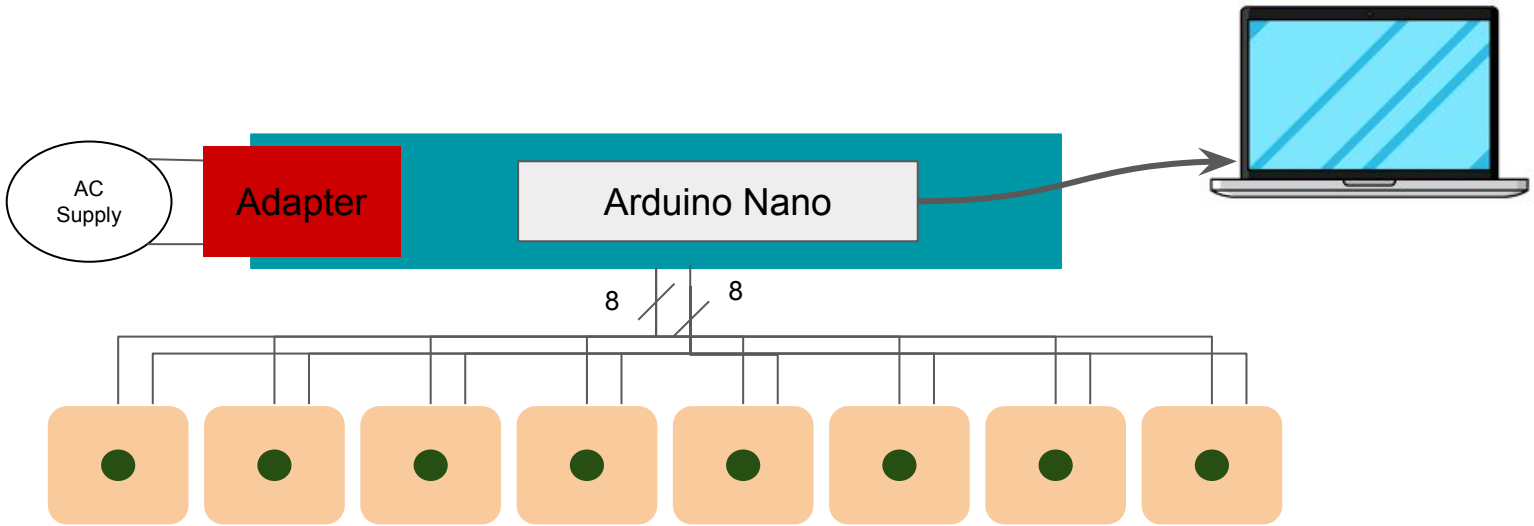
In Association With

Constraints given by Qriosity

- Wired
- 8 Buzzers
- Only the first press is registered
- 5 meter wire from each buzzer
- LED Indication on the first pressed buzzer
- GUI in the connected laptop will show the buzzer number
- No Battery, instead we are using the adaptor to power up the setup

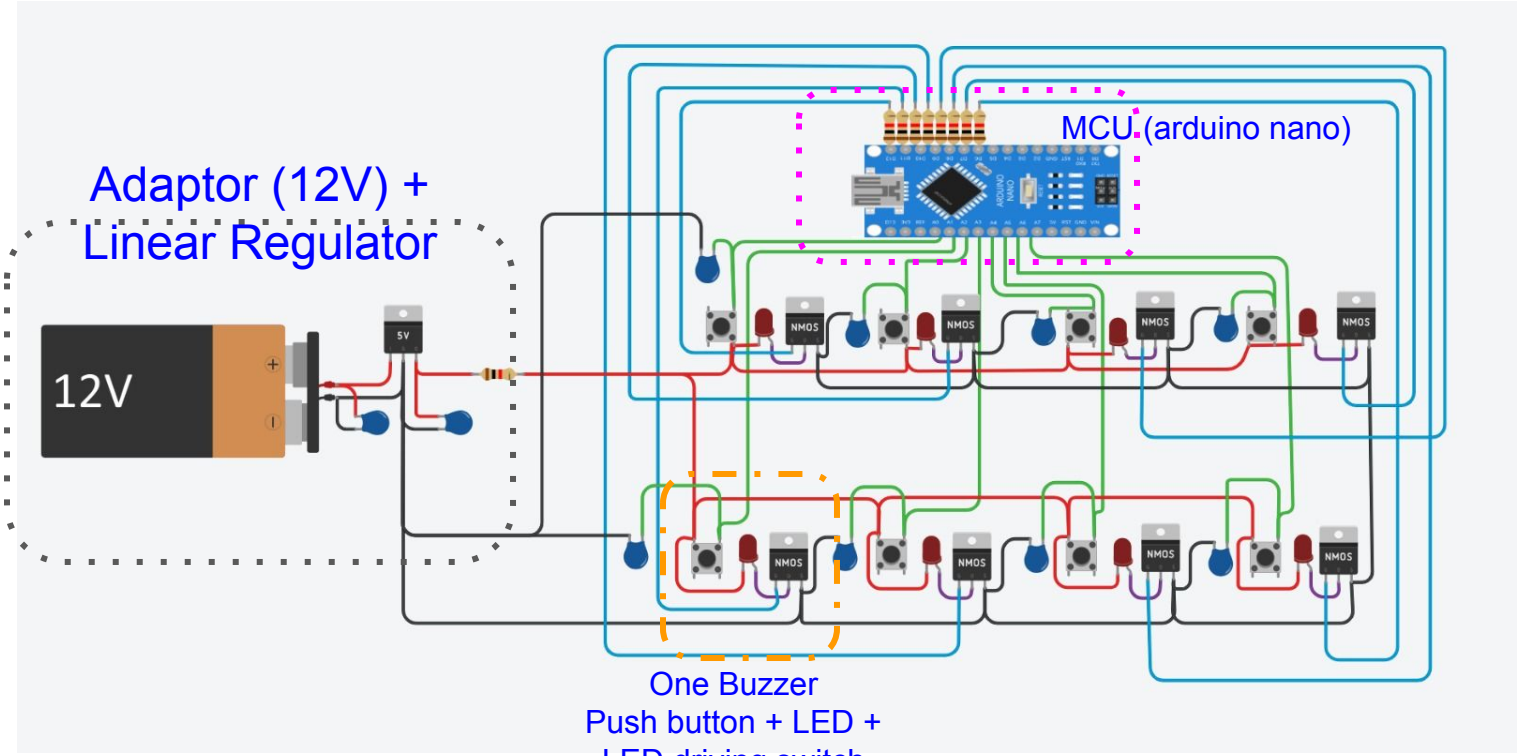
Can you think of any other design constraints \ change any given constraints that can improve the product's features ?

System Design



Come up with some other design / better implementation model for the given constraints

System Design



Bill of Materials

Why did we choose these components ? BOM

since total 4 wires are going into one buzzer as per the design

A good mechanical switch with spring return mechanism

We needed a 12V DC supply and 5V DC supply

USB A to B connector for connecting the Arduino to PC to interact with the GUI

Minimal features which satisfy our requirements

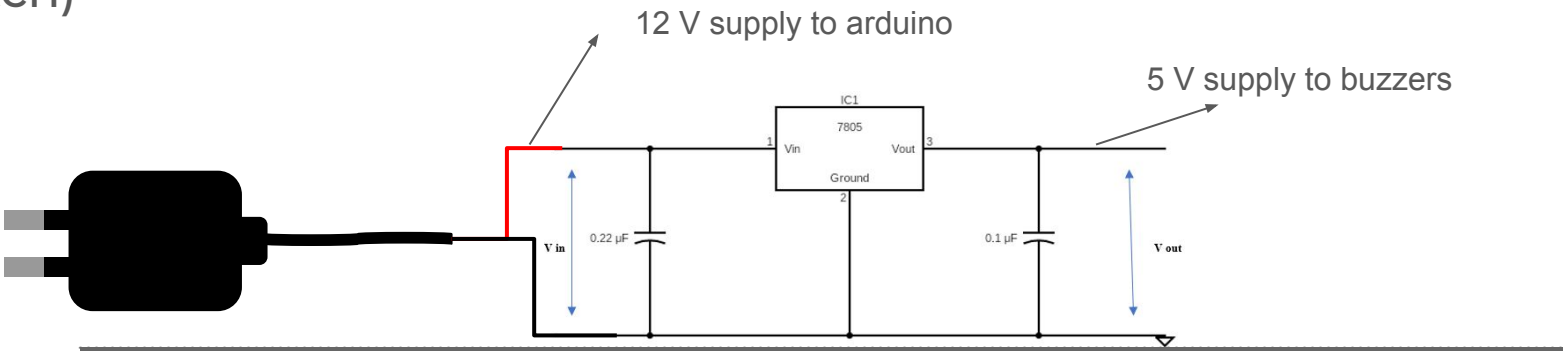
LED set which is bright enough to see the indication

Power supply

We are using an 12V adapter

12V since the input supply to arduino nano is 12

We use a voltage regulator (L7805) to make 5V supply (for supplying the switch)



Why can’t we use a simple resistive divider circuit to make 5V supply from 12V supply, what’s the need of a Linear voltage regulator?

Connection to GPIO pins (input)

- **Pull down resistor**

  to avoid floating values when the switch is at floating state

- **Debounce capacitor**

  to avoid false trigger due to the switches multiple response to a press (we can handle the issue by using a digital logic also which will be explained later)

Compute the values of Pull down resistor and Debounce capacitor (assume practical values wherever required)

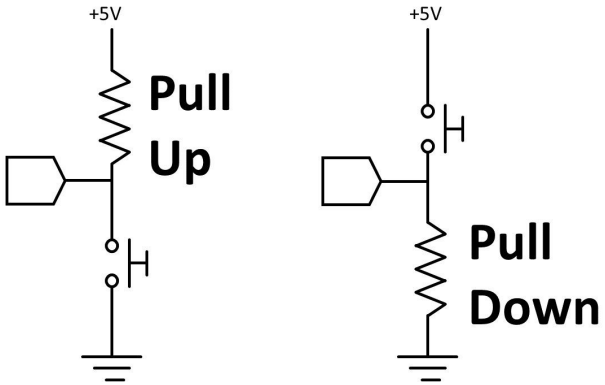
Connection to GPIO pins (input)

Arduino doesn’t have an internal

pull-down resistor.

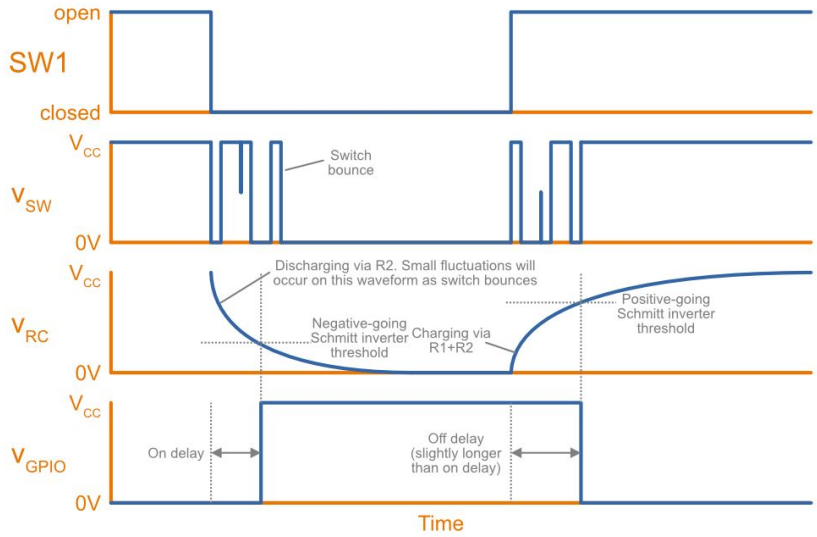
instead we can add one external resistor

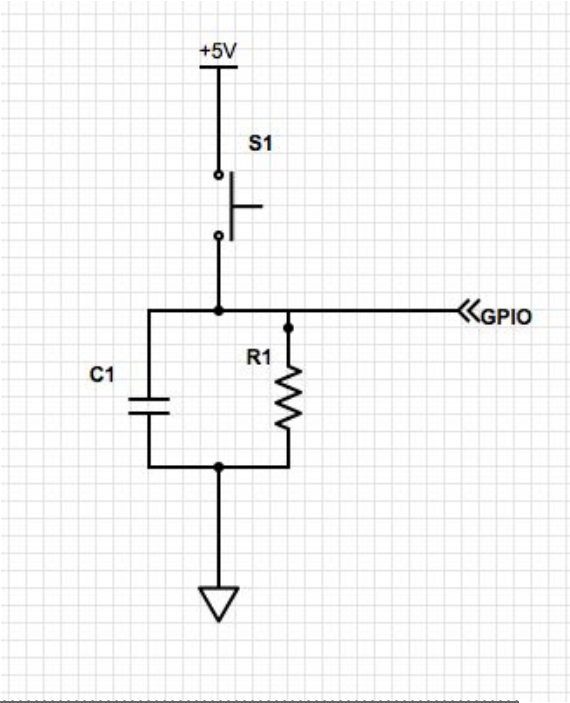
usually we choose a high value resistor (10K)



Connection to GPIO pins (input)

Debounce capacitor





This is one of the simplest implementations of an analog debouncer, can you find out more fail proof designs for debouncers?

GPIO (output)

Like MOSFETs,there is another class of transistors called BJT, what is the alternative design of a LED driver circuit using BJT, (out of these two which one do you will be think better?)

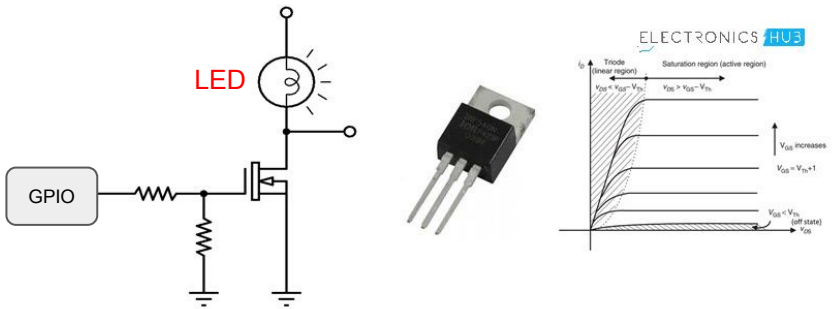
- why not connect directly?

  The maximum current limit to arduino I/O pin is 20 mA, the LED set we are using draw close to 100 mA current, this much current sourcing/sinking can damage the circuit

- Solution:

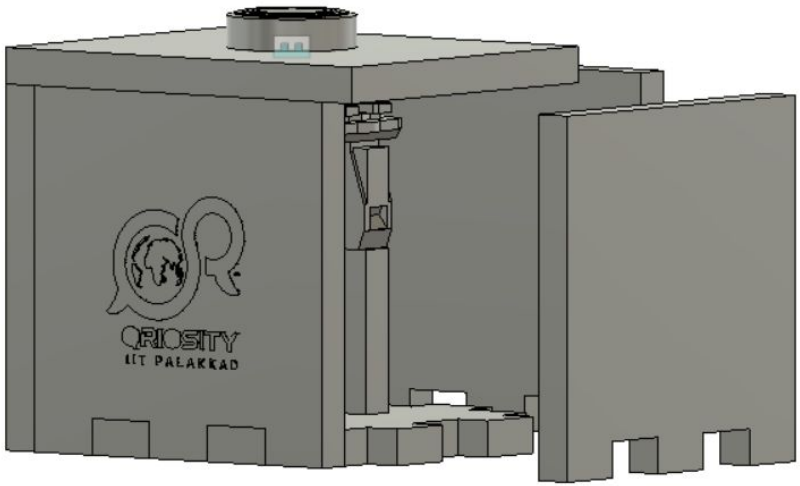
  LED connected to a MOSFET switch controlled by the GPIO pin

find the value of resistors for this setup to work as a voltage controller switch ?



Enclosure design

Fusion 360 design



how can we firmly connect the pushbutton to the enclosure, come up with a design solution

Arduino coding

Initialise:

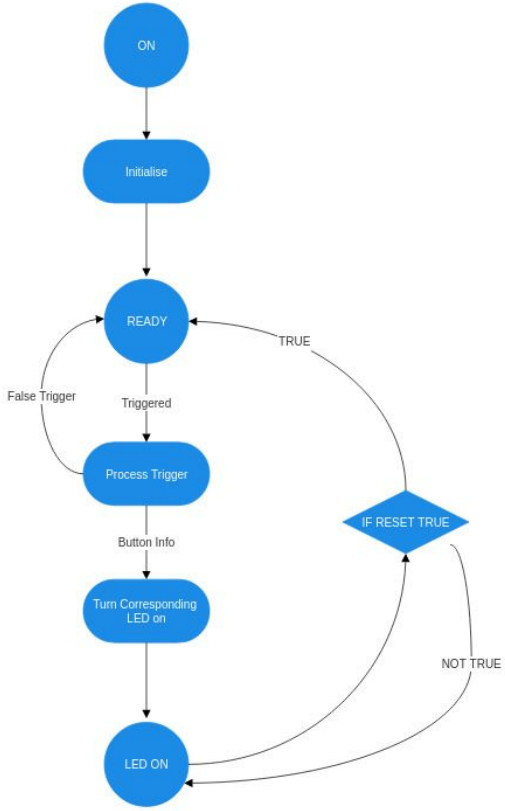
- Set up all the necessary pins.

Ready State:

- Listening to the buttons

Triggered State:

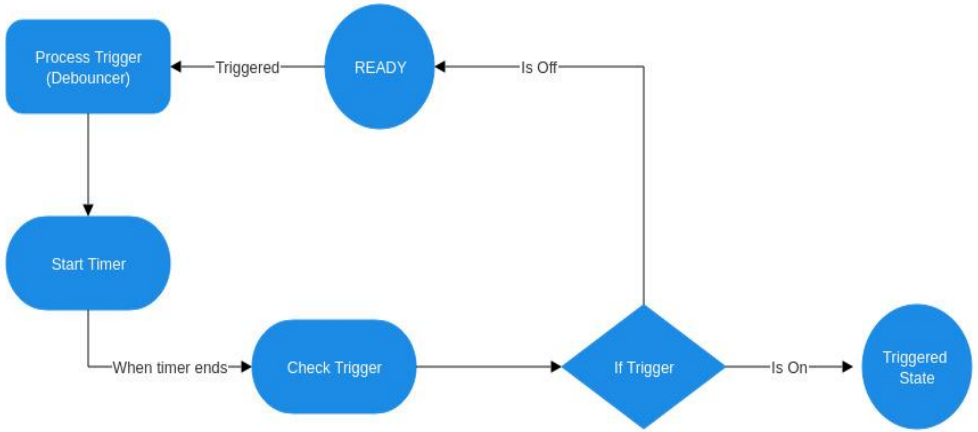
- Displays the button pressed and remains in the state till reset.



Write the arduino code based on this flowchart

Debouncer

- Differentiates between a false and intended trigger.
- Uses just a timer.



Can we use the same technique if we are reading multiple push button at the same time? Which interrupt should have higher priority among the debouncer timer and push button interrupt?