

Ardunio :- It is device which can be used as open source microcontroller by means of hardware as well as software i.e. User can use it according to the requirement.

It provides us a platform to control a electronic circuit in the way we want.

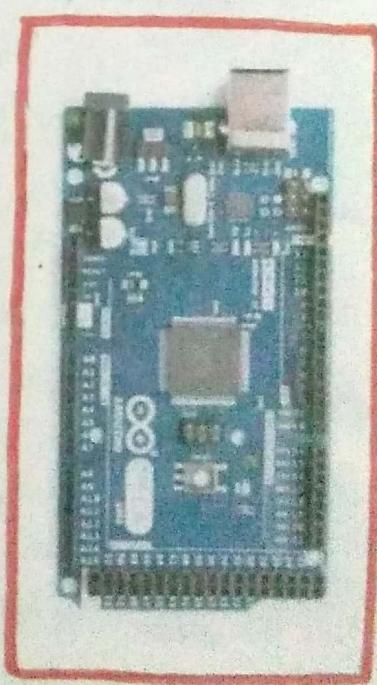
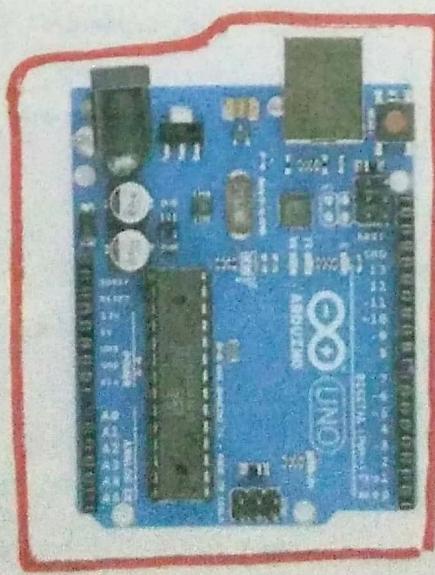
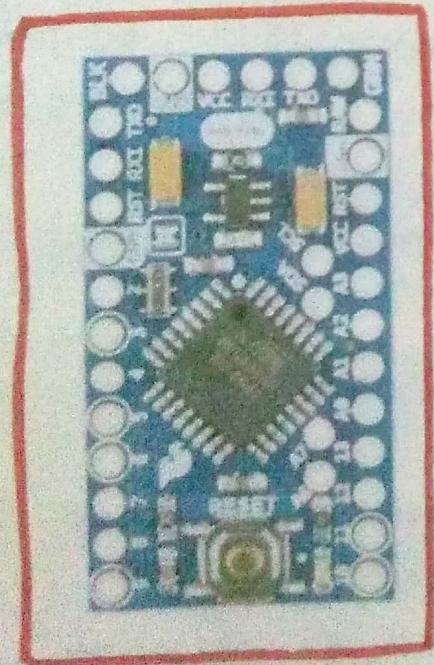
We can control various physical devices using arduino e.g. motor, LED & bulb etc.

Types : There are 3 types (basically) of Arduino microcontroller

1. Arduino mini
2. Arduino mega.
3. Arduino UNO.

This classification is based on the versatility of use of arduino.

The most used arduino microcontroller is Arduino UNO.



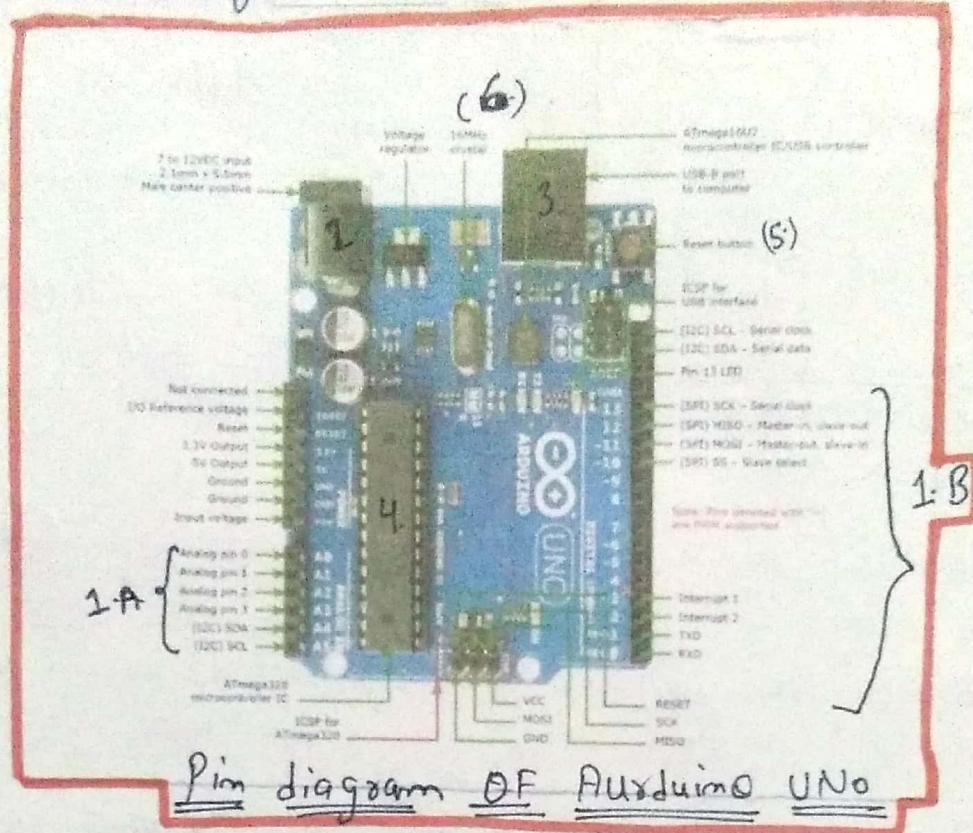
1. Arduino Mini

2. Arduino UNO

3. Arduino MEGA

# Arduino circuitry (UNO) :-

1/1



Pin diagram of Arduino UNO

1. INPUT / OUTPUT PINS: These are the pins which are used to input & output from arduino.

(A) Analog Pins: These are the pins which are used for analog I/O. There are 6.

(B) Digital Pins: These are the pins which can be used for digital I/O. There are 14.

PWM Pins: These are pins which provide facility of pulse width modulation I/O. The pins no 3, 5, 6, 9, 10, 11 can be used as PWM Pins.

# Their is pin number 13 which is connected with LED at arduino can also be used as digital I/O.

# There are some pins for grounds & some of the pins are for 3.3v or 5v output.

2. DC Power Jack: It can be used to give dc power to the Arduino UNO. (7-12 V DC)

3. USB Port: It can be used also for dc power supply (9 volt DC) & also use for programming in arduino board.

Microcontroller IC: It is used to control all the functions of the arduino board as instructed by user.  
It is named as Atmega328 IC

(5) Reset button:- It is used for making reset the Arduino it means program restart from beginning.

(6) Crystal oscillator (16 MHz):- It work actually clock pulse for the microcontroller IC's & by which it can calculate the time it can work with such accuracy that it can measure a time of  $1 \mu\text{sec} = 10^{-6}\text{ sec}$ .

Here are some basic Arduino functions which are used to program it

(1) `digitalRead(pin)`: Reads the digital value at given pin.

(2) `digitalWrite(pin, value)`: Writes the digital value to the given pin.

(3) `pinMode(pin, mode)`: Sets the pin to input or output mode.

(4) `analogRead(pin)`: Reads the value & return also.

(5) `analogWrite(pin, value)`: Write the value to that pin.

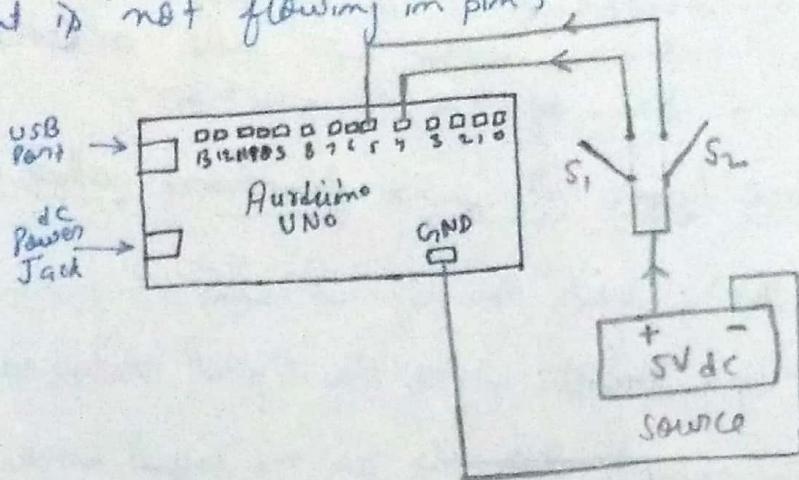
(6) `serial.begin(baud rate)`: sets the beginning of serial communication by setting the bit rate.

The screenshot shows the Arduino Serial Monitor window titled "COM21". The text area contains a continuous loop of the following message:  
You are on blink number: 1  
You are on blink number: 2  
You are on blink number: 3  
You are on blink number: 4  
You are on blink number: 5  
The below LED is Blinking  
You are on blink number: 1  
You are on blink number: 2  
You are on blink number: 3  
You are on blink number: 4  
You are on blink number: 5  
The Red LED is Blinking  
You are on blink number: 1  
You are on blink number: 2  
You are on blink number: 3  
You are on blink number: 4  
You are on blink number: 5  
The Blue LED is Blinking  
You are on blink number: 1  
You are on blink number: 2  
You are on blink number: 3  
You are on blink number: 4  
You are on blink number: 5  
The Red LED is Blinking  
You are on blink number: 1  
You are on blink number: 2  
You are on blink number: 3  
You are on blink number: 4  
You are on blink number: 5  
The Blue LED is Blinking  
You are on blink number: 1  
You are on blink number: 2  
You are on blink number: 3  
You are on blink number: 4  
You are on blink number: 5

This is a special feature of arduino UNO due to which the user can use above function numbers 6. `serial.begin(baud rate)` & it give output status of simply if any message which user want to print. Here baud rate can taken as 9600, 14400 or 19200 etc. It is actually data rate in bits per second.

Case: Suppose a situation in which if I am giving two signals to the Pin no 4 & 5 (digital) & I want that at serial print screen it will show me the output status by passing a corresponding message that

- Message
- 1. current is flowing in pin 4.
  - 2. current is not flowing in pin 4.
  - 3. current is flowing in pin 5.
  - 4. current is not flowing in pin 5.



Circuit diagram of real life situation or Problem

Here in diagram I have shown it clearly that switch  $S_1$  &  $S_2$  are provided, now if we want to use serial print then the output come on the basis of

$S_1$	$S_2$	Message Print
0	0	2 & 4
0	1	2 & 3
1	0	1 & 4
1	1	1 & 3

Here  
 $0 \rightarrow \text{OFF}$   
 $1 \rightarrow \text{ON}$ .

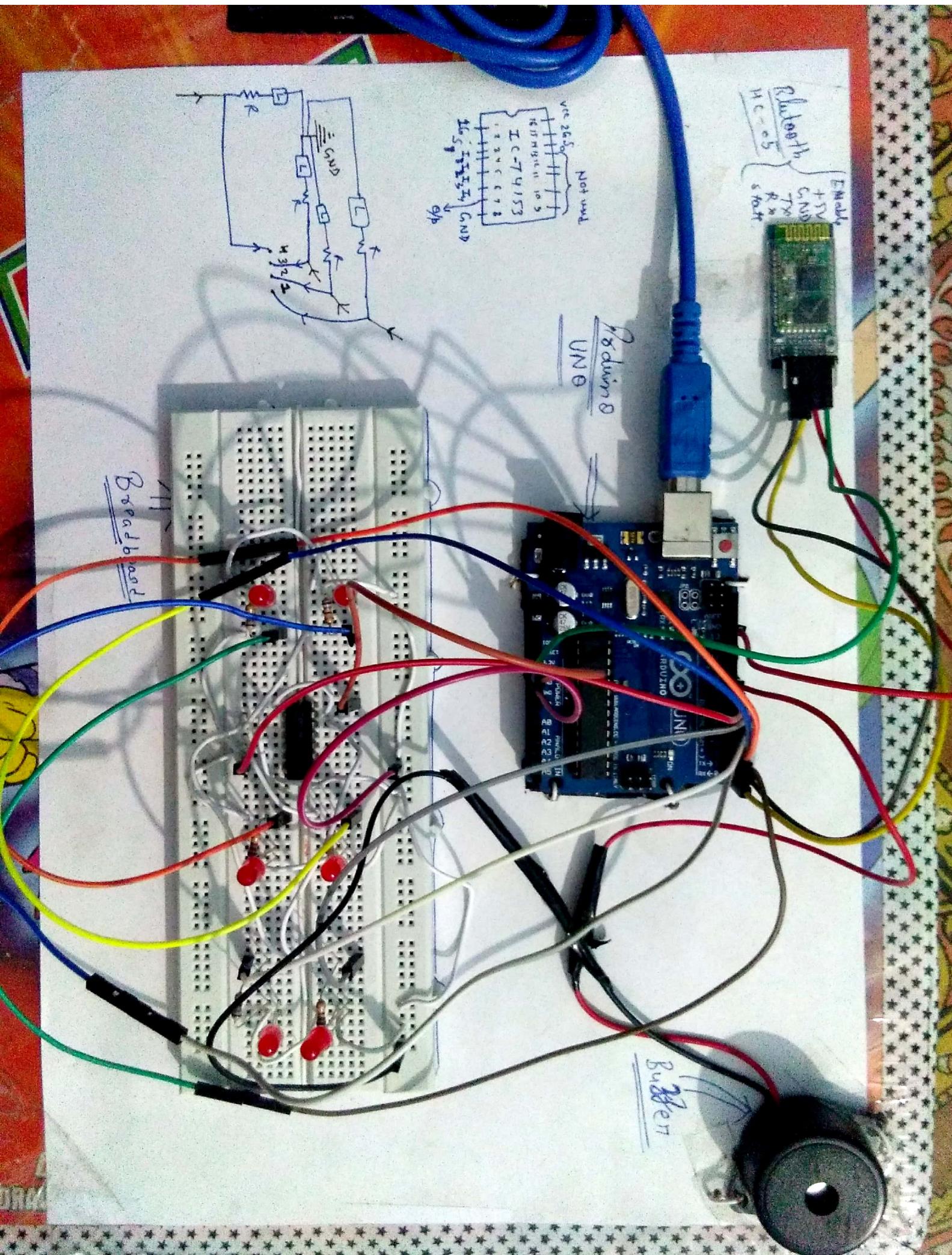
current is flowing in pin 4  
 current is not flowing in pin 5  
 current is flowing in pin 4  
 current is not flowing in pin 5

- - - - -  
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 - - - - -

current is flowing in pin 4  
 current is not flowing in pin 5.

serial print screen

Now suppose if we give the input supply at pin 4 & not giving input at pin 5 it means  $S_1, S_2 = 1, 0$   
 so it will print a message of number 1 & 4 as shown in diagram on right (Suppose we provide delay of 1000 millisecond)





# Project

Topic : Detection of breakage in the railway track at joints to avoid accidents.

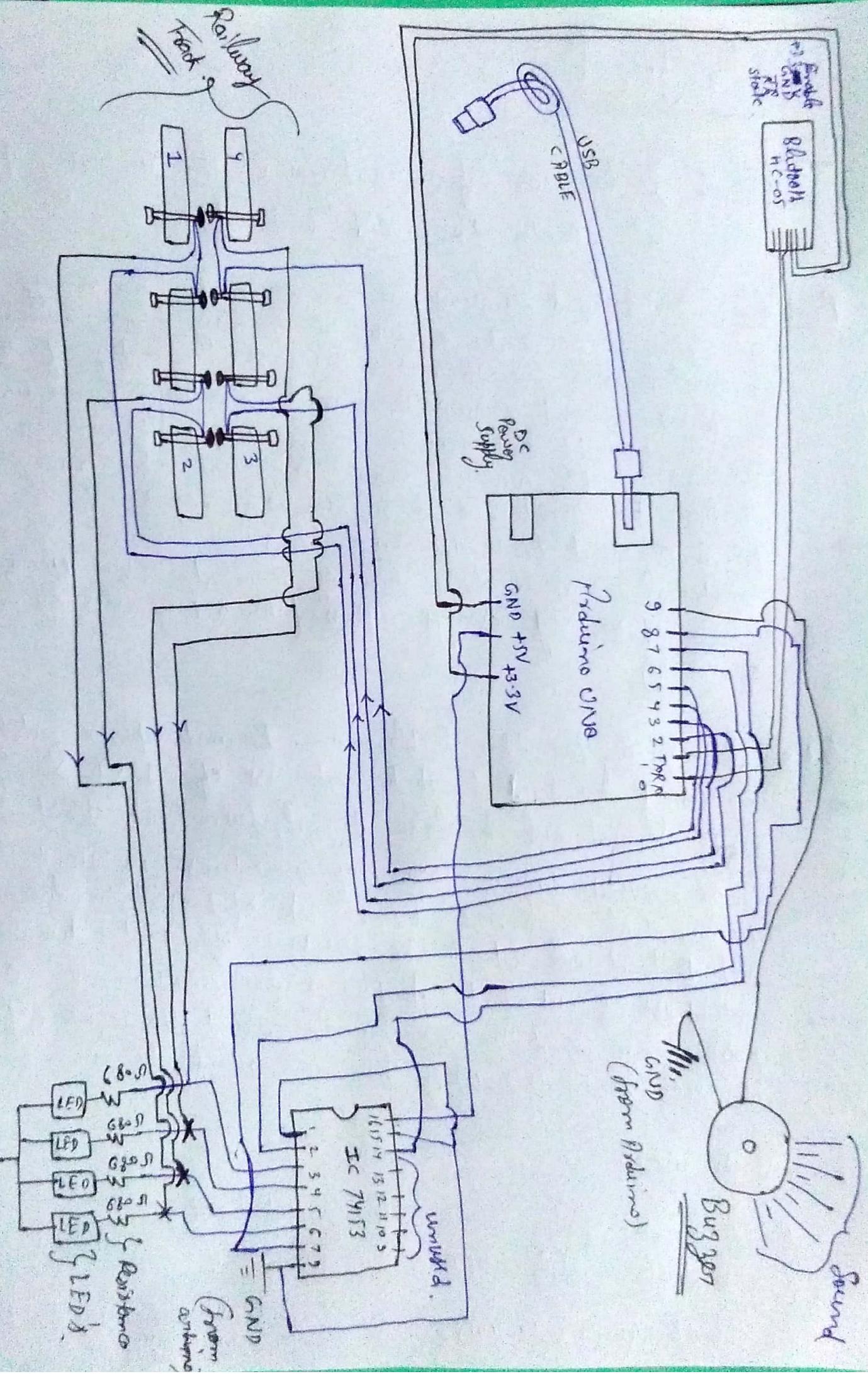
Problem : In present scenario, we can see that how many number of accidents occurred on railway track human negligence & due to other reasons. Presently if the break at joint occurs then railway authorities manually maintain it but due to negligence of the worker joints do not checked well & they get break when rail passes through the track (due to vibration they break) & it leads to a accident to cause huge loss to human life & material. Due to these type of accidents every year ministry of railway always suffers from a huge loss by means of money.

Solution : Solution for this problem can be made approximately by using this project which make use of IOT & reads a individual boolean signal from each joint & send corresponding message of correctness of joint to the control room & this set up of project is designed such that it will detect the breakage of joint (due to untightness of nut-bolts) before a particular time so that control room send the workers to correct the joint before it break & in this way the rail accidents can be avoided.

Components used :

1. Arduino UNO.
2. Bluetooth module - HC-05
3. Jump wires & IC-74153
4. Breadboard
5. Buzzers.
6. Temporary railway track.
7. LED's and Resistors.

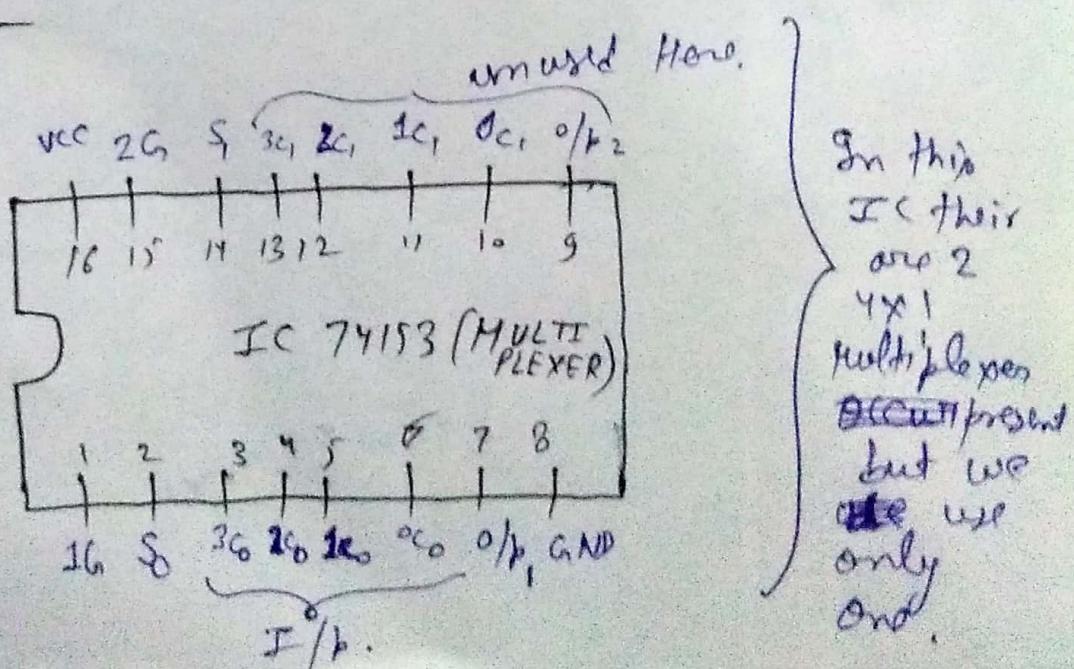
## Circuit diagram

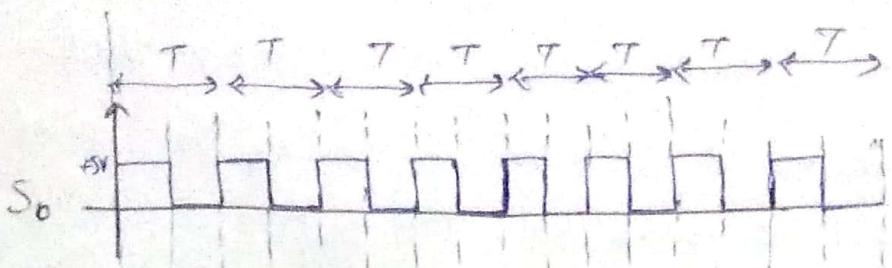


Explanation: In the circuit shown it is clear that a wire is made to pass from each of the joint in which the current is made to flow from digital pin 2, 3, 4 & 5 of Arduino UNO & in this way a boolean signal is given to multiplexer IC (74153) at its pins 3, 4, 5, 6 it select one of these input signals & produce at output (By using multiplexer we can cover number of joints on a single set up in Round Robin fashion which reduces the cost of set up).

Here the coding is made such that if the boolean output is 1 at output pin of mux (which goes to the digital pin no 8 of Arduino & can be digitally read) then a corresponding message "Joint is correct" is shown at receiver's end (control room) otherwise buzzer get activated & a message "Joint is going to break" is shown at the receiver's end.

Working of Mux IC 74153 can be understood as follows:-



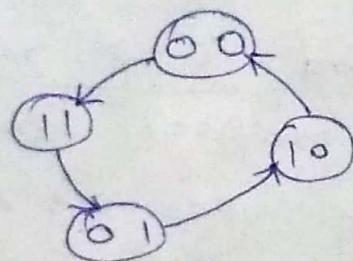


$$f_{S_0} = 2 f_{S_1}$$

$$T_{S_0} = \frac{1}{2} T_{S_1}$$

$S_0$	1 0 1 0 1 0 1 0 1 0 1 0 1 0 - - -
$S_1$	1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 - - -

$S_0, S_1$ 's Value rotate in a circular fashion as shown below



In this way selection line's value updated in a round robin fashion, in some way the different input ( $I_0, I_1, I_2, I_3$ ) selected to give at output line (Pin 7) in round robin fashion.