Turn Signal Bike Safety Indicator

The major aim of this project is to reduce the overall accidents due to the lack of visibility of bikers during no-light situations.

Suppose a road that has less load would be lightly illuminated and the streets having higher traffic would be significantly more illuminated.

While developing this system we realized that we would be utilizing sensors for the same. Unfortunately due to the weight of cyclists and bikes when compared to heavy vehicles, we realized that the roads having traffic of cyclists would be less illuminated which may lead to more accidents.

Hence we developed the sensor system mainly focusing primarily on cyclists and bikes. It can be modified for cars too.

It is a Turn Signal Bike Safety Indicator designed to be wearable. It is an indicator system intended to increase a cyclist's visibility, especially at night. It is also improving the cyclist's communication and intent with other motorists and pedestrians on the road.

Features:-
1. **A lightweight Weatherproof LED** (with IP67 Rated LEDs)
2. **Turn Signals**– Fully programmable RGB LEDs
3. **Wireless remote to control the lights** (with four fully customizable buttons)
4. **ON/OFF Switch Button**
5. **Go Hand's Free with an Inbuilt accelerometer** – control Turn signals from our bike handle.

LED Strip	Color	Function
Diamond Strip-Half	**Green**	**Turn Left**
Diamond Strip Red	**Yellow**	**Abrupt Brake Lights**
Diamond Strip-Half	**Green**	**Turn right**

Overall, an indicator is a light strip controlled by a microcontroller that can be applied to a wearable fabric, such as a vest. We can build on this idea from this point, making it waterproof, lightweight, portable, and even communicate with other devices.

Going into detail, the Bike Remote and the LED Bike Vest have two ESP32 (Microcontrollers) which communicate with each other through ESP now.

The LED vest works by using an ESP32 to control a set of LED strips (WS2812B) based on the user's action. The ESP32 can also control individually addressable RGB LEDs from the LED strip.

The Bike Remote has three customizable push buttons. When a button is pressed, a value is sent to the receiver ESP32, triggering the LED strip/ WS2812B to light up in a specific way based on the particular value received.

Example #1:

Action: When we press the Right Button of the Remote

Communication: the value 'R' (representing Right is sent to the LED Vest microcontroller via Bluetooth)

Result: The LED strip would light up the right arrows of the LED strip.

But you may also be wondering, *"That means we will need to press the remote every time you require to turn… what if we are riding a bike?!"*

This is where the gyroscope (MPU6050) comes into the picture. Using the relative position/orientation of the MPU6050, we can figure out whether the Bike is turning left or right. So, based on the same principles above, we can mount the remote to the Bike handles and do the same.

Example #2

Action: When you turn the handlebar right.

Microcontroller: The Gyroscope detects the relative change in orientation to the Right. The value 'R' (representing Right) is sent to the LED Vest microcontroller via Bluetooth.

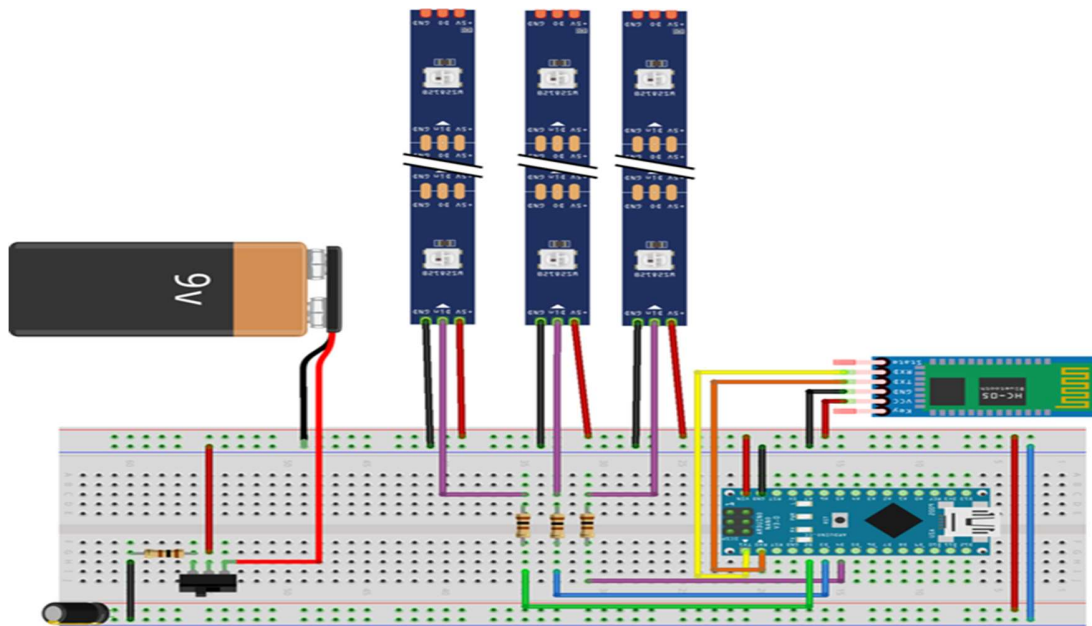**Result:** The LED strip would light up the right arrows of the LED strip.

Indicator – Breadboard Implementation:

The indicator consists of:

- LED Bike indicator– An LED Strip and an ESP32
- Bike Suit Remote – Controls the LED Strip via ESP now

The below diagram shows the Breadboard implementation
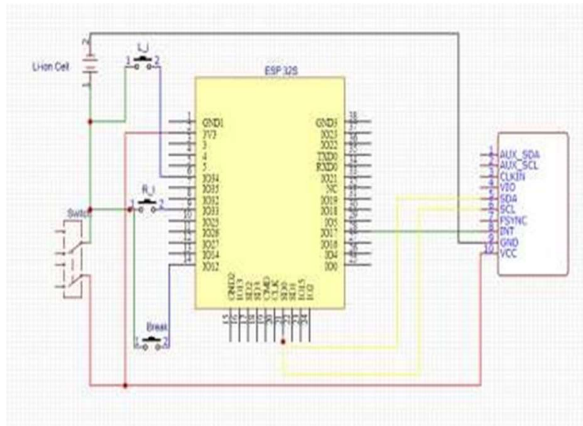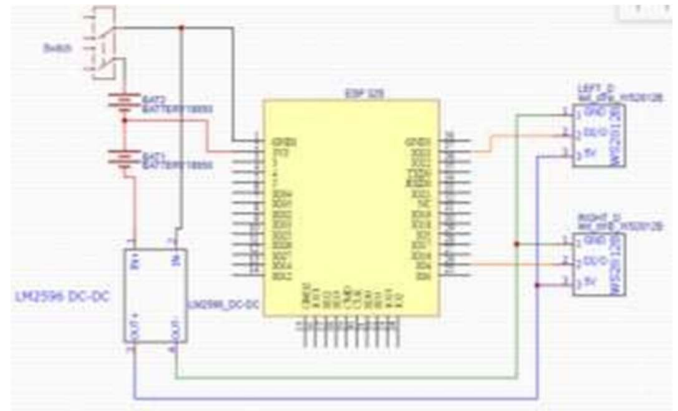
Receiver circuit

The Bike Remote

The corresponding LED lights will turn on, indicating that the button has successfully been pressed. As a result, a value would be sent from the remote Arduino to the Bike Vest Arduino via Bluetooth using the HC05 Bluetooth module.
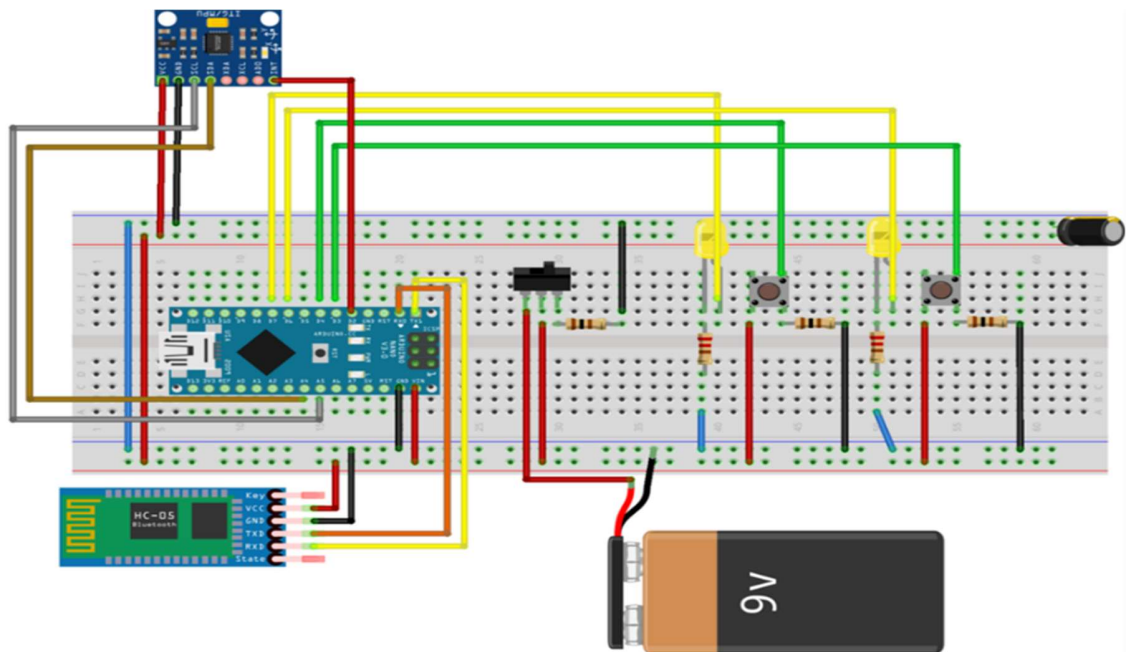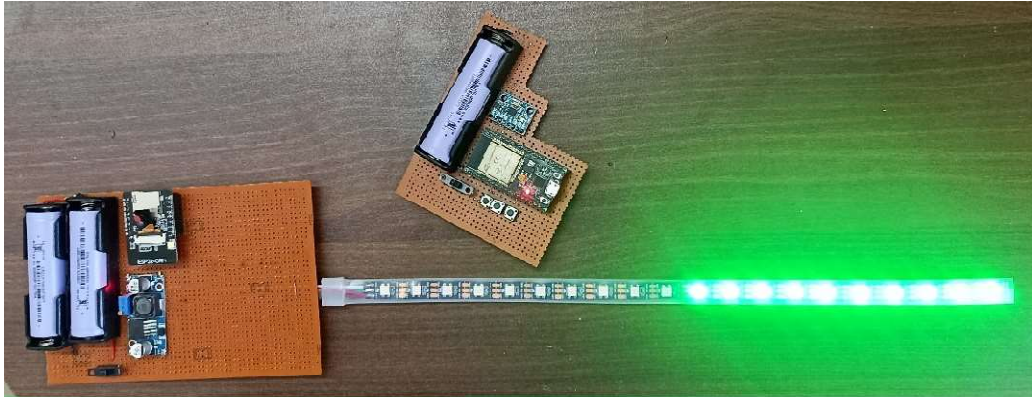
Remote circuit
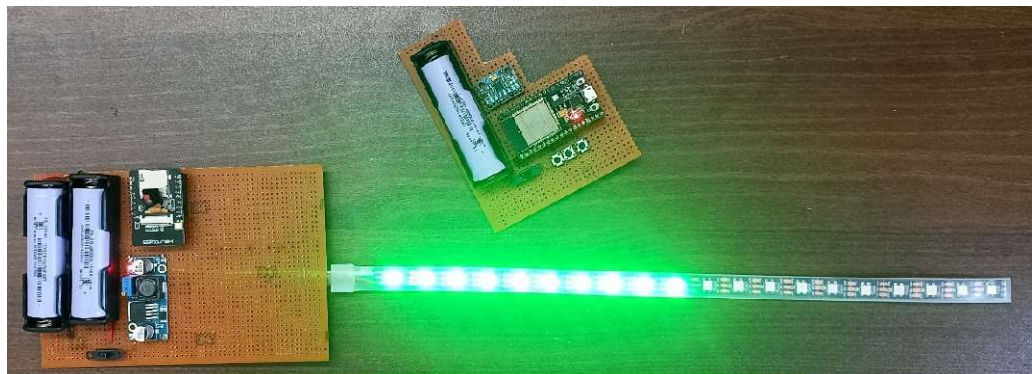

Remote circuit

Light-controlling unit circuit

The emergency feature will be further extended by possibly sending alert notifications to the medical emergency unit or the medical room, the faculty advisor, and the emergency contact listed by the user.
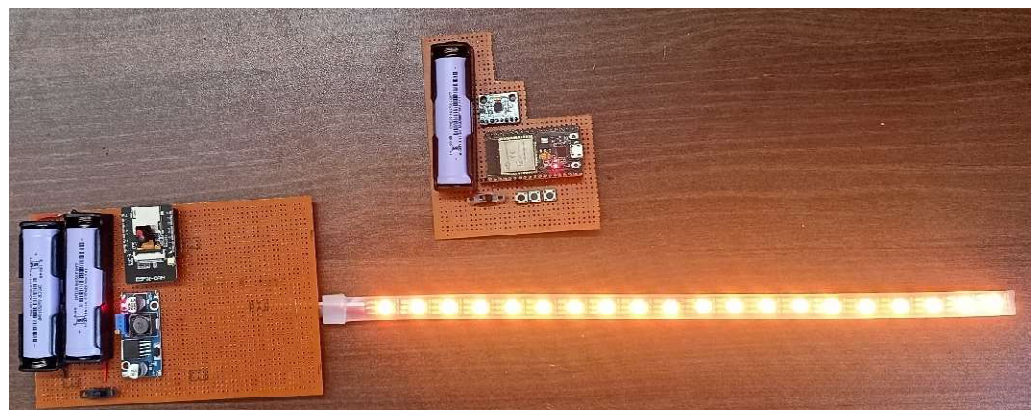
Out puts

Right Turn Indication

Left Turn Indication

Indication when applying breaks

How it works

Both the remote and controller have a sliding button to on and off the circuit.
When the circuit is on the remote sends the signal to the controller, and as per the signal, the controller responds.
It will blink the first 10 LEDs 5 times if we press the left button/turn left, or the next 10 LEDs 5 times if we press the right button/turn right, or all LEDs 5 times if we press the slow button/apply break.
The threshold can be changed as per requirements and vehicle.

Scope of Improvements and Features can be added

The size of the circuit can be further reduced by using Lipo instead of Li-ion cells and removing the buck converter.
Further, we can send data and track your journey by phone, and a signal can be sent to the medical team in case of an accident, we can attach a camera to record our journey as it can be used as video evidence in case of accidents.