SMART WEARABLE SAFETY VEST

# Team members:

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# Summary:

This report proposes the development and design of a smart wearable safety vest aimed at enhancing the safety of bike riders and motorcyclists. The vest integrates advanced technologies to increase visibility, provide real-time hazard alerts, and improve overall safety for riders on the road. The design focuses on comfort, durability, and user-friendliness.

The safety vest has been designed in such a way as to reduce road accident rates involved with bike riders. Unfortunately, existing safety clothes are rather ineffective as it is not able to provide enough visibility and signals. The integration of intelligent systems is envisaged to increase the efficiency of existing safety vests

# Objectives:

1. Enhance Visibility: Integrate high-visibility materials and LED lighting to make riders more conspicuous to other road users, especially in low-light conditions.
2. Provide automatic turn signal indications to improve the safety of bike riders while changing lanes or making turns.
3. Comfort and Ergonomics: Develop a design that ensures comfort, freedom of movement, and an ergonomic fit for different body types.
4. Durability: Use durable and weather-resistant materials to ensure the vest withstands various environmental conditions.
5. Power Efficiency: Optimize power consumption to ensure long battery life and minimize the need for frequent recharging.

# Introduction

Bike riders are vulnerable road users, often exposed to high risks due to limited visibility and the lack of safety features. The number of fatalities for pedal cyclists increased from 33 recorded in 2022 to 46 recorded within a similar period in 2023. According to the 2023 Economic Survey, a total of 159 pedal cyclists died on the road in 2022.

However, cyclists continue to form a crucial part of the transport sector in Kenya, Africa, and the world abroad and are a vital resource of cheap transport within cities and towns. Cycling nowadays is used 1st as a form of transport, secondly as a means of exercise and, thirdly as a means of recreation.

An estimated 55,000 daily trips in Nairobi are made by cycling, accounting for 1.1% of the share of journeys made by different modes of transport. This statistic shows that there is a significant opportunity to raise the profile of cycling as a convenient and healthy means of mobility, for all ages. As an active means of transport, cycling is relatively fast for short and medium journeys, does not contribute to pollution, and has the added health benefits of physical activity.

Though the numbers seem low, there’s need to include safety measures on the road to reduce the number of accidents The proposed smart wearable safety vest addresses these challenges by incorporating cutting-edge technology to minimize accidents and promote safer riding practices. This innovative solution aims to enhance the safety of bike riders on the roads by integrating various technologies into a wearable vest

# System components

## Led lights

I used the RGB led light to be used as indicators, and to be used to increase visibility on the road.  LED lights are 95% energy efficient. Led light provide better light focus. A focused light provides better visibility than one that is dispersed by normal hind lamps. Where LED Light is used in a larger environment, more lumens mean better illumination as it is focused and not scattered, thus better safety. They also offer great design flexibility

## Micro controllers

I chose esp32 because it has options. A variety of communications, mainly wifi, bluetooth, i2c, serial can be used immediately. But the thing that has only the esp family chip is esp-now, which is a communication protocol at the MAC layer level on the wifi frequency (2.4Ghz) similar to a Wireless mouse that has a Dongle receiver. esp-idf ) supports esp-now, and the addition of esp32 is support for Encryption communication up to 6 nodes at the same time.

## ESP Now

Esp Now is a protocal developed by Expressif. It offers simple communication between Esp devices. The protocal is similar to the 2.4GHz wireless connectivity that is often deployed in wireless mouses. It uses wifi module though no need to connetct to an external router. It can transmit encrypted or unencrypted data.

### Advantages:

1. Has both unidirectional and Bi-directional modes
2. Offers persistent connection after pairing (connection resumes after power)
3. Offers connection of upto 100m

### Limitations:

Limited to a max of 250 bytes per packet