**Engineering Design Report: Smart Wearable Safety Vest for Bike Riders**

**1. Introduction**

This engineering design report presents the concept and design of a smart wearable safety vest for bike riders. This innovative solution aims to enhance the safety of bike riders on the roads by integrating various technologies into a wearable vest. The key features of the smart vest include improved visibility, automatic turn signal indication, and an alert system for potential collisions.

**2. Objectives**

The primary objectives of the smart wearable safety vest are:

* Enhance the visibility of bike riders, especially during low light conditions.
* Provide automatic turn signal indications to improve the safety of bike riders while changing lanes or making turns.
* Integrate collision alert system to warn bike riders of potential collisions from various directions.

**3. System Components**

The smart wearable safety vest will incorporate the following components:

**3.1 LED Lights**

High-intensity LED lights will be embedded onto the front, back, and sides of the vest to improve visibility. These lights will be programmable to adjust brightness and flashing patterns as per the rider's preference.

**3.2 Turn Signal Indicators**

The vest will include built-in sensors and buttons to detect the rider's intention to turn. On activating the turn signal, the corresponding LED lights on the front or back of the vest will flash to indicate the direction of the upcoming turn.

**3.3 Collision Alert System**

The vest will be equipped with proximity sensors to detect potential collisions. These sensors will scan the surroundings and provide real-time feedback to the rider. In the event of an imminent collision, the vest will emit visual and auditory alerts to warn the rider to take appropriate action.

**3.4 Power and Connectivity**

The smart vest will feature a rechargeable battery pack and will be connected wirelessly to a companion smartphone application. The smartphone application will allow riders to customize vest settings, monitor battery life, and receive relevant notifications.

**4. Design Considerations**

**4.1 Ergonomics and Comfort**

The vest's design will prioritize ergonomics and user comfort to ensure it can be worn for extended periods without causing discomfort.

**4.2 Durability and Weather Resistance**

To withstand different weather conditions, the vest will be designed using weather-resistant materials to prevent water damage and ensure its longevity.

**4.3 User Interface and Controls**

The interface and controls should be intuitive to allow for easy operation by riders. Buttons and switches will be strategically placed on the vest for quick access without compromising safety.

**5. Testing and Validation**

The smart wearable safety vest will undergo rigorous testing to ensure its effectiveness and reliability. The tests will include:

* Verification of LED lights' visibility and programmability.
* Assessment of turn signal accuracy and responsiveness.
* Evaluation of collision alert system's efficiency in detecting potential collisions.
* Evaluation of the vest's durability and weather resistance.

**6. Conclusion**

The smart wearable safety vest for bike riders is designed to enhance visibility and safety on the roads. With its LED lights, automatic turn signal indicators, and collision alert system, this smart vest aims to reduce accidents and improve the overall biking experience. By incorporating user feedback and conducting thorough testing, we strive to develop a reliable and robust product that will make biking safer for all riders.