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Smart Jacket for Bike Riders Safety

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ABSTRACT

Wearables and other goods based on the fusion of the IT and traditional sectors will probably become more prevalent and varied because of recent advancements in augmented reality (AR) and virtual reality (VR) technologies.[12]. The demand for increased safety will grow as more people start to use alternate modes of transportation like walking, cycling, and riding. Clothing can incorporate technology to improve its fundamental functions, transforming it into a mobile platform that supports sensing and an interface with context-aware computing. [13,, 14, 15, 16]. As a result, riders must take the necessary safety precautions, including wearing helmets, observing traffic laws and signals, using proper bike lights, and using the right safety equipment, to reduce the likelihood of accidents. Nevertheless, with the growth of technology, a smart jacket with a turning direction indicator and safety assist was proposed in this project. To conclude, with an all-in-one system of these features, the obstacle detection, inflating air bag technology, and alerting vibration sensor and buzzer can help the riders stay attentive and focused on the road. This jacket is also water-resistant and washable. Our jacket is equipped with sensors that will detect when the rider loses control of the motorcycle Upon detection, it will instantly deploy an airbag, allowing the rider to survive a crash. The airbag technology will inflate in a fraction of a second, protecting the rider's vital organs.The following six features were chosen: fall detection, automatic emergency calls, temperature-responsive heating, GPS and GSM tracing and alerting, heart rate monitoring, and ultrasonic sensor (obstacle detection).

The remainder of this paper is organized as follows. Section II contains Techniques and resources. Section III presents our assumption's Block diagram and description of the model's operation with a flowchart, as well as an explanation of. Section IV Section analyzes and states our conclusions.

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Keywords: safety, accidents, jacket, detection, riding

1.INTRODUCTION

Progressive reductions in the safety of human beings while riding, as well as the promotion of more sustainable alternative modes of transportation, are now observable components of global strategies. These significant changes in transportation dynamics will not only contribute to environmental advantages but also improve the safety of riders, especially after the lockdown phase, when the youngster was under house arrest and in the mode of riding out. I see global plans as promoting safer alternative means of transportation and progressively reducing the safety of people while they travel. Not only will these large modifications to transportation dynamics benefit the environment, but they will also increase rider safety, particularly following the lockdown period when the youngster was under house arrest and riding out. As more people begin to explore alternative modes of transportation, such as walking, cycling, and riding, the need for improving safety will become even more pronounced To achieve these goals, various tactics for increasing riding demand through this activity have been developed, resulting in a significant increase in the number of bicycle users in most situations, from adults to children.Numerous strategies have been devised to increase riding demand through this activity, resulting in a significant increase in the number of people using bicycles in most scenarios, from adults to children, to achieve these aims. Safety has been a major problem because riders are more susceptible to fatalities and serious injuries during traffic incidents than other vehicle occupants, even if this activity aids in keeping individuals safe and healthy after lockup. The World Health Organization (WHO) reports that vulnerable road users account for half of all traffic fatalities worldwide. For instance, despite the moderate amount of cyclists on the road, cycling accidents cause 2.20 per cent and 4.60 per cent, respectively, of all road fatalities and injuries in Canada. These factors, as well as other variables like the number of riders on the road, the state of the roads, the weather, and the amount of experience and ability of the riders, can have a significant impact on the percentage of riding accidents.

However, everyone widely acknowledges that bicycle accidents can be a major cause of injuries and fatalities [11].Active 1: The smartphone can immediately incorporate only crucial and particular functionalities into the garment platform, handling complex data and using it as a display device [17,18]. Even if we found a solution in the form of the Smart Jacket, which is a required component, the majority of people are not at all bothered by those. They can be at least 80% safe by donning our smart jacket.[11]. Since they usually struggle to keep safe around other cars, it is obvious that the riders' main worries are the difficulties of visibility and detection. Riders on the road must be visible to other drivers, who must likewise be aware of their direction.

Although this activity helps people stay safe and healthy after lockdown, safety has been a serious concern as riders are more vulnerable than other vehicle occupants to fatalities and severe injuries during road collisions. According to the World Health Organization (WHO), half of the world's road traffic deaths occur among vulnerable road users. For example, in Canada, cycling accidents result in 2.20 percent and 4.60 percent of all

road fatalities and injuries, respectively, despite the low proportion of cyclists on the road. The percentage of riding accidents can vary widely depending on these factors and can also be affected by various other factors such as the number of riders on the road, road conditions, weather conditions, and the experience and skill level of the riders.

However, it is generally recognised that cycling accidents can be a significant source of injuries and fatalities, and riders need to take proper safety precautions such as wearing helmets, following traffic rules and signals, using proper bike lights, and using appropriate safety gear to minimise the risk of accidents. Although we came across a solution in the form of the Smart Jacket, which is a mandatory part, most people are not at all minding By wearing our smart jacket, they can be at least 80 per cent safe.

Additionally, the wearable system can connect to a smartphone and offer computer services that may conflict with the fundamental requirements of clothes, such as comfort or wearability. Even with the aid of side mirrors, riding a vehicle can be challenging due to riders' reduced visibility caused by fast riding and air particles, and accidents can easily happen as a result of this issue. So, our smart jacket can save lives by ensuring that riders are clearly visible to other road users to prevent accidents.[11] . This research created a prototype of a multifunctional smart outdoor jacket with a number of features to assist users in managing hazardous or risky outdoor circumstances by sensing and identifying potentially harmful environmental elements to avoid accidents and injuries [17].

Clearly, the issues of visibility and detection are the key concerns for the riders, since they frequently struggle to stay safe among other vehicles. Other road users need to be alert to the existence of riders on the road and also to the direction of the riders. Furthermore, riders have limited vision due to fast riding and air follicles, which may be a challenge for everyone who will ride vehicles, even with the help of side mirrors, and accidents can easily occur as a result of this problem. Thus, our smart jacket can be a lifesaver, making sure that the riders are easily visible to other road users in order to avoid accidents Nevertheless, with the growth of technology, a smart jacket with a turning direction indicator and safety assist was proposed in this project. To conclude, with an all-in-one system of these features, the obstacle detection, inflating air bag technology, and alerting vibration sensor and buzzer can help the riders stay attentive and focused on the road. This jacket is also water-resistant and washable. Our jacket is equipped with sensors that will detect when the rider loses control of the motorcycle. Upon detection, it will instantly deploy an airbag, allowing the rider to survive a crash. The airbag technology will inflate in a fraction of a second, protecting the rider's vital organs.

1.1. MaterialsandMethods

This section provides a thorough overview of the methods and materials used in this project. The Information will include all aspects related to the work plan for each stage, like block diagram,software and hardware used and overview of the system flowchart.

1.1.1 Materials

The design of this project was made based on its functionality as a smart jacket. Since this innovation involves the riders' safety, there were many decisions to be made concerning the positioning of the various components on the jacket. However, it is designed to be a wearable technology that can alert and notify riders via sensors to keep them safe while riding. To create smart jackets with obstacle detection and vibration alerting systems that provide riders with immediate proximity detection by alerting them, giving them more time to avoid and prevent collisions, the list of components and software used for this project is listed below:

HC-SR04 ultrasonic sensor

The HC-SR04 ultrasonic sensor can be integrated into smart clothing for bike riders to detect obstacles or measure distance, providing a safer and more efficient riding experience. The sensor can be used to detect nearby vehicles, pedestrians, or obstacles and send alerts to the rider through a microcontroller or smartphone app.

Arduino Nano

The Arduino Nano is a small development board based on the Atmega328p microcontroller. It has a USB interface for programming and communication with a computer and can be powered through the USB or an external power supply. The Nano is a popular choice for small projects that require a compact and easy-to-use microcontroller board.

DS18B21 Temperature Sensor

The DS18B21 temperature sensor can be integrated into smart clothing for bike riders to monitor their body temperature and prevent overheating or hypothermia during long rides. Real-time temperature readings can be displayed on a display or sent to a smartphone app through a microcontroller and wireless communication module.

Triaxial accelerometer ADXL345

The ADXL345 is a triaxial accelerometer sensor that can measure acceleration in three dimensions. When integrated with a microcontroller and wireless communication module, it can be used in

smart clothing for bike riders to detect sudden impacts or accidents and send alerts to emergency contacts or medical services. This can improve rider safety and provide peace of mind during long rides.

Touch Sensor

The touch sensor is a crucial component in many electronic devices, as it allows for user interaction and input. Its ability to trigger other sensors also enables complex automated systems to be created.

Relay Driver DC Air Pump

A relay driver integrated into smart clothing for bike riders can control a DC air pump for on-demand cooling or heating, enabling riders to regulate their body temperature and prevent overheating or hypothermia during long rides.

900a GSM Module

A 900a GSM module in smart clothing for bike riders enables secure communication with other riders or emergency contacts through voice or text messages, phone calls, and GPS tracking.

GPS module

A GPS module integrated into smart clothing for bike riders enables real-time tracking of the rider's location, speed, and distance travelled. This information can be used to plan routes, monitor progress, and ensure safety during rides.

Piezoelectric Buzzer

A piezoelectric buzzer integrated into smart clothing for bike riders can provide audible alerts for various events, such as incoming calls, text messages, turn signals, or collision warnings. This can improve rider awareness and safety during rides.

9-Volt Lithium-Ion Battery

A 9-volt lithium-ion battery integrated into smart clothing for bike riders can provide a lightweight and long-lasting power source for various electronic components, such as sensors, microcontrollers, GPS modules, and communication modules. This can enable greater mobility and functionality of the smart clothing during rides.

Arduino IDE

The Arduino IDE (Integrated Development Environment) can be used to program and upload code to the microcontroller integrated into smart clothing for bike riders, enabling customisation and functionality of the smart clothing components such as sensors, communication modules, and GPS modules

Blynk Software

Blynk software can be used to develop smartphone apps for controlling and monitoring the smart clothing components used by bike riders, such as sensors, GPS modules, communication modules, and touch sensors. This can provide a user-friendly interface and greater control over the smart clothing during rides.

1.1.2 Methods

Generally, the two main functions of this system are obstacle detection and inflating the system via the vibration sensor and DC air pump. It depicts an overview of how the system functions. The system starts by having the user check the battery level to determine if the power for the system is sufficient. Next, the user is required to check all the sensors' functionality by wearing them, and as soon as the touch sensor is activated, it senses and triggers all the sensors, and it starts sensing according to its potential and given parameters The ultrasonic sensor, then, checks for any obstacles present in the environment and sends a signal to the vibrational sensor and also to the DC air pump, which inflated or deflated the cushion based on how much pressure is applied or the pressure of falling, and the ultrasonic sensor triggers the vibration sensor after detection. Once the vibrational sensor is triggered, it vibrates at a specific frequency and thus creates an environment where the person can sense changes in the surroundings and make decisions accordingly.

Once the user starts riding, the ultrasonic sensor initiates pins Trig and Echo to read data. The ultrasonic sensor is used for detection to avoid and prevent potentially dangerous collisions with any obstacles. The sensor will detect and calculate the distance between the rider and the vehicles. If the vehicle is within 10 metres, the vibration will be less, and if the vehicle is within 2 metres, the vibration sensor and buzzer will vibrate and ignite to alert the riders that the object detected is too close. As a result, the purpose of this vibration sensor and buzzer feature is to provide as much road awareness as possible while allowing riders to remain focused on the road.

The solution is to provide safety measures for bike riders who are travelling in hilly areas. We have also integrated some features, like airbags and sensors, to provide solutions to all those problems faced by riders, such as a lack of weather protection, poor visibility to other vehicles, backaches, insufficient storage capacity, and improvements to health and safety. It is immediately ready to defend. Without any cable or connection.

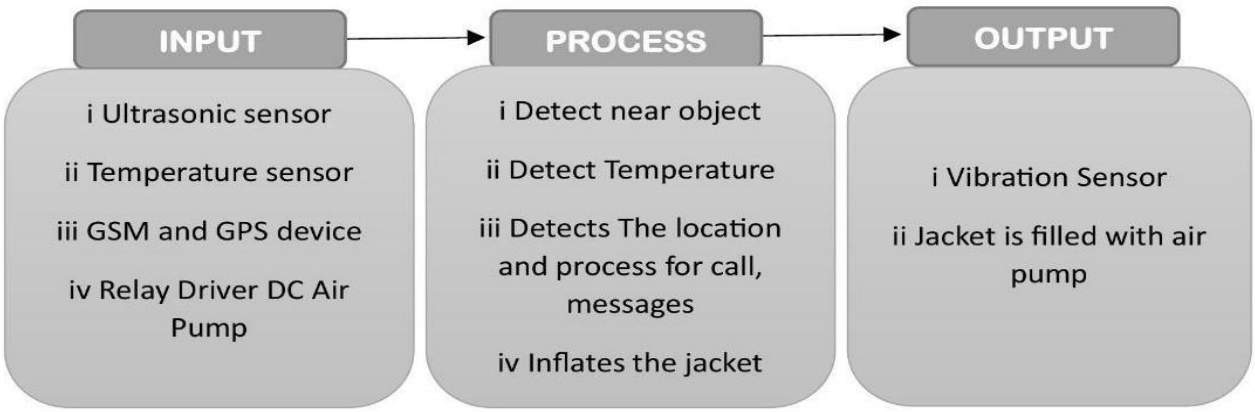
It automatically senses dangerous situations and immediately activates the airbags to protect the rider, and with the use of a sensor, it can sense any obstacle and make the rider alert.

A complex algorithm detects danger and rapidly inflates the airbag to protect your back, chest, and vital organs. The smart jacket uses many sensors to analyse data quickly so that it will be ready to deploy at a moment's notice to riders' homes, and it also alerts the rider when he is not conscious; it can pre-alert the rider. Our jacket is equipped with sensors that will detect when the rider loses control of the motorcycle. Upon detection, it will instantly deploy an airbag, allowing the rider to survive a crash. The airbag technology will inflate in a fraction of a second, protecting the rider's vital organs. Without any cable or connection, it automatically senses dangerous situations and immediately activates the airbags to protect the rider, and with the use of a sensor, it can sense any obstacle and make the rider alert. A complex algorithm detects danger and rapidly inflates the airbag to protect your back, chest, and vital organs.

Smart Jacket uses many sensors to analyse data quickly so that it will be ready to deploy at a moment's notice to riders' homes, and it also alerts the rider when he is not conscious; it can pre-alert the rider. Experience the highest level of safety for use in any situation on the road.

It offers perfect ventilation for warmer days, and its advanced technology can withstand any downpour or weather condition. You'll be protected for more than 26 hours without recharging thanks to the long-lasting battery. The smart jacket monitors what's happening around the rider 1,000 times a second.It always activates the shield when necessary, and only then, to provide the rider with maximum protection. So, while on the road, you have the necessary protection and comfort that you need.

2. GENERAL BLOCK DIAGRAM

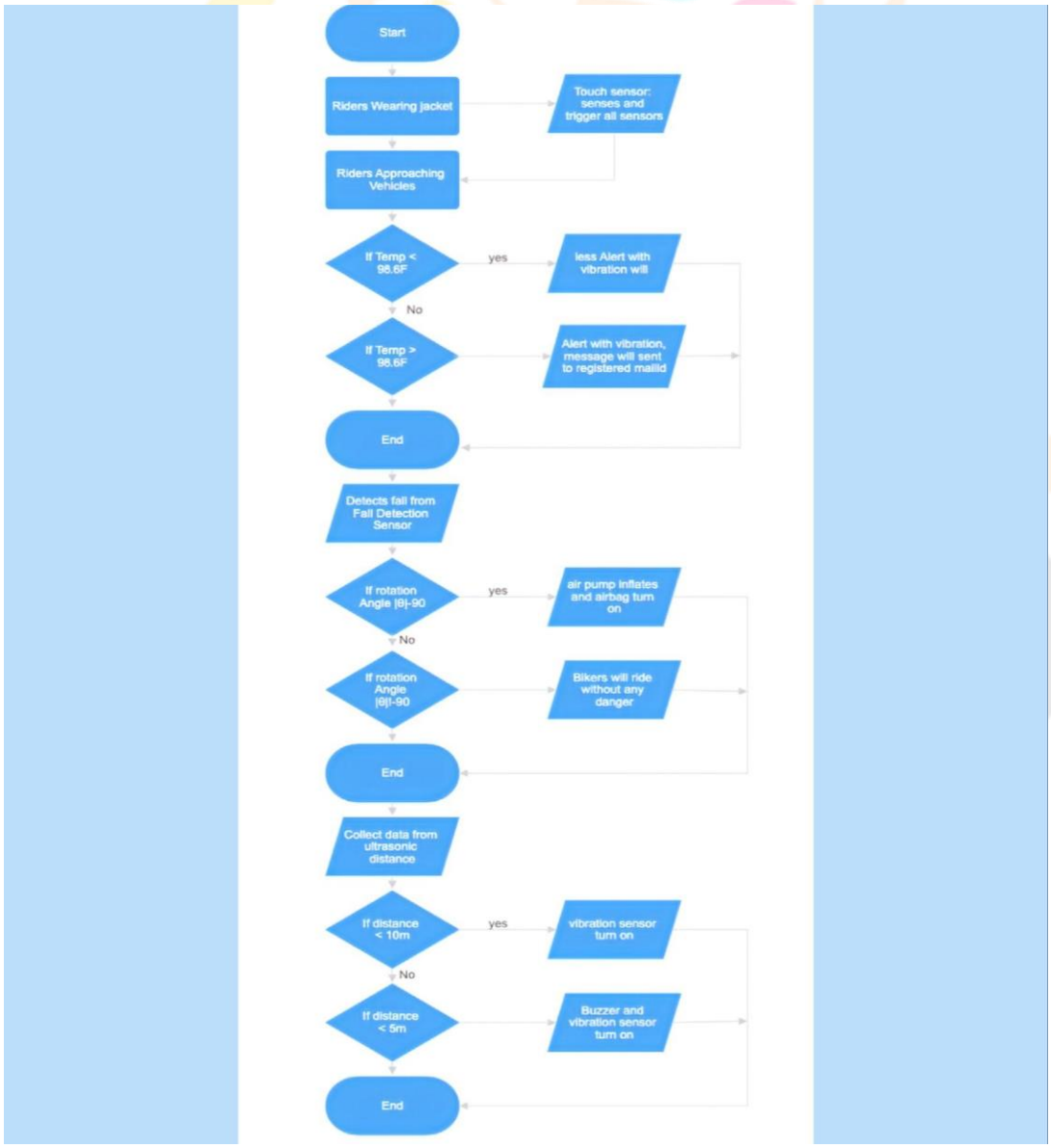


In the block diagram of this project, the system utilizes the Arduino Nano Microcontroller as the major control system. The microcontroller is programmed by the Arduino Ide program to function as desired. The input and output of this project are represented through the general block diagram. This smart jacket consists of an ultrasonic sensor and temperature sensor, a GSM and GPS device, and a relay driver and DC air pump as inputs. The ultrasonic sensor, on the other hand, is used to detect objects nearby that can be detected using the pins Trig

and Echo. This sensor has a detection range of approximately 10m. After collecting data, it notifies the user via SMS or by calling an emergency number. For instance, when the sensor detects an object within the range, it notifies the user through the installed system. On the other hand, the entire system is programmed with the Blynk Arduino IDE software. Moreover, this prototype of the smart jacket uses a 9.0 V lithium-ion battery as a power supply. The lithium-ion battery is a rechargeable battery that is lightweight and has a long battery life. Finally, the reason for using the Arduino as a nano microcontroller rather than the Lilypad Arduino is that, aside from its capabilities, the Arduino Nano is inexpensive and widely available.

The Arduino Nano is also capable of low power operations and has an extended feature set compared to the Lilypad Arduino As a result, the Arduino Nano is much better suited for this prototype than the Lilypad Arduino, which is designed specifically for wearable applications and is not as versatile Thus, this prototype of a smart jacket is water-resistant and washable, and it keeps riders safe and comfortable when riding.

3. FLOW CHART



4. CONCLUSION

Based on the conclusion that the Smart Jacket is an effective wearable technology with optimised functionality, especially during night rides, hill rides, and long rides, This is due to the fact that, while the majority of wearable technology projects for riders are safety-focused, only a few of them produce a safety jacket that includes all integrated features and sensors. The Smart Jacket goes a step further and enhances the riding experience by providing accurate data on riding performance and environmental conditions. When situations may increase the number of vehicle-vehicle collisions, such as rear-end, angle, overtaking, and turning left or right collisions. As a result, the rider's smart jacket was created to improve the rider's visibility and alert the riders of obstacles via a vibration and buzzer alert. This feature is intended to provide riders with as much road awareness as possible while allowing them riders to remain focused on the road. Another feature of this smart jacket is an air-inflation system that inflates upon detection and an alert from the sensors In fact, the purpose of vibration and the igniting of a buzzer is to help distract the driver's attention, allowing them more time to avoid and prevent collisions. Additionally, the objective of developing the smart jacket with various sensors, namely an ultrasonic sensor, a temperature sensor, an accelerometer sensor, and a piezoelectric buzzer, is to embed them into the jacket so that all the sensors can be mounted on the jacket and function as desired. As a result, this smart jacket demonstrated its ability to integrate with the circuit by allowing it to achieve as programmes are set and improve system functionality, such as avoiding obstacles and inflating the jacket's air pump.This will require further study on tailoring practicality and the insertion of electronics into the textile to create better flexibility for cyclists through the integration of all aspects of a circuit into a fully functional and practical smart jacket

5. AUTHOR CONTRIBUTION

I contributed to the design and implementation of the research, to the analysis of the results and the writing of the manuscript.

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