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BIKE RIDER SAFETY SYSTEM USING STM 32 MICROCONTROLLER

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Abstract -

This study focuses on the development of an innovative safety jacket designed for horse riders, high-altitude workers, and particularly two-wheeler riders to mitigate the impact of accidents and enhance life-saving measures. Given the high incidence of road accidents in India, with 499,628 reported in 2010 leading to 134,513 fatalities and over 500,000 injuries, the need for improved safety mechanisms is critical. The proposed safety jacket integrates a micro controller-based system to detect falls and trigger an emergency response, inflating air cushions around the jacket to cushion impacts. Additionally, the system incorporates an alcohol sensor and a helmet detection sensor to ensure the bike starts only if the rider is sober and wearing a helmet.

Visibility issues for riders are also addressed, with the jacket featuring turn indicators and other visibility enhancements to alert other road users. The jacket is designed to be water-resistant and washable, ensuring durability and ease of maintenance. The Bike Rider Safety System (BRSS) further enhances safety through real-time monitoring and adaptive response to potential hazards, using accelerometer, gyroscopes, and proximity sensors. The Arduino-based system comprises four main functionalities: helmet and alcohol detection, accident detection, airbag deployment, and live location transmission to authorities.

In summary, the smart jacket aims to significantly reduce the risks faced by riders by incorporating advanced technology and a robust design to ensure their safety on the road.

1. INTRODUCTION

The main aim is to design this safety jacket is for horse riders, horse riders, high altitude workers like construction site workers, electricians painters and so on to reduce the high impact and to save the life from major impact. Considering major accident in two wheel riders have concentrated more on bike riders and designed more applicable for them. Two-wheeler can be extremely convenient when traveling a short distance with one or two people. Thanks to their light-weight mechanism and affordable price, two-wheeler have always been the preferred choice for many. During the year 2010, there were around 5 lakh road accidents, which resulted in deaths of 134,513 people and injured more than 5 lakh persons in India. These numbers translate into 1 road accident every minute, and 1 road accident death every four minutes.1.5 The loss to the Indian economy due to fatalities and accident injuries estimated at 3% of GDP in 1999-2000 is particularly severe as 53.1% of road accident victims were in the age group of 25 to 65 years in 2010, with pedestrians, bicyclists and two-wheeler, who comprise the most unprotected road users, accounting for around 40% of all fatalities.

Fig 1: Accident with Motorcycle on the road

During 2010, 499,628 road accidents were reported by all States/ Union Territories (UTS). Of these, about 23.9% (119,558) were fatal accidents. The number of persons killed in road accidents was 134,513, i.e. an average of one fatality per 3.7 accidents. Our system consists of a micro controller which detects fall and triggers an emergency safety system which releases pressurized air into the inflatable. The jacket body is surrounded by inflatables, which inflates as before rider falls down.this will cousin the fall and prevent from major injury. In the accident prevention system we have alcohol sensor which will detect the alcohol if the driver has drunk it and additionally we have helmet sensor which will detect the helmet if the bike rider has not

worn the helmet of if has consumed the alcohol then bike will not start, he has to wear the helmet and he should not been consumed the alcohol then the bike will get start.

Fig 2:Airbag opening demo

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.

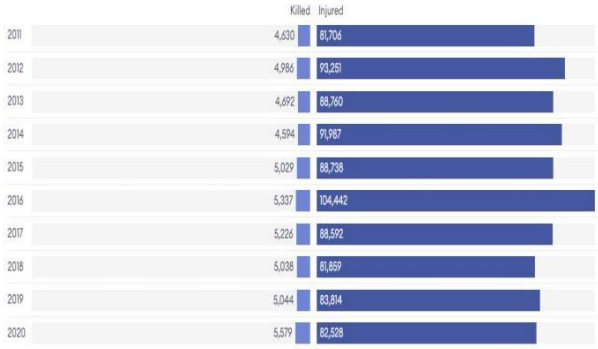

Fig 3: Accident status

In an era where road safety is paramount, the need to ensure the safety of bike riders has never been more critical. To address this concern, an innovative Bike Rider Safety System (BRSS) has been developed, integrating advanced technology and robust design principles. This report provides a detailed examination of the BRSS, encompassing its features, functionality, and potential impact on rider safety. The BRSS is engineered to mitigate the inherent risks associated with biking, offering real-time monitoring and intervention capabilities. Through a combination of sensors, algorithms, and communication protocols, the system proactively identifies potential hazards and alerts riders accordingly. Moreover, it incorporates adaptive measures to accommodate varying road conditions and user preferences.

Key components of the BRSS include a sensor suite comprising accelerometer, gyroscopes, and proximity sensors, enabling comprehensive environmental awareness. This data is processed in real-time by a central control unit, which employs machine learning algorithms to analyze patterns and predict potential threats. Additionally, the system interfaces with a user-friendly dashboard, providing riders with intuitive feedback and actionable insights.

2. PROBLEM STATEMENT

- In remote areas, bike accidents pose a heightened risk due to limited access to immediate medical assistance and communication networks.
- Riders may find themselves stranded in remote locations without the ability to contact emergency services or inform their family members about the accident.
- Accidents can leave individuals feeling helpless, especially when they are alone and unable to communicate their situation to others.
- In such circumstances, the injured rider may struggle to seek help or make decisions regarding their safety and well-being.
- Motorcycle rider safety is a pressing global concern, with a significant number of accidents occurring each year worldwide.
- These accidents often result in severe injuries and fatalities, highlighting the inherent risks associated with motorcycle riding.
- Factors such as reckless driving, inadequate safety measures, and road infrastructure

contribute to the high incidence of motorcycle accidents.

3. OBJECTIVES OF THE PROJECT:

The main objective of the proposed system is

1. Alcohol, helmet detection of the bike rider through which the accident will be reduced.

2. Design the accident detection system.

3. Deployment of air bag in rider jacket.

4. To fetch the live location of the person who met with an accident and send the information to the nearest ambulance driver or parents.

4. METHODOLOGY

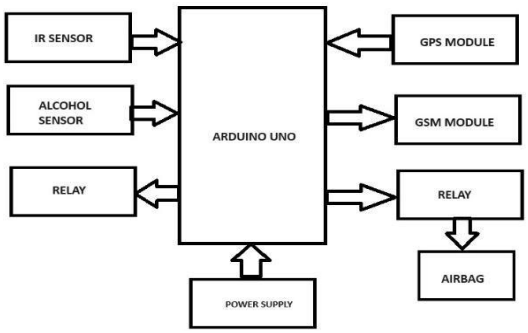

Fig 5: Block Diagram

The Arduino board which is based on the atmega328p micro controller is the brain of our system.all the sensor and solenoid are connected to arduino.

Our system consists of 4 main key functionality

1. Detection of helmet and alcohol
2. Detection of accident
3. Deployment of air bag in jacket
4. Sending Live Location to authorities

➢ Detection of helmet and alcohol

A IR sensor is connected to the stm32 which will detect the helmet has worn by the driver or not and it will also detect the alcohol if the driver has consumed or not, if both the conditions are matched then the bike will be turned on using relay module

➢ Detection of accident

An accelerometer sensor is connected to arduino, when accident happens huge amount of G-force will be experienced by the rider which will be detected by the arduino. Hence when accident happens it will detected by the jacket before rider falls down to ground

➢ Deployment of air bag in jacket

After detection of accident the solenoid air valve will be activated by the board which will release compressed air into the air bag which inflates the bag. This inflated air bag will absorb the impact of the accident.

➢ Sending live location to authorities

When the accident is detected the GPS module will fetch the live location of the person and it will be sent to the nearest ambulance and parents through GSM module so that rescue process will be made easy.

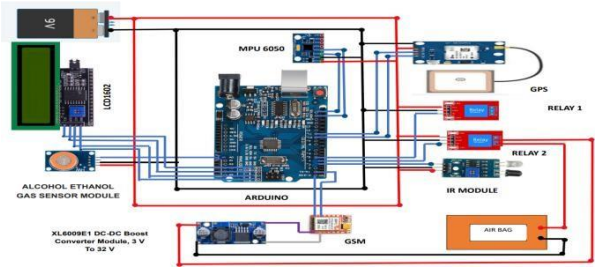

Fig 6: Pin configuration

5. FUTURE GOAL

➢ Cameras and Sensors:

Accident Detection and Analysis: Advanced cameras and sensors can detect accidents in real-time. When an accident occurs, these devices can capture detailed footage, providing valuable data for post-accident analysis. This information can be used to understand the cause of accidents and improve safety measures.

Dash Cams for Cyclists: Similar to car dash cams, cameras mounted on bikes can record rides, offering evidence in case of incidents and aiding in insurance claims and legal disputes.

➢ Traffic Prediction and Navigation:

Real-Time Traffic Updates: Integration with traffic prediction systems can provide cyclists with real-time updates about traffic conditions, helping them choose safer and less congested routes. This can reduce the risk of accidents and improve overall ride efficiency.

Smart Navigation Systems: These systems can offer dynamic route planning based on current traffic conditions, road work, weather, and **other**

factors that might affect a cyclist's safety and travel time.

- **Collision Avoidance Systems;**

Proximity Sensors: These sensors can detect nearby vehicles and obstacles, warning cyclists of potential collisions. Advanced systems might also integrate with braking and steering mechanisms to assist in avoiding accidents.

Vehicle-to-Everything (V2X) Communication: This technology allows bikes to communicate with other vehicles on the road, traffic signals, and infrastructure, creating a comprehensive network that can predict and prevent accidents.

- **Machine Learning and AI:**

Predictive Analytics: AI can analyze vast amounts of data to predict potential accident hotspots and risky situations. These predictions can be shared with riders in real-time, allowing them to take precautionary measures.

Behavioral Analysis: Machine learning algorithms can assess a rider's behavior and provide personalized safety tips, such as advising on speed adjustments or cautioning against risky maneuvers.

6. CONCLUSION

The main motive of this project is to give the safest ride for motorbike riders, horse riders, and other similar activities by providing them with a rider safety jacket that consists of an integrated airbag and tracking system. The jacket is install to significantly reduce the risk of serious injury in the event of an accident. When an accident occurs, the airbag deploys automatically, providing critical cushioning to protect vital areas such as the neck, spine, and chest. This immediate response can be crucial in preventing life-threatening injuries.

In addition to the airbag, the jacket features a state-of-the-art tracking system. This system continuously monitors the rider's location and transmits real-time data to designated contacts, including family members and emergency services. In case of an accident, the tracking system sends an alert with the rider's precise location, enabling a swift response from medical personnel.The integration of these technologies aims to enhance the overall safety and security of riders, giving them peace of mind. Parents and loved ones can feel more at ease knowing they can monitor the rider's whereabouts and be promptly informed if any incident occurs. This can also expedite the arrival of ssmedical help, potentially saving lives by reducing response times.

Moreover, this innovative safety jacket encourages safer riding practices and may inspire further advancements in wearable safety technology. By prioritizing the well-being of riders, this project contributes to the broader goal of reducing fatalities and serious injuries on roads and trails. The ultimate vision is to create a safer environment for all riders, ensuring they can enjoy their activities with the assurance that they are protected by cutting-edge safety measures.

7. Photo of the Model

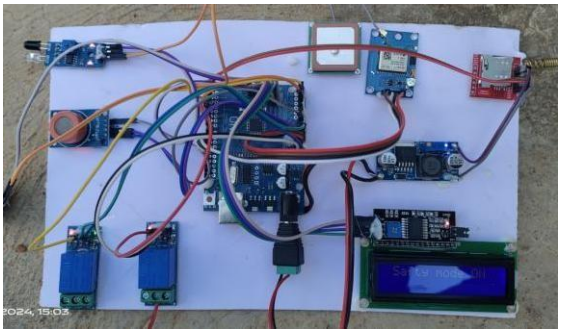

Fig 7: Model Photo

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