Child Safety Bicycle System

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Abstract:

Bicycle crashes with automobile vehicles in roads mostly on curved roads and kills thousands of bicyclists with great injuries every year. This fact indicates the importance of advancement in conventional vehicle systems. This project presents a prototype model of smart bicycle safety system using ESP32 and ESP8266 Microcontrollers. The system consists of hand gesture to show turn direction of rider, send messages along with location if rider is in trouble and indicates if it is safe to take a turn or not. An IR Sensor for obstacle determination along with Speed Sensor and GPS is connected. LED Lights are used for indication based on the gestures provided. The system is very cost efficient and provides safety and security for riders of bicycle and other low-end vehicles.

Introduction:

Bicycles enable efficient and sustainable personal transport with more than one billion bicycles produced worldwide in the last fifteen years. Technological systems for use when cycling are a recent growth area. However, a fundamental challenge for these interactive systems is the unsuitability of traditional user interfaces for use while cycling, which can cause safety problems as systems constrain and capture attention. One potential solution to this challenge is to use the environment in the vicinity of the bike as a display and user interface. Relevant and contextual information can be displayed where it is needed, and interaction can harness already known tasks and expectations. In recent days, many people are becoming tired and disheartened of motor vehicles due to various reasons such as pollution, increase in fuel cost etc.. As a result, bicycling is becoming more popular. But the safety system of this transport system is not improving. As per the League of American Bicyclists, in 2007, 698 cyclists faced deadly injuries, also, 43,000 cyclists got injured in accident including motor bike. Most of the bicycle accidents occur in daylight with the peak hours, 8:00 to 9:00 am and 3.00 to 6.00 pm; cycling mischances oblivious will probably be lethal. Buses and other vehicles are always in hurry and it has brought up the issue of security of low-end vehicles like bicycle. Major reasons for road accident are failure to look, crossing roads, executing wrong turn, too fast motor vehicles. Besides, tracking the location can increase accessibility of services and t is important for providing high quality services.

Literature Survey:

According to Betty and Ricardo, a system has proposed with some features for bike safety using light signal [1]. In that system, there is a light signal for turning but no option to notify the rider about the turn safety. Betty and Richardo has proposed a model for bicycle safety. However they do not have option which can detect accident or which allows the rider to contact with someone when the rider is in trouble. Again, they do not have option to show location of the rider.

According to P. R. Moje, M. Bannatwale, S. Jamdade, and P. Halloli, a model has been proposed with some features for vehicle safety especially lowend vehicle security and safety [2]. In that system, it has discussed that when there is a curve road and rider need to indicate the direction there will be a headlight which will automatically on by sensing the surrounding.

In model which is proposed by P.R. Moje, M.Bannatwale, S. Jamdade, and P. Halloli, they did not clearly said how the sensor will sense the surrounding and what kind of data the sensor is sensing from surrounding. Again they have said that there will be collision detect feature but they did not clear that if the rider has made any accident then how the device will work after the incident.

Problem Statement:

To design and develop a Bicycle Rider Safety System that serves the following purposes:

1. A transmitter and a receiver device communicating on WiFi protocol.

2. Hand gestures using Accelerometer Sensor with output using LED Indications that are unique for each gesture.

3. IR Sensor for proximity determination.

4. Speed Sensor for realtime speed monitoring.

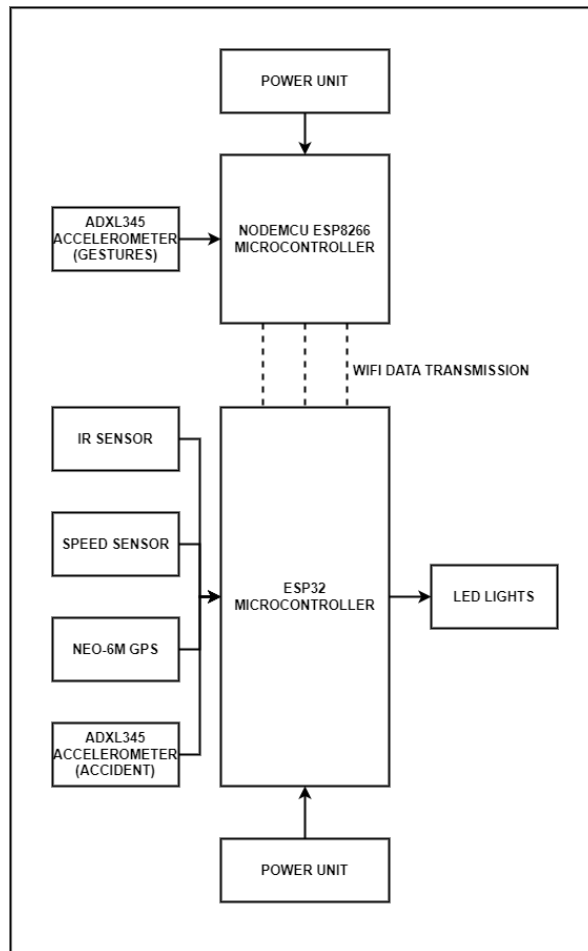5. GPS for location tracking.

Block Diagram:

Fig 1. Block Diagram

Working:

The system uses a NodeMCU ESP8266 microcontroller at the transmitter side and ESP32 microcontroller at the receiver side. A ADXL345 Accelerometer is used to provide the gestures used through hand. These gestures are then converted into values and are transmitted over Wi-Fi to the ESP32 microcontroller at the receiver side. At the receiver side IR sensor is used for proximity detection.

A speed sensor for is used to determine the speed of the cycle.

NEO6M GPS is used in order to locate or track the location of the rider.

ADXL345 Accelerometer sensor is used to determine accidents based on the gestures received from the transmitter side. LED Lights are used in order to indicate different gestures.

Future Scope:

1. The accident can be reported to the nearest police station and ambulance service automatically.

2. Battery backup can be increased.

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