Optimal Driving System for Two Wheelers

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Abstract: **- In this paper, we implement interaction between the bike and various sections like caution board, traffic signal and helmet through wireless communication protocols, which is based on the RF, ZigBee and Bluetooth technology. By using this system, all the bike automations can be performed through helmet, obstacles can be avoided, caution board indications and the status of traffic signals can be known. This is a complete safety purpose developed system for the two wheelers.**

Keywords: **- ARM -7, 8051 microcontroller, RF module, Bluetooth, ZigBee, Ultrasonic sensor, voice recognition unit.**

1. INTRODUCTION

In this proposed system we are using a wireless communication between bike to helmet, bike to signal section, bike to caution boards. The system will be comprised of a helmet module including microphone and a bike mounted base unit. The system will make use of different wireless communication protocols like Radio Frequency protocols, Bluetooth protocols and ZigBee protocols.

This system has 4 sections.

- Helmet section
- Traffic signal section
- Caution board section
- Bike section

Helmet section: - The helmet system is designed with stereo speakers, microphone & a wireless communication device. By using this system rider can communicate with the bike wirelessly. For example if the rider wants to ON the headlights isn't necessary to do it physically. Rider can just say right in a microphone which is placed in the helmet then the data is wirelessly transferred to the bike section using Bluetooth module. Similarly complete bike automations like headlights, horn and indicators can be controlled from helmet only they no need to switch it physically. Mobile phone with Bluetooth technology can be synchronized with the helmet Bluetooth module, so that the rider can attend calls, listen to songs...Etc the phone Bluetooth functionality will be activated in helmet Bluetooth module. Whenever mobile phone is synchronized to helmet Bluetooth module, all the bike automations must be manually done by the rider.

Traffic signal section: -Whenever we are in traffic, sometimes the signal will not be visible to the rider, the present signal status is transmitted by using ZigBee transmitter of traffic signal section. The status of signal is received at the bike section through ZigBee receiver and displays the signal status.

Caution board section: - When the rider driving a bike he doesn't know where the speed breakers, school zone, speed curves...etc is there. By using RF technology, a RF transmitter is placed at every caution board which continuously transfers the data of that caution board to certain range, Whenever the bike comes in that range, a warning message will be displayed in the bike section so that the rider will know where the speed breakers, school zone, speed curves…etc are there.

Bike section: - Data from the helmet are received wirelessly through Bluetooth and it activates the bike automations like indicators, horn, head light accordingly. Ultrasonic sensor is placed in front end side of the bike, which will continuously monitor the road. It is used indicate the rider, whenever there is any obstacles present. Using ZigBee module nearest signal status can be intimated. Using RF module the Caution signals like speed breaker, speed curves, school zones…etc can be intimated in bike section

2. RELATED WORK

***ARM-7 microcontroller:* -** In this paper ARM-7 microcontroller is used in bike section. The main block of multifunctional monitoring system is ARM-7 microcontroller. The software program is stored in ARM-7 microcontroller on chip memory, accordingly to which it provides the controlling actions.ARM-7 microcontroller combines the microcontroller with embedded high speed flash memory ranging from 32kB to 512kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate which offers high performance and very low power consumption. This results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.

***8051 microcontroller:* -** In this paper 8051 microcontroller is used in traffic signal section. 8051 has 128 bytes of RAM and 2 timers. It has 4K bytes of on-chip program ROM.

RF module: - In this paper RF module is used in caution board section. An RF module is a small electronic circuit used to transmit and/or receive radio signals on one of a number of Carrier frequencies. RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Here RF transmitter is placed at Speed breaker section. RF receiver is placed at bike's section. Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals

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through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

ZigBee module: - In this paper ZigBee module is used in traffic signal section. ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4,2006 standard for wireless personal area networks (WPANs), such as wireless headphones connecting with cell phones via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPAN, such as Bluetooth. ZigBee is used in applications that require a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 Kbits/s, best suited for periodic or intermittent data or a single signal transmission from an input device. Applications include wireless traffic management systems, and other consumer and industrial equipment that require range. ZigBee is the only Standards based wireless technology designed to address the unique needs of low-cost, low-power wireless sensor and control networks in just about any market.

Bluetooth module: - In this paper Bluetooth module is used in helmet section. Bluetooth technology is a short-range technology that is simple and secure. It is replacing the connecting devices containing cables and maintains high level of security. The key features of Bluetooth technology are low power, robustness, and low cost. Two Bluetooth enabled devices connecting each other is called pairing. It is an operation on unlicensed industrial, scientific and medical (ISM) band at 2.4 to 2.48GHz, using a frequency hopping, spread spectrum, full-duplex signal up to 1600 hops/sec. The signal hops among 79 frequencies at 1MHz. The Bluetooth Specification defines a short range (10 meter) or a medium range (100 meter) radio link that is capable of data or voice transmission to a maximum capacity of 720 kbps per channel.

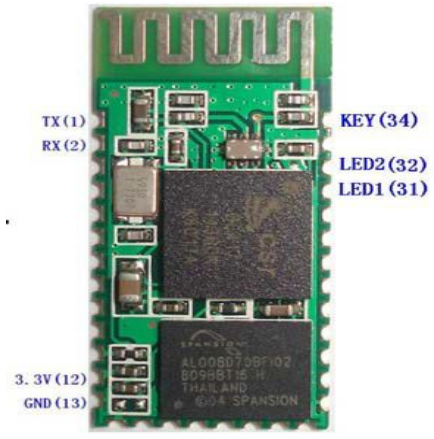

Figure 1.HC-05

Voice recognition unit: - In this paper the voice recognition unit is used in bike section. The speech recognition system is a completely assembled and easy to use programmable several carrier frequencies are commonly used in commercially-available RF modules, including 433.92 MHz, 315 MHz, 868 MHz and 915 MHz, these frequencies are used because of national and international regulations governing the use of radio for communication. The speech recognition system is completely assembled and easy to use programmable speech recognition circuit. Programmable, in the sense that you train the words (or vocal utterances) you want the circuit to recognize. This board allows you to experiment with many facets of speech recognition technology. It has 8 bit data out which can be interfaced with any microcontroller for further development. Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech assisted technologies, speech to text translation, and many more.

Ultrasonic sensor: -In this paper ultrasonic sensor is used in bike section. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:
(1) Using IO trigger for at least 10us high level signal,
(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

Figure 2.Ultrasonic sensor (HCSR-04)

3. SYSTEM IMPLEMENTATION

BLOCK DIAGRAMS

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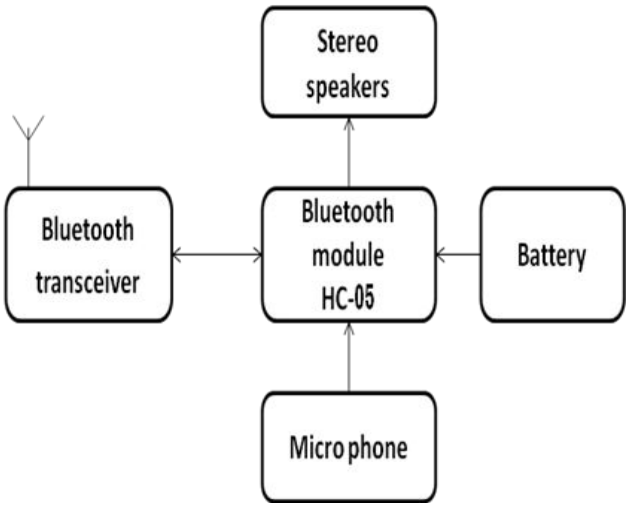

Figure 3.Helmet section

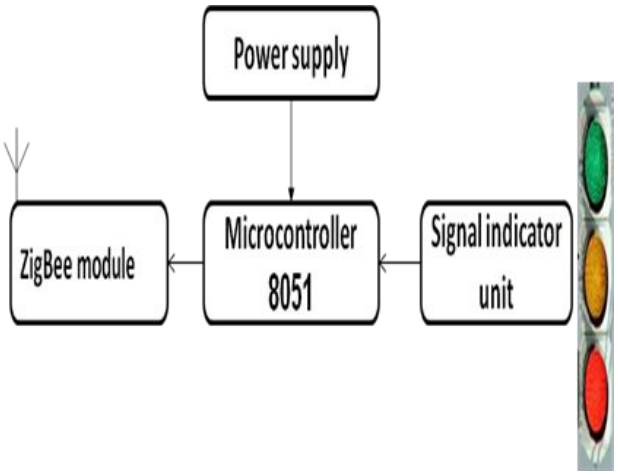

Figure 4.Traffic signal section

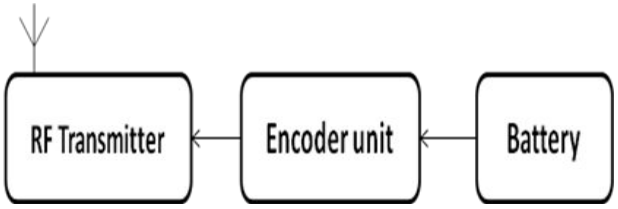

Figure 5.Caution board section

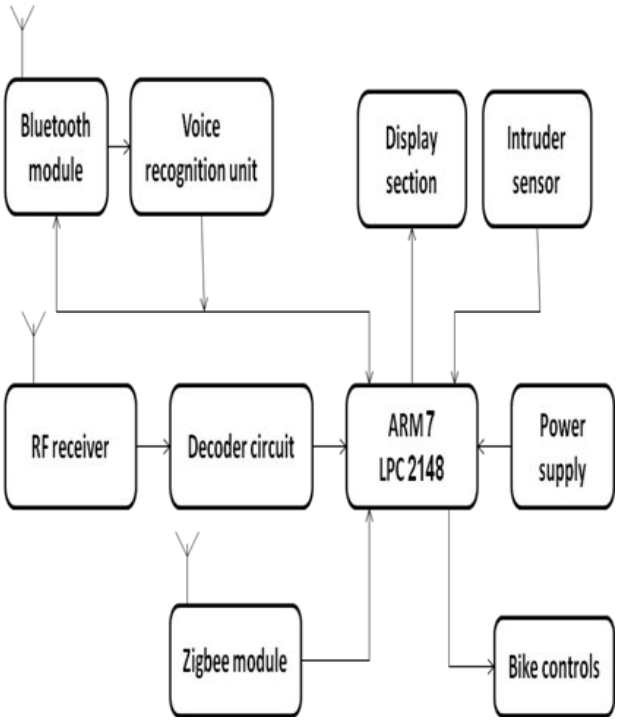

Figure 6.Bike section

In this paper implementation of an optimal driving system by using wireless helmet, complete driving safety system is developed. Whenever we are driving a bike, ever time we need to switch the bike automations manually. So we have developed a wireless helmet which is used to activate the bike automations through the voice commands. Suppose if we want to turn ON the right indicator just by saying 'right' in helmet will automatically turn ON the right indicator, to turn OFF the indicator just by saying 'stop' in helmet will turn OFF the indicators. Similarly bike automations like Headlights, horn and indicators can be controlled from helmet only. Since we are making use of Bluetooth module in helmet section, the rider can sync his mobile phone with the helmet Bluetooth module and can use helmet as mobile phone Bluetooth functionalities like attending calls in helmet Bluetooth module only. When phone is synced with helmet Bluetooth module, the bike automations must be physically done.

When we are in traffic, sometimes traffic signals are not visible. Using this technique we can eliminate that problem. In the traffic signal we place one ZigBee module and in the bike section we use one ZigBee module. Suppose traffic signal is in green colour, then green LED will turn ON in bike section. Similarly remaining signals like red and orange will also display in the bike section.

When we are driving a bike, sometimes we don't know where speed breakers, school zone, speed curves...Etc is there. Using this method we can eliminate that problem. At speed breaker section we place one RF transmitter.

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Similarly at the bike section we place one RF receiver. If we are nearer to speed breaker, then a warning message is displayed in bike section i.e., 'Speed breakers ahead go slow'. Similarly by placing a RF transmitter at different caution board like school zone, speed curves…etc, a warning will be displayed in bike section when we are nearer to those caution boards.

While driving we can't predict where Obstacles are there. So we have placed an ultrasonic sensor in bike front end, which is used to determine the obstacles on road. Warning message will be displayed in the bike section when ever there are any obstacles.

4. RESULTS

In this proposed paper implementation of add-on interaction between bike to rider, bike to traffic signal and bike to caution boards wireless communication, which is based on Bluetooth technology, RF technology and ZigBee technology. We have developed a safety driving system for two wheelers. By using this system we can eliminate bike accidents.

5. CONCLUSION AND FUTURE SCOPE

By using this kind of system we can eliminate the bike accidents. In future, by adding an android based touch screen navigation system in bike section will be an application in this project. Now by using the navigation system the rider can go any where, even though he doesn't know the route.

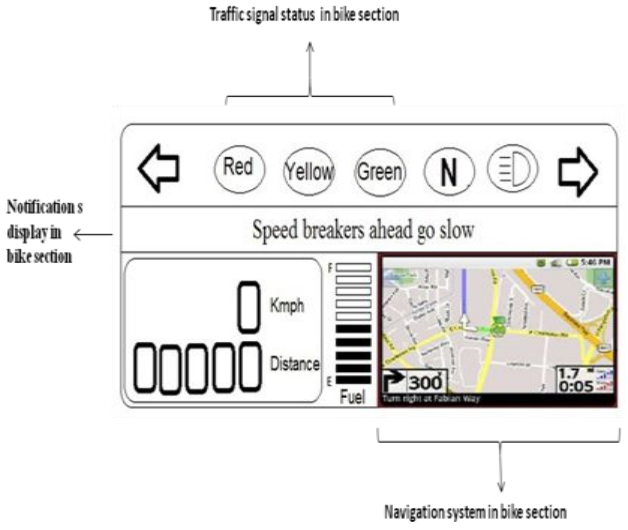

Figure 7.Bike dashboard look in navigation mode

By placing IR sensors in the indicators at the back side of the bike and placing a small camera in the brake light at the back side of the bike. Whenever any vehicle comes closer to the bike then the IR sensor senses them, when IR sensor is high, camera will switched to ON state. Thus now in the bike section the android touch screen will be in camera video mode. Thus the vehicles behind can be sensed and can be seen in the bike section. When ever the IR sensor is low, camera will be in OFF state .Sometimes the rider may require only navigation mode or camera mode, so the rider will be given an option to switch to navigation or camera mode.

Figure 7.Small camera

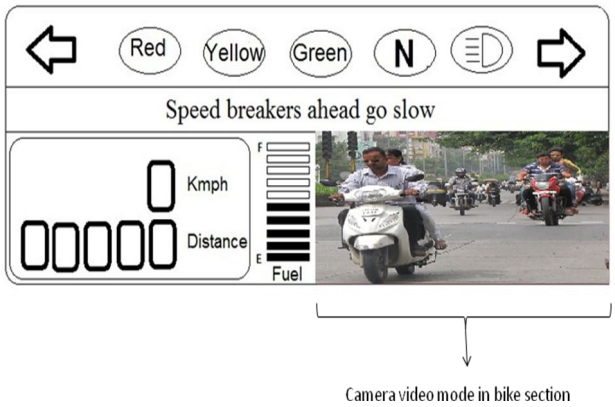

Figure 8.Bike dashboard look in camera mode

In real time implementation for this navigation and camera mode, an application purpose android touch screen must be developed.

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