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Smart Helmet for Accident and Alcohol Detection using GSM and GPS Technology

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Abstract: *In our daily life, the number of vehicles especially two-wheelers are gradually increasing and the number of two-wheelers used by students is also high and that becomes a concern for their parents to look after their children's safety while driving .Here, the Smart Helmet for Accident and Alcohol Detection Using GSM and GPS Technology was suggested. This device automatically detects if a driver is wearing a helmet and has non-alcoholic breath while they are on the road. This device consists of a helmet transmitter and a bike receiver. A switch is used to guarantee that the helmet is on the head. The switch's ON state ensures that the helmet is properly positioned .A gas sensor is positioned near the driver's lips in the helmet to detect the presence of alcohol. The data to be conveyed is encoded with an RF encoder and broadcast through a radio frequency transmitter. The data is received by the bike's receiver, which decodes it using an RF decoder. If any of the two requirements is violated, the engine should not start.*

Keywords: Smart Helmet, Accident Prevention, Alcohol Detection, GSM, GPS, ON, RF transceiver, RF encoder

I. INTRODUCTION

The helmet is very important while driving the bike. It reduces or escapes human lives from rare accidents. Most road accidents and loss of human lives are happening because of not wearing a helmet while driving the two-wheelers. In this regard, the smart helmet minimizes accidents and human being lives. This system uses radio frequency transmission and reception. The frequency waves are connected by the helmet and bike. The radio frequency transmission and reception are done by using an RF transmitter and receiver IC. The cost of the RF IC is very low. The cost of the integrated circuit is determined by the frequency and range of distance coverage. In this project, we require 10 meters of distance coverage. The RF transmission and reception communication will take place within a 10meter range. The implementation of the project is very simple for existing bikes and for manufacturing bikes because of the self-motor used for ignition. The hardware implementation is very simple. Drunken driving is a frequently occurring phenomenon while driving in either a two-wheeler or car. This leads to hazardous road accidents. Because of the unconditional state of the human brain while drunk driving, the human brain will become unconscious. In this regard, driver alcohol detection minimizes drunken driving accidents. The MQ-3 alcohol sensor is assembled on the bike, where it senses the alcohol continuously. The cost of the alcohol sensor is very low, so the overall system cost is reduced. An embedded system is a type of computer system that is primarily designed to access, process, store, and regulate data in various electronic-based systems. Embedded systems are made up of hardware and software, with the software being firmware embedded in the hardware. One of the most essential properties of these systems is that they provide output within time constraints. Embedded systems assist with the task to make it more ideal and convenient. As a result, we commonly utilise embedded systems in both basic and complicated equipment. Microwaves, calculators, TV remote controls, home security systems, neighbourhood traffic control systems, and other gadgets are examples of embedded system applications.

II. WORKING PRINCIPLE

The timing switches circuit regulates the bike's OFF time. The arrangements of mechanical switches are used to change the timing. If the driver does not wear a helmet while driving, the bike will automatically turn OFF depending upon the

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period of the timing switches. Before this action, it is providing a timing alarm by using buzzer and giving instructions on the LCD (liquid crystal display). The LCD is used for monitoring the timing. The Timing will decrement, this action indicated by the LCD. In this smart project, a special timer is used to calculate the off time of the bike's ignition. If the helmet is removed while driving the bike, the driver will have to wear the helmet within a particular period, otherwise the bike ignition will automatically cut off the mechanical relay connection.

The timing process is based on two categories.

- Without wearing the Helmet
- Wearing the Helmet

2.1 Without wearing the Helmet

In figure 1, the timer program is already programmed at the microcontroller, and special timer functions are used in the controller. The microcontroller IC sends the signal to the timer circuit. If the value of the signal is one, the timer will activate, and it will produces the timing gaps for 10 or 15 seconds. If the timing gap exceeds the previously set time, the bike ignition will turn OFF automatically.

2.2 When wearing the Helmet

The timer program is already programmed at the microcontroller, and the special timer functions are used in the controller. The microcontroller IC sends the signal to the timer circuit. If the value of the signal is 1, the timer will not activate, and it will not produce the timing gaps for 10 or 15 seconds. There is no interruption as the bike gets ignited and ready for a drive.

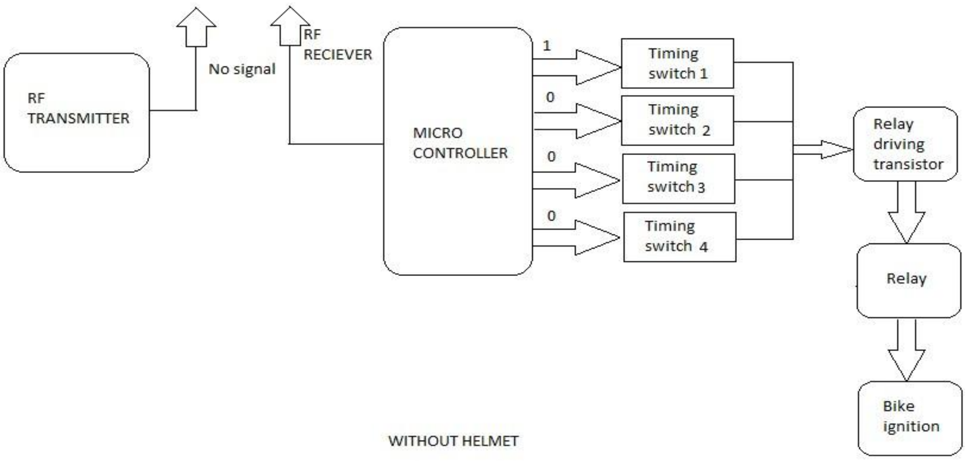

Figure 1: Without Helmet Timing Architecture

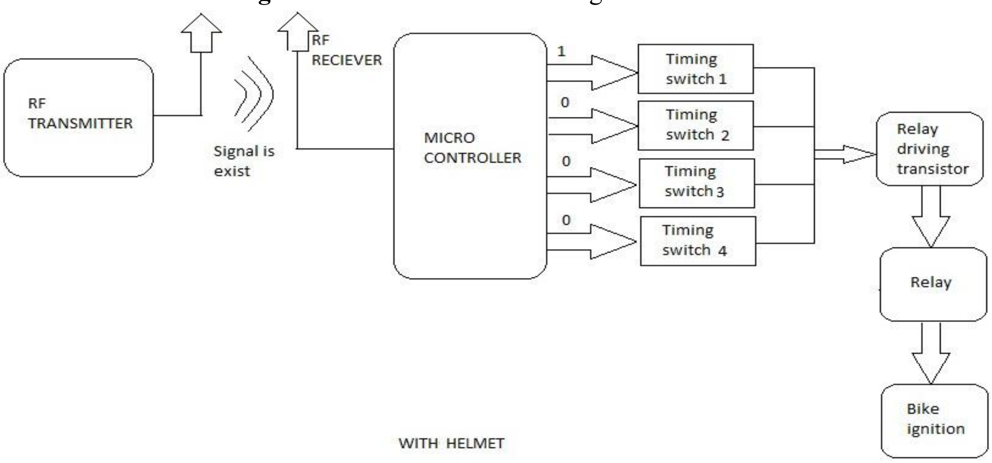

Figure 2: With Helmet Timing Architecture

III. HARDWARE MODULES

3.1 Microcontroller (ATMEL)

The microcontroller manages the signal handling, relay control, monitoring, and driving of the liquid crystal display. This ATMEL (8051) in Figure 3 is one of the most important ICs to program a HEX file. It uses the industry standard 3-wire SPI interface to program the target device.

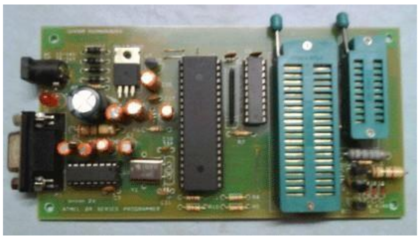

Figure 3: ATMEL 8051 **RF TRANSMITTER:**

The RF transmitter in Figure 4 has an operational voltage range of 5 volts. The low-cost RF transmitter can send a signal up to 100 metres. This wireless transmitter works with 315 MHz receivers. They work with microcontrollers to create a very simple wireless data link.

3.2 RF Receiver

The RF receiver in Figure 5 has an operating voltage range of 5 volts. The super regeneration design ensures sensitivity to a weak signal. It receives RF signals from the transmitter at a specific frequency range. It works in pairs with RF transmitters to communicate with each other.

Figure 4: RF Transmitter

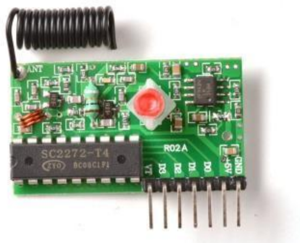

Figure 5: RF Receiver

3.3 GAS Sensor (MQ-303 A)

The MQ-303A in Figure 6 is a tin dioxide semiconductor gas sensorthat has a high sensitivity to alcohol and a rapid reaction time. This variant is appropriate for alcohol detection equipment such as portable breath alcohol testers or ignition locking systems in vehicles.

Figure 6: MQ-303A

3.4 LCD Display

In Figure 7, a flat panel display, electronic visual display, or video display is referred to as a liquid-crystal display (LCD) because it makes advantage of liquid crystals' ability to modulate light. The extremely simple module known as a 16x2 LCD is frequently used

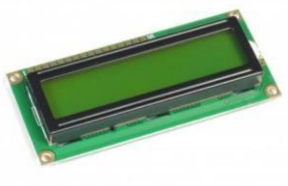

Figure 7: LCD Display

IV. CIRCUIT DIAGRAM

The microcontroller has four ports, each port can be used as both an input and an output. At port 1 (PIN 1), as shown in Figure 8, the radio frequency receiver is connected. If the antenna receives the signal, the transistor will be ON, and it will interface with port 3. The transistor will activate the relay, while the relay will trigger the bike's ignition.

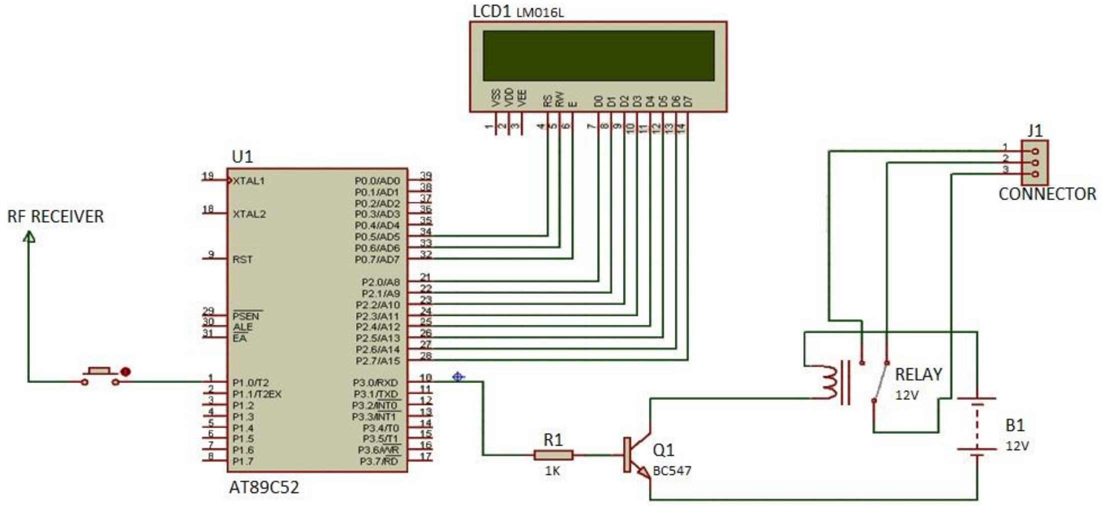

Figure 8: Circuit Diagram

V. RESULT AND DISCUSSION

The microcontroller has four ports, each port can be used as both an input and an output. At the port 1(PIN 1), the radio frequency receiver is connected. If the antenna receives the signal, the transistor will turn ON, which is interfacing with port 3. The transistor will activate the relay, and the relay will trigger the bike's ignition. If any one of the methodologies fails, the bike will shut off and an error message will be generated. The loop continues and verifies the topology after every time interval and updates the condition instantly.

VI. CONCLUSION

This paper considers the scenarios of not wearing a helmet, accidents, and drunken driving. Hence, the problem may be solved by using frequency transmission and reception. As stated in the conclusion, wearing a helmet while driving can assist in avoiding accidents and the effect of drunken driving. Also, the implementation of the project is very simple when compared with other projects and existing systems. The hardware connections are not complicated and they can be implemented on the existing bike without any mechanical assistance.

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