Intelligent Accident Prevention System using IoT

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ABSTRACT

Despite the technological advancements of this era, road accidents remain a major concern, leading to public health issues and the loss of lakhs of lives annually throughout the country. The leading cause of road accidents worldwide is the consumption of alcohol before driving. Drunk drivers are in an unstable state, resulting in impulsive judgments on the road and endangering the lives of other road users. Another issue is unlicensed individuals driving illegally. To strengthen the identification system for drunken and unlicensed drivers, the advancement of vehicle engineering is crucial. To address these problems, we propose using a gear locking technology that prevents drunk drivers from operating a vehicle. Instead of an engine locking system, our proposed system uses a gear locking mechanism, allowing the engine to work for the air conditioning while locking the gear system if the driver is drunk. Our system includes a method for detecting the presence of alcohol from the breath of drivers using an MQ3 sensor and ATMEGA2560 microcontroller. Additionally, a fingerprint scanner is available for license verification. Due to its compact size, cost-effectiveness, excellent dependability, and high reliability, the proposed system is an ideal solution for preventing both drunken and unlicensed driving.

Keywords: Drunk drivers, License verification, Accident detection

1 Introduction

IOT based projects have been a revolution in the past few years. So, our topic mainly focuses on how human and controller interaction can be made easier and how easier it can make effective will be discussed here. A great number of accidents in recent years were caused due to drunk driving. Drunk drivers are in an extremely unstable condition, which could indeed make the drunk person to make rash decisions on the highway which harm the lives of public. Driving without driving license is illegal, which is another problem. This technology which is being used currently one of the best and safest way of taking the car automation to a better side of the automobile industry. Here, we introduce a gear locking technology that prevents drunk drivers from operating the vehicle. Instead of utilizing an engine locking system, we can use a gear locking system, which locks the gears when the driver is intoxicated while allowing the engine to operate for the AC.

Also, the system can be advanced using the license verification before starting the engine, as a next step we'll acquire the intoxicated driver's license number. The fingerprint analysis is used to carry out this verification. Therefore, if an accident happens, notification about the accident and the license holder is sent to the appropriate authority. By this method, we can provide immediate medical attention with the help of GPS location and IOT. The steps included in this work are step1:- The finger print scanning , step2:- identifying the driver's license ,step3:- Checks whether the persons has consumed alcohol or not step4:- If yes then the gear system will be locked ,step5:- In case any accident caused the details of the vehicle and location will be reported immediately to the higher authorities, more about this steps will be discussed in the working and proposed method section .This type of IOT application provides the user to make a safe journey throughout his life also the number an increased accidents throughout the world can be reduced.

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2 Literature Survey and Related Works

The death rate is rising due to a rise in road accidents. Many studies have been conducted on road accidents and driver's drowsiness. The consumption of alcohol by drivers is reason for a significant proportion of traffic collisions. A system is developed, that employs a MQ3 alcohol sensor with an Arduino, as well as a GSM module to send SMS notifications to user numbers, an LCD display to determine whether alcohol is detected, and a DC motor to detect alcohol and automatically stop the motor [1]. An Arduino Uno with an alcohol sensor is used to create an engine locking mechanism. The technique uses a MQ-3 alcohol sensor to continually assess blood alcohol content (BAC) in order to detect the presence of alcohol in a driver's breath [2]. A cost-effective Arduino uno and nano based automatic accident prevention, post accidental rescue system has been developed. This technology will play a role in the reduction of accidents. If the collision is unavoidable, it will assist the rescue crew by providing an accurate position of the accident site [3]. A system for accident detection and prevention has been created that can quickly send an ambulance to the location of the vehicle [4]. A system offers many tracking options is developed. A multi-tracking system combines technologies like GPS and GSM. Multiple tracking devices are supported by the platform for a number of uses like live vehicle tracking, personal tracking, and asset tracking [5]. A gadget combining an eye blinking sensor and an alcohol sensor has been developed. The sensors detect the driver's blink when he starts the engine and check his breath for alcohol content [6]. As shown in Figure-1, When a particular level of alcohol is detected in the driver's breath, a system is created that automatically shuts down the vehicle's engine. When the presence of alcohol is detected, the microcontroller stops the vehicle's engine, a siren sounds, and the message "Alcohol Detected" appears on the LCD screen [7].

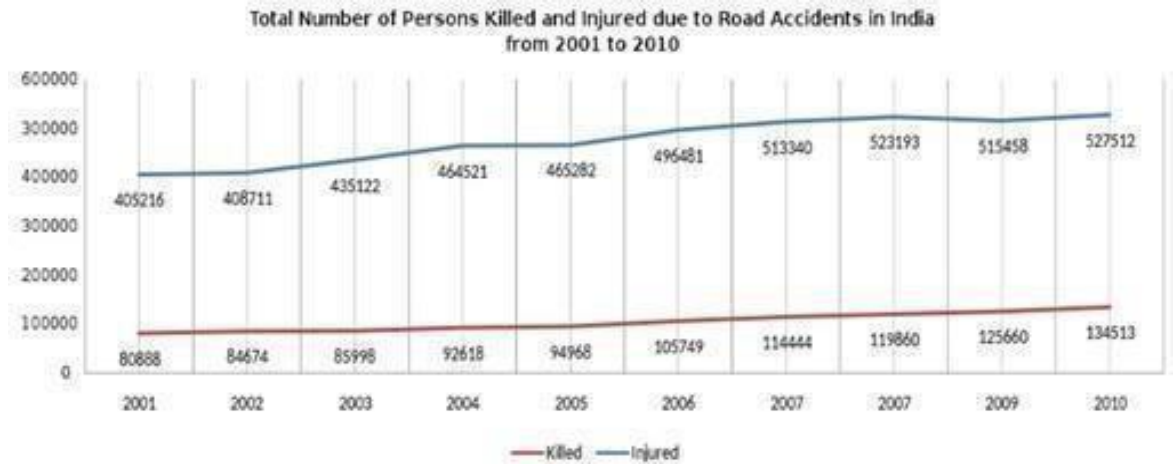

Figure 1: *Graphical Representation of Road Accidents*

3 Proposed System

As shown in the Figure-2, The proposed system for intelligent accident prevention system using IoT is implemented using Arduino microcontroller, an alcoholic sensor, GPS module, fingerprint scanner, module driver, gyro sensor, Wi-Fi module, LED, LCD display and a buzzer. Arduino mega is used to get readings from different sensors and to control the system. GT-511C3 fingerprint sensor gets the reading and it is used to verify the license of the user. After the successful verification, the engines can be started, which will be indicated by an LED and displayed on LCD display. After the successful verification of the license, the system then checks for the content of alcohol using MQ3 alcoholic sensor in user. If the sensor identifies the content of alcohol, the gear system will be locked while the engine and air conditioner keep working. The reason for which the gear system has been locked will be viewed in the LCD display while LED keeps blinking, and buzzer keeps producing a beep sound. Gyro sensor recognizes the tilt of the vehicle and provide the readings. The GPS module is used to pinpoint the location and notify the necessary authorities (police

station, ambulance) by sending a message from the Blynk server to g-mail. Different voltages are provided to different component needed.

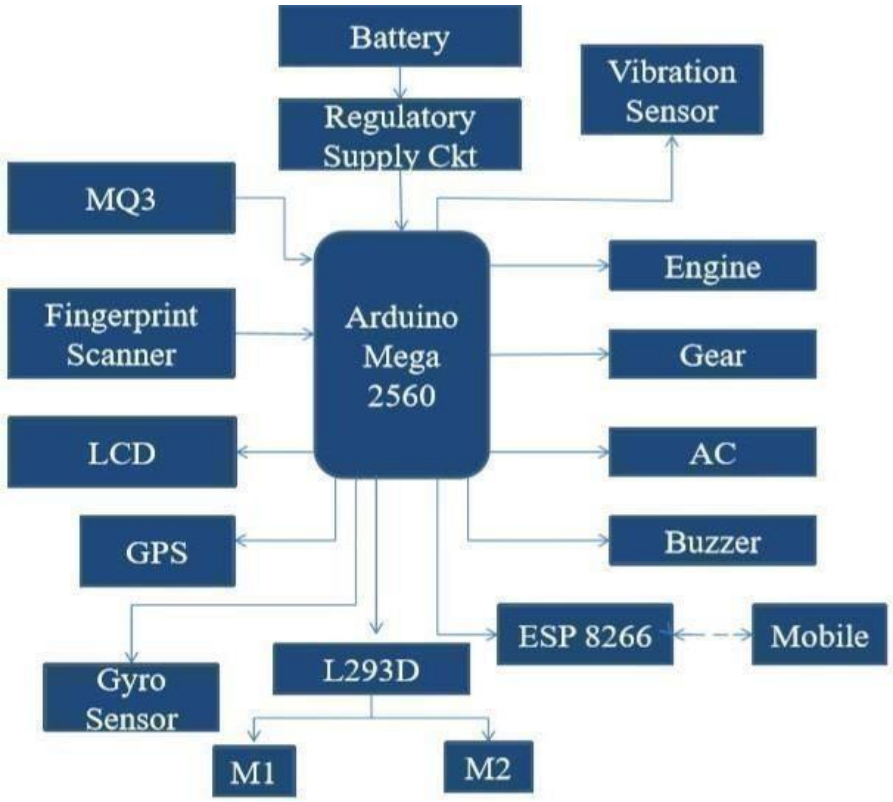

Figure. 2: *Block Diagram*

4 Experimental Setup

The proposed system can be divided into two parts, (1) hardware implementation and (2) software implementation. The block diagram of the setup is shown in figure 2.

4.1 Hardware Implementation

The hardware part of the proposed system deals with setting up the Arduino microcontroller and different sensors. This part consists of Arduino Mega, MQ-3 alcohol sensor, fingerprint scanner, Wi-Fi module, LCD display, gyro and vibration sensor and GPS module.

4.1.1 Arduino Board

Figure 3: *Arduino Board*

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As shown in the Figure-3, The microcontroller used in Arduino mega is Atmega2560. It has 54 digital I/O pins, among which 15 are PWM outputs, 16 analog input pins, crystal oscillator of 16MHz, 4 UARTs and a reset button. It has a 256 KB of flash memory from which 8KB is consumed by the bootloader. It also does have SRAM of 8KB and EEPROM of 4KB. The Arduino can be powered by a USB connection of 5V. It can operate on 6 to 20 volts, but 7 to 12 volts are preferred because less than 7 volts may result in instability and greater than 12 volts might overheat the voltage regulator and damage the board. Many DIY projects, home automations, robotics, wearable technologies, and many educational purposes can be achieved by using Arduino board.

4.1.2 MQ-3 Alcohol Sensor

Figure 4: *Alcohol sensor*

As shown in Figure-4, The alcohol concentration can be detected using MQ-3 alcohol sensor which is shown in fig.4. It can also be used to detect Benzine unto small sensitivity. The sensor supports alcohol concentration based on the output that is analog resistive. The threshold value can be adjusted by using built-in potentiometer. According to the gas concentration present, the sensor conductivity will also vary. MQ-3 sensor is a MOS (metal oxide semiconductor) sensor whose detection is done by sensing the materials resistance change. These types of sensors are also known as chemiresistors. The MQ-3 alcohol sensor uses 800mW and needs 5V DC to work. The detection range of the sensor varies from 25 to 500 ppm. The MQ- 3 sensor is a heater-driven sensor which has high sensitivity for alcohol gas. It is inexpensive and suitable for a wide range of alcohol detection applications.

4.1.3 L293D Motor Driver

Figure 5: *Motor driver*

As shown in Figure-5, L293D is a motor driver IC used for driving DC motor in either direction. It is an integrated circuit with 16 pins for operating two DC motors in any directions at the same time. It is a quadruple half H driver

designed for the purpose of providing two-way drive current till 600mA at voltage levels from 4.5V to 36V. It can simultaneously maintain the direction and speed of two DC motors. It has 16 pins. There are 2input pins and two output pins and 1 enable pin for each motor. Various applications include home automation, robotics, camera and surveillance system, education, and training purposes etc.

4.1.4 Fingerprint Scanner (GT-511C3)

As shown in Figure-6, It depends upon the images of user fingerprint to recognize its pattern. This module has a built-in camera for taking the picture of user's fingerprint. The fingerprints are scanned by the optical sensor and are processed by ARM architecture. This module is designed with such ease of integration with serial interface. Fingerprint identification at high speed and accuracy using the Smack Finger 3.0 Algorithm. Fingerprint Templates and Databases can be read and written. Capable of 360° Fingerprint Recognition.

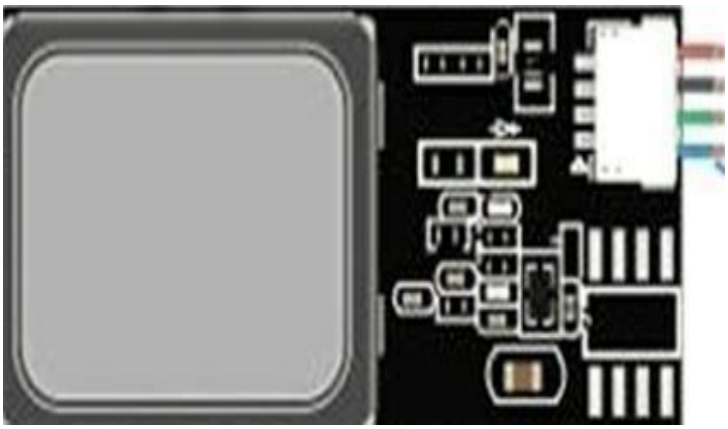

Figure 6: *Fingerprint Scanner*

4.1.5 GPS Module

As shown in Figure-7, Locating something on Earth is made possible by the global positioning system (GPS), a network of satellites and receivers. The radiofrequency of 1.1 to 1.5 GHZ is used to transmit information signal from the GPS satellite to the receiver. By using the signal, we are able to determine the position of the module using latitude, longitude, and altitude. It can be used for navigation, asset tracking, surveying etc. Specific RF frequencies are used by GPS modules' tiny CPUs and antennas to directly receive data from satellites. Then, it will obtain data, including timestamps, from each visible satellite. It was utilized for tracking, navigation, and position determination.

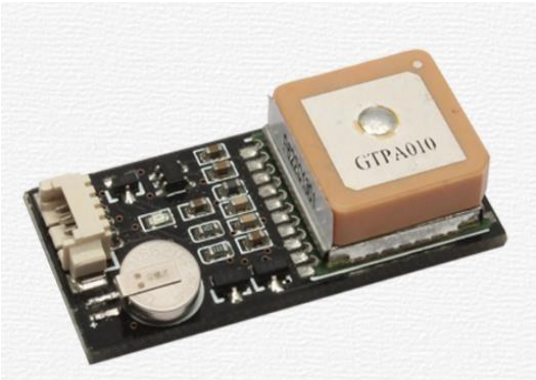

Figure 7: *GPS module*

It is highly sensitive and uses little power.

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4.1.6 LCD Display

A flat panel display or equivalent optical device with an electronic signal that modulates light is known as a liquid crystal display (LCD). It is used in IOT devices, learning aids, and other things to show information and instructions. Compared to the technology they substituted, such as light-emitting diode and gas- plasma displays, LCDs represented a major improvement. LCD technology was able to create displays that were far smaller than cathode ray tube (CRT) technology. Compared to LED and gas-display displays, LCD displays use significantly less power.

4.1.7 ESP8266 (Wi-Fi Module)

Figure 8: *Wi-fi Module*

As shown in Figure-8, The most widely used and affordable Wi-Fi SoC is the ESP8266, which includes a 32-bit microcontroller with a low power consumption TCP/IP stack. The clock frequency of this module is adjustable from 80 MHz to 160 MHz. It has a flash memory of 4KB and 128 KB of RAM. Wi-fi modules are used for different applications such as IOT applications, wireless sensors and controllers, embedded systems etc. Applications may be hosted on the ESP8266, or all Wi-Fi networking tasks can be assigned to another CPU.

4.1.8 Gyro and Vibration Sensor

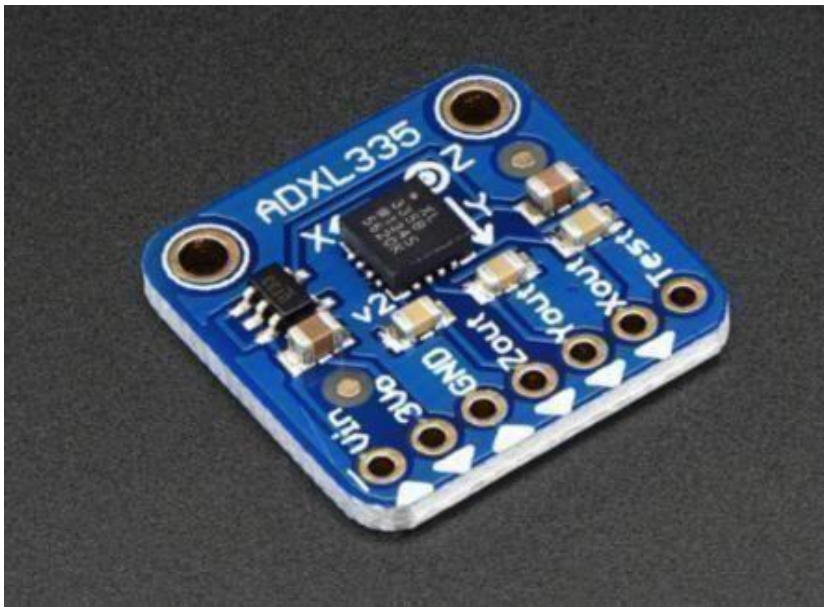

Figure 9: *ADXL 335 gyroscope sensor*

As shown in the Figure-9, A gyroscope sensor (ADXL335) is a tool that determine and keep track of an object's orientation and angular velocity. It can measure acceleration in three axes. It is commonly used in motion sensing, automotive, aerospace's etc. Nowadays it is also used in gaming and entertainment purposes. It detects the amount of angular velocity generated. Used to calculate the amount of motion. Detects the angular velocity caused by the sensor's own movement. A CPU detects angles through integration processes. The ADXL335 is a complete 3-axis accelerometer that is compact, thin, and low power. It also has signal-conditioned voltage outputs. A minimum 3G

full-scale range is used to evaluate acceleration in this product.

4.2 Software Implementation

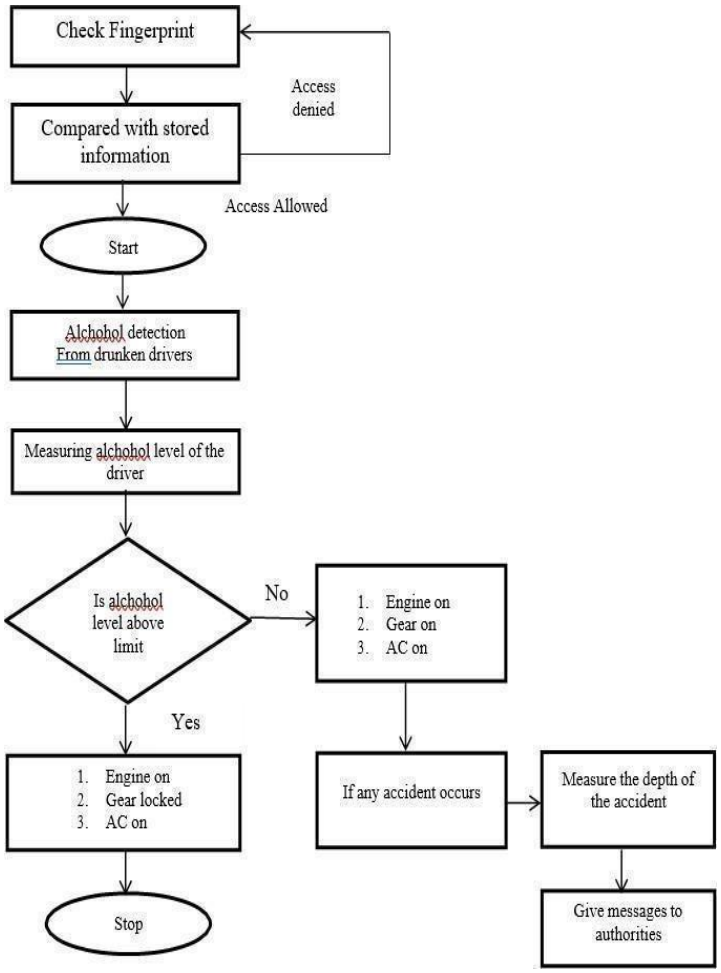

Figure 10: *System flow diagram*

The suggested system's software implementation is created utilizing the flowchart illustrated as shown in Figure-10. The Arduino IDE is the software utilized in the project. And c is the programming language used. BLYNK, an app, controls the entire system. Users can remotely control devices like the Arduino, Raspberry Pi, and Node MCU by utilizing IoT platforms like Blynk. We can control the movement of the vehicle, locate the location of the device, and retrieve the result of alcohol content by using the MQ- 3 alcohol sensor by using BLYNK. As shown in Figure-11, With the help of the Blynk platform, hardware projects can be easily controlled and monitored from iOS or Android mobile devices. After installing the blynk software, we can make a project dashboard by adding buttons, sliders, graphs, and other widgets to the display.

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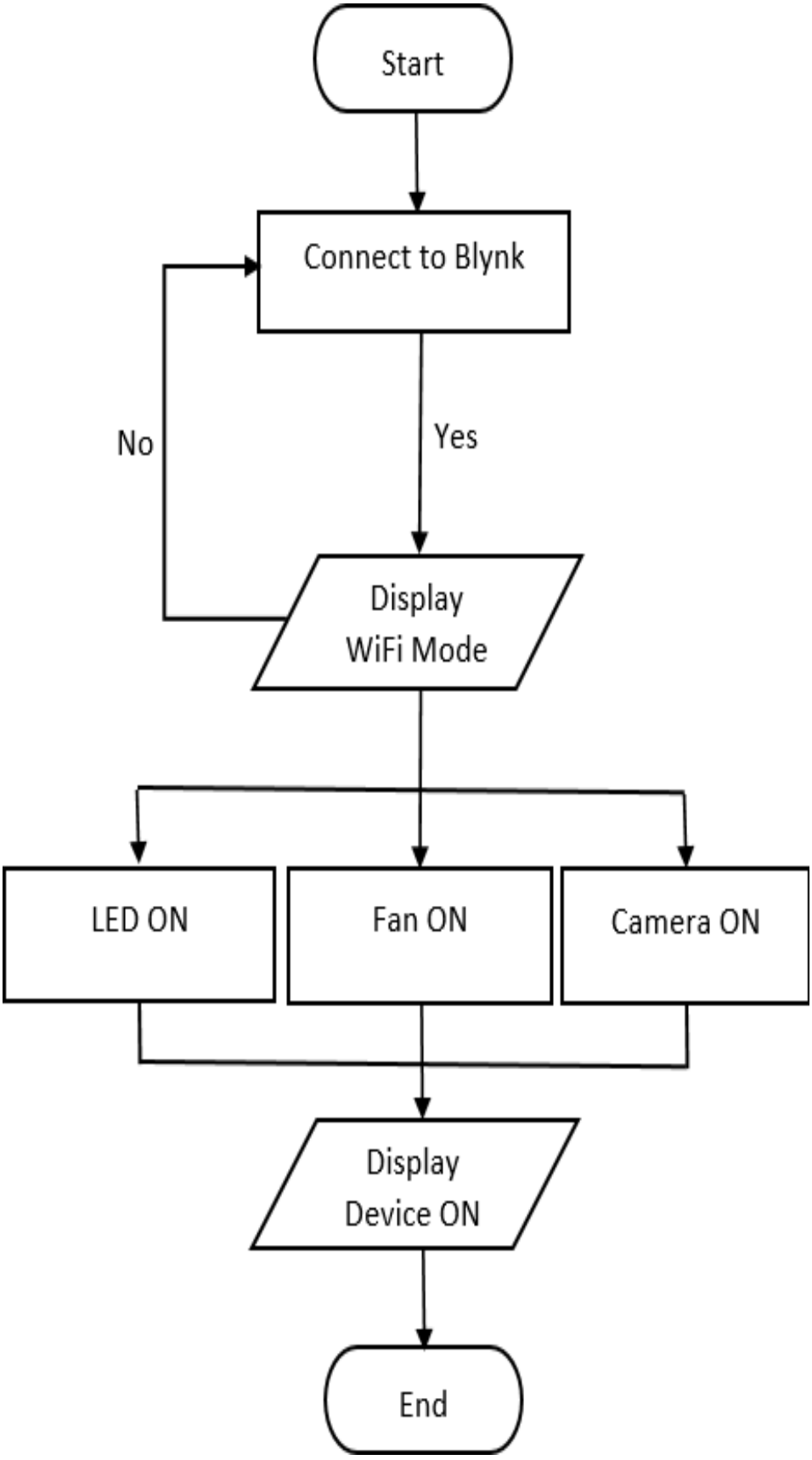

Figure 11: *Flow chart of blynk application*

5 Experimental Result

Low-cost intelligent accident prevention system based on IoT is built and its performance is validated. Figure-12 depicts the result obtained in the LCD display. This project plan provides a method of preventing car accidents. This gadget scrutinizes a driver's fingerprint and compares it to the stored information. Then outcome is shown on the LCD display.

Figure 12: *Experimental Results*

The alcohol monitor detects the driver's exhaust air and displays it on the LCD. If any accident occurs, it will be detected and reported to the appropriate officials. (Police, ambulance). Blynk will send information about the driver and the location to Gmail. The blynk app controls the entire prototype.

6 Future Scope

The proposed method utilizes GT-511C3 fingerprint analysis to verify license. The engine will not start until the license has been verified. Using a licensed person's fingerprint, it is possible for an unlicensed person to operate a car. By employing facial recognition rather than fingerprint analysis, this can be prevented. The face is recognized on periodically, ensuring that the same individual is driving the vehicle.

7 Conclusion

Drunk driving is the reason for an enormous percentage of traffic accidents. It has been established that drinking impairs driving competence and shoot up the chance of an accident. Driving while drowsy significantly increases the likelihood of an accident resulting in injury or death, according to research [8]. As a result, several countries have been working for a long time on remedies to drunk driving, such as providing awareness to public and education, as well as strong restrictions for drinking and driving. The laws prohibiting driving after consuming alcohol have been implemented and violators face heavy penalties [9]. Another issue is the illegal driving by the unlicensed people. Driving without a license is prohibited and dangerous. Here we are introducing Gear locking system. As a result, an alcoholic cannot operate the vehicle. We can use the gear locking system instead of the engine locking system to keep the engine running when the gear system is locked when the driver is drunk. The suggested system includes a technique for identifying the presence of alcohol on drivers' breath. The system has been designed successfully and implemented with the help of a MQ3 sensor and ATMEGA2560 microcontroller. For license verification, there is a fingerprint scanner. Small volume and high reliability are a benefit of the entire system. This system increases the safety features while also bringing innovation to the vehicles' current technology, making it a successful advancement in the automotive sector.

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8 Declarations

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