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AI based Driving Licence Holder Recognition

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Abstract

Here's an example of how AI will be applied in various vehicles. So that only drivers with RTO-approved driver's licences are allowed to operate the vehicles. Because there is an increase in road accidents caused by drivers who do not have a legal driver's licence, we can utilise AI-based technology to recognise the face of the motorist and verify whether or not he/she has a legitimate government-approved licence. The ESP32 CAM Wi-Fi Module, Sim 900 GSM Module, and IR illuminator Module can all be used to create this system. Artificial intelligence (AI), also known as machine intelligence, is a branch of computer science aimed at giving software the ability to analyse its environment using predetermined rules and search algorithms, or pattern-recognizing machine learning models, and then make decisions based on those analyses. This system is offered to reduce the cost of the prior method. By adding an AI module to the suggested design, it can readily be converted for use in the automotive industry. This design will be extremely valuable in reducing road accidents, and this module will also be useful in counting the number of persons in the vehicle.

Keywords: **ESP32 CAM Wi-Fi Module, Sim 900 GSM module, IR illuminator module, Artificial Intelligence, Counting.**

1. Introduction

In today's world, several countries' traffic police departments collect fines by examining the driver's licence and the number of passengers in the car. If someone does not obey the norms of the RTO, the traffic police agency may demand a bribe.

This would also assist to limit the number of accidents caused by vehicles that break RTO laws. Nearly 1.3 million individuals die each year as a result of a road traffic collision, with over 3000 deaths per day, and more than half of these victims are not in a car. Non-fatal injuries occur in 20 to 50 million additional persons as a result of collisions, and these injuries are a major cause of disability around the world. Ninety percent of road traffic fatalities occur in low and middle-income nations, which account for less than half of the global vehicle fleet [1]. In 2017, road accidents involving drivers with a learner's permit and those without a valid driver's licence accounted for 17.5% of all accidents (see Chart 1.1 below). The number of accidents involving drivers who do not have a valid driver's licence rose from 32,088 in 2016 to 48,503 in 2017 [2].

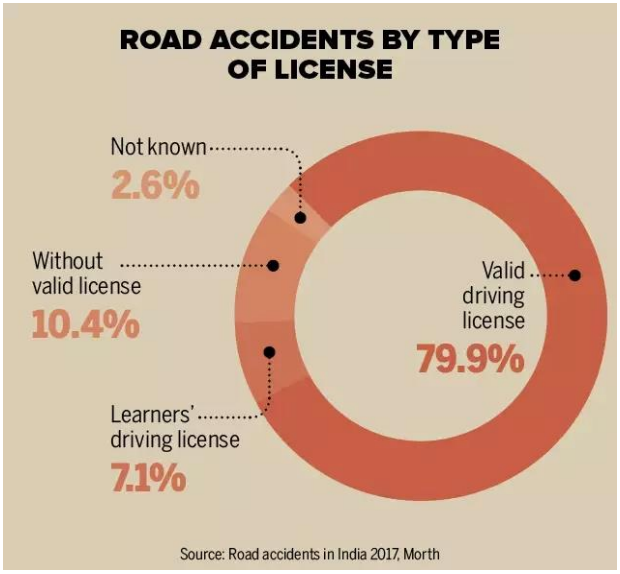


Chart 1.1: Road accidents chart [2].

We can apply AI-based Driving Licence Holder Recognition to solve these problems. When a person applies for a driver's licence at the RTO office and passes all of the required tests, the RTO office will be required to learn that person's face. Any AI-based tool, such as the ESP CAM module, or any other AI-based tool, can learn the face. This recognised face, along

with his other information, will be recorded in the traffic police department's database. Only the RTOs of the respective cities will be able to save this information. On the other hand, every vehicle will be required to have an AI scanner setup with a Sim 900 GSM module and an IR illuminator board module. This will be installed slightly above the driver's seat, in front of the driver's face, so the camera can scan the driver's face. The AI camera will scan the driver's face at predetermined intervals and compare it to the face saved in the traffic police's central web server during the granting of a driver's licence. This camera will also check the number of persons in the vehicle on a regular basis. The vehicle will only operate after the driver's face has been verified and the number of persons in the vehicle has been counted; otherwise, the vehicle will not operate. Now since scanning the face at night is a difficult operation, we'll employ the IR illuminator board module, which will automatically activate only when the light intensity is low, with the help of incorporated Light Dependent Resistor (LDR).

1.1. Design Requirements

Both software and hardware components are used to implement the suggested system. Any microcontroller IDE software that is available for any operating system can be used to write the code in c++ programming languages. The following is a list of the hardware requirements for the system, as shown in Table.2.1:

A. ESP32-CAM [5]:

The ESP32-CAM is a small, inexpensive ESP32-based development board with a built-in camera. It's ideal for Internet of Things (IoT) projects, prototypes, and do-it-yourself projects. The board incorporates Wi-Fi, conventional Bluetooth, and low-power BLE with two high-performance 32-bit LX6 CPUs. With a main frequency adjustment range of 80MHz to 240MHz, it has a 7-stage pipeline architecture, an on-chip sensor, a Hall sensor, a temperature sensor, and other characteristics. It can be used as a master to build a standalone network controller or as a slave to add networking to existing devices that use other host MCUs. Bluetooth 4.2 and Wi-Fi 802.11b/g/n/e/i protocols are fully supported. The ESP32-CAM is suitable for a wide range of IoT applications. It can be used to make smart home devices, industrial wireless control, wireless monitoring, QR wireless identification, wireless

positioning system signals, and other Internet of Things applications. It's an excellent choice for projects involving the Internet of Things (IoT) [5].

B. IR Illuminator Module[7]:

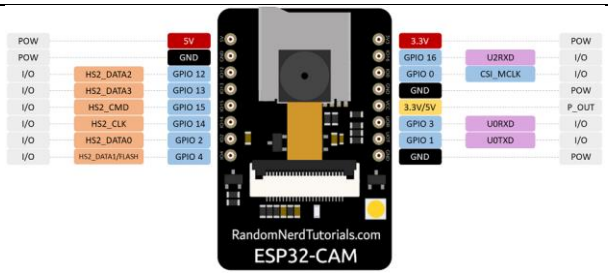
Imagine being able to see in complete darkness; with any normal CCD video camera and our LED DISC IR Infrared illumination, you can! Infrared light is sensitive in most CCD TV cameras and night vision scopes. When you use infrared light to illuminate items, the camera will view them as if they were lit by a floodlight, but they will appear utterly dark to the untrained human eye.

LED DISC IR has a rated output of 480mW/Sr and is made up of 24 high-power 850nm or 940nm 120° LEDs set on a 42.1mm (1.66") diameter board with an aluminum base for heat dissipation. The board's power needs are 12v to 14v DC, with a maximum current draw of 200mA. The board is fully constructed and tested when it is delivered. This module will help EspCam to detect driver face and head count in vehicles [7].

C. GSM Module;

The SIM900A GSM Module is the smallest and most cost-effective GPRS/GSM module available. The bulk of embedded applications use Arduino and microcontrollers. The module uses GPRS/GSM technology to communicate with a mobile sim card. Users can make and receive phone calls as well as send and receive SMS messages using the 900 and 1800 MHz frequency bands. Developers can create unique applications using the keypad and display interface. It also has two operating modes: command and data. GPRS/GSM and different protocols/frequencies are utilised in each country. In command mode, developers can adjust the default parameters to suit their needs. [8].

Table 1.1: The hardware system components

ESP32 CAM	
Infrared Illuminator	
Sim 900 GSM Module	

1.2. System Architecture

The system consists of different components which are integrated together in an iterative mechanism. Which summarizes the mechanism of AI based Driving Licence Holder Recognition.

A. Operations Performed at RTO office for learning face:

This operations will be performed at RTO office for learning the face while allocating driving licence. The ESP32 CAM module is programed in such a way that it will learn the face and will store that learned face in a database of RTO. And after this process is successful the driving licence will be allocated to the concerned driver. The face of the driver should be

updated every 5 years to avoid any consequences during scanning the face in vehicle. The RTO officer will only have the rights to store the learned faces in database based on the data.

B. Operation performed in vehicle to validate the driver's face:

1. The EspCam will scan and recognise the face of the driver.
2. All the collected data will be matched with RTO database
3. GSM module integrated in vehicle with EspCam will be used to send and fetch the database values from RTO database.
4. If the validation is successful then the vehicle will start.
5. Simultaneously the same ESP came will continuously detect the head counts in vehicles and if the no. of head counts is more than the passing permission then the care vehicle will not operate.

The LED indicator using in EspCam can be programmed according to user expectation. Table.1.2 indicated the LED indicator we programed in EspCam:

Table.1.2: LED indicators in EspCam

Colour	**Status**
Blink White	Scanning in process
White	Face Scan Successful
Blue	Connecting To internet
Blue light off	Connected to internet

1.3. Final Prototype Designing

A. Installing EspCam Board in Arduino IDE:

- To use the Arduino IDE to install third-party dev boards, copy their JSON URL, which in our instance is https://dl.espressif.com/dl/package esp32 index.json.

- In the Arduino IDE's Preferences, paste the above URL into the extra board management URL area.
- To get the ESP32 Board package, open the board manager and search for ESP32, then enter the URL.
- Restart the Arduino IDE after completing these instructions, and the new ESP32 Board should appear in the board management menu.

B. Connecting the FTDI With ESP32 CAM and Wiring:

- We'll need to utilise an external USB to Serial Programming module because the ESP32 CAM doesn't have an on-board programming chip.
- For this, the USB to Serial module will be utilised. This module employs the FTDI FT232 chip. Other serial converters can be used; the wiring will remain the same because the ESP32 only requires TX and RX connections.

C. Flashing the ESP32:

- In your code, enter your SSID and password.
- Replace #define CAMERA MODEL WROVER KIT with #define CAMERA MODEL AI THINKER in the camera module.
- Next, go to Tools and pick the appropriate board, in this case the AI-Thinker ESP32-CAM.
- Select the appropriate port and press the upload button on IDE.
- The connecting message with dots and dashes will now appear when the ESP32 starts uploading. Press the reset button on the bottom of the board when the dots and dashes appear.

D. Connecting GSM Module:

- Connect **TX pin of GSM Module to RX pin** of EspCam.
- Connect **RX pin of GSM Module to TX pin** of EspCam.
- Connect GND pin of GSM Module to GND pin of EspCam.
- Connect 5v power supply to GSM module
- Connect antenna to GSM module for improving network range.

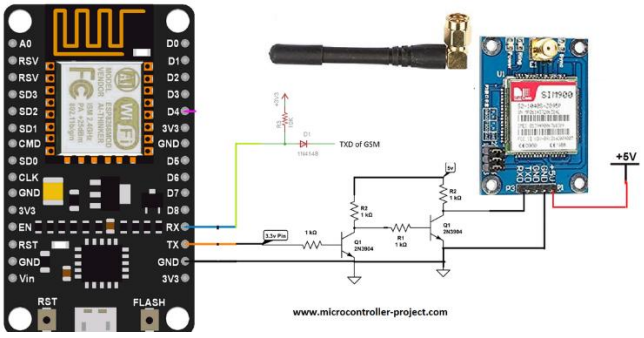


Fig 1.3 Integrating GPS module with EspCam.

1.4. Conclusion

According to a give an understanding, by 2020, there will be a considerable number of autonomous vehicles on the marketplace, including partially and fully driverless. According to projections, by 2035, the majority of cars on the road will be self-driving. So, in order to prevent road accidents and eliminate bribes paid to traffic cops, we created an AI-based Driving Licence Holder Recognition system, in which the driver's face is learned at the time of licence allocation and saved in a webserver. And this system will also count the no of persons sitting in the vehicle when the driver drives car the face of driver will be scanned and match it with the saved face in database of traffic police department and after verification the vehicle will start. Because everything around us is getting more automated, we've decided to focus on the possibility of automating the recognition of drivers' licence holders.

Appendix A

A. Dot Projector to create 3-Dimensional map (For area and depth) of your face.

B. We use GSM module for always keeping our device connected with internet.

C. Data servers to store all the RTO data to fetch relevant data from these servers.

D. EspCam to detect face.

E. Infrared for detecting face at night.

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