

# “IOT based Driving Licence Holder Recognition”

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**Abstract** - Here we are going to cover how Artificial Intelligence will be used in vehicles like cars, trucks, buses, vans, taxis, cranes, tractors etc. so that only the government approved driving licence holder can drive the vehicle. There is an increase in road accidents caused by drivers driving vehicles without a driving licence. So to overcome this problem, we can use IOT based technology which will recognise the face of the driver and validate whether he or she has a valid government-approved licence. This system can be designed using Arduino UNO, the GSM Module, the IR infrared board module, and HuskyLens PRO. 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. Here we are going to cover the hardware which is required to create this system, the connections between that hardware, the prototype, the challenges involved with IOT based Driving Licence Holder Recognition, and its features and advantages. The proposed design can be easily adapted to the automotive industry by just implementing the extra module of AI in it. Such a design can be very useful to reduce road accidents and reduce corruption in the police department of traffic. This will bring a huge change in people's lives as well as in traffic control units like the police department.

**Key Words:** Arduino, GSM module, HuskyLens, IR infrared board module, Artificial Intelligence, Vehicles, IOT based Driving Licence Holder Recognition, Corruption.

## 1. INTRODUCTION

In the today's world the traffic police department of many countries are struggling with checking driving licence of person one who drives vehicle. This sometimes leads to the bribe taken by the traffic police department if someone is not carrying their driving licence with them.

This will also help to reduce the accidents cause due to vehicles driven by untrained and unqualified drivers who don't have driving licence. Nearly 1.3 million people die each year as a result of a road traffic collision, with over 3000 deaths per day, and more than half of these people are not in a vehicle. Non-fatal injuries occur in 20 to 50 million more persons as a result of collisions, and these injuries are a leading source of disability globally. Ninety percent of deaths 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 learners' licence and

without valid licence together constitute 17.5 per cent of total accidents (see Chart 1.1 below). The number of accident cases involving drivers without valid driving licence has increased from 32,088 in 2016 to 48,503 in 2017 [2].

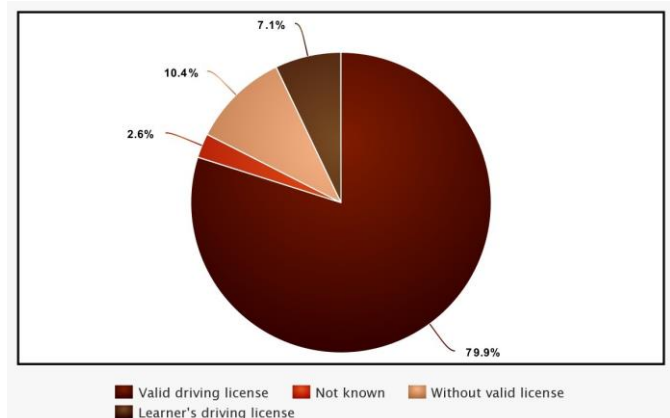


Fig 1: Road accidents by type of licence [2].

To overcome this issues we can use IOT based Driving Licence Holder Recognition. First when the person appears for the driving licence in RTO office and after passing all the tests for driving licence it will be compulsory to learn the face of that person by RTO office. The face can be learned by AI based module called HuskyLens or the any other AI based tool. This recognised face will be saved in the central web server of traffic police department along with his name and other details. Only the RTO of respective cities will have the rights to save this details. On other hand The AI scanner setup with Arduino, GSM module, HuskyLens, IR infrared board module will be implemented in every vehicle by the automotive industries compulsorily. This will be implement just above the driver's seat in front of the face of driver, so that the camera can scan the face of the driver. The AI camera will scan the face of the driver for every specific interval of time and after validating it with the saved face in central web server of traffic police during issuing of driving licence. Only after validating the recognised face of driver vehicle will start/operate. If the recognised face is not valid then that person doesn't have any driving licence then vehicle will not start/operate so that only the driving licence holder can drive the vehicle. To scan the face at night we will use the IR infrared board module which will automatically operate only in the condition where the intensity of the light is less with the help of inbuilt Light Dependent Resistor (LDR) in IR infrared board module.

### 1.1 Design Requirements

The proposed system is implemented using both software and hardware components. The code can be written in c/c++ programming languages using Arduino IDE software which is available for every computer system. Table.2.1. shows the complete system requirements. The hardware required for the system is as follows:

*A. SEN0336 HuskyLens PRO: OV5640 [5]:*

HuskyLens is a simple AI machine vision sensor that has six built-in functions: face identification, object tracking, object recognition, line following, colour detection, and tag detection. HuskyLens can link to Arduino, Raspberry Pi, or micro:bit via the UART/I2C connection. It features a 3.3-5.0V current supply voltage range, a 2.0-inch IPS screen with 320\*240 resolution, and current consumption (TYP) of 320mA@3.3V and 230mA@5.0V.

*B. DFRduino UNO R3-Arduino Compatible:*

DFRobot's DFRduino Uno V3.0 is a compact physical world computer board for academics or development. It's a straightforward microcontroller board that works with the Arduino UNO R3 and the Arduino IDE open source development environment [6]. Arduino is an open-source prototype platform with simple hardware and software. It consists of a programmable circuit board (also known as a microcontroller) and ready-to-use software known as the Arduino IDE (Integrated Development Environment), which is used to write computer code and upload it to the physical board [7].

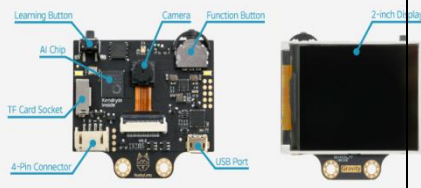





*C. 24 LED 850nm IR Infrared Illuminator Board:*

This board has 24 Infrared LEDs which will illuminate at night/low-intensity-light to detect the face using HuskyLens. It has a built-in Light Dependent Resistor (LDR) which will detect the intensity of light and, accordingly, the IR LEDs will illuminate if the light intensity is low, i.e. at night.

*D. GSM Module:*

A GSM Module is essentially a GSM Modem (such as the SIM 900) coupled to a PCB with various sorts of outputs, such as TTL Output (for Arduino, 8051, and other microcontrollers) and RS232 Output (to communicate directly with a PC) [8]. This module will assist Arduino/HuskyLens in sending and receiving data from a traffic police web server in order to verify the recognised face.

Table 1: The complete system components

<p>SEN0336 HuskyLens PRO: OV5640 (5.0 Mega Pixel)</p>	
<p>DFRduino UNO R3 - Arduino Compatible</p>	
<p>24 LED 850nm IR Infrared Illuminator Board</p>	
<p>GSM Module</p>	
<p>M-M/F-M/F-F Jumper wires</p>	
<p>Resistors</p>	

### 1.2 System Mechanism

The system consists of different components which are integrated together in a conditional and iterative mechanism, as illustrated in the Activity Diagram of the system in Fig 2, which summarizes the mechanism of IOT based Driving Licence Holder Recognition.

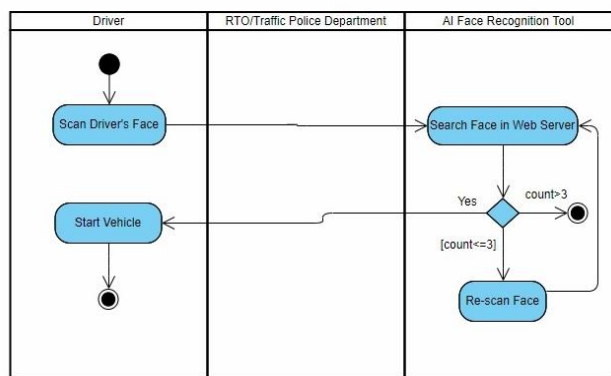
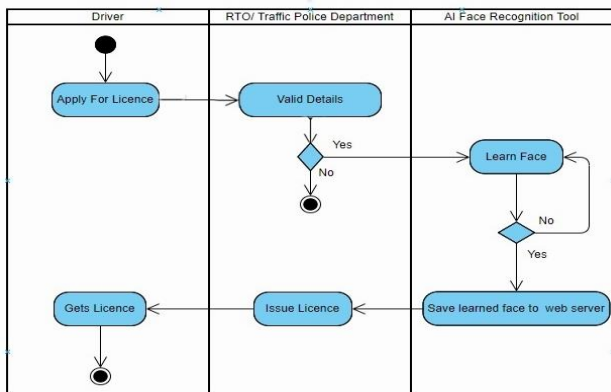


Fig 2: (a) Operations for learning face (b) Operations to validate the driver's face

**A. Operations Performed at RTO office for learning face:**

This operation will be carried out at the RTO office in order to learn the face before issuing a driver's licence. The HuskyLens has two buttons: one for function and one for learning. The following are the basic functions of these two buttons:

- To switch between functions, dial the "function button" to the left or right [5].
- Short click the "Learning button" to learn the selected object; long press the "Learning button" to learn the specified object from various angles and distances; if HuskyLens has already learnt the object, short press the "Learn button" to make it forget [5]. Long press the "function button" to enter into the second-level menu (parameter setting) in the current function. Dial left, right or short press the "function button" to set related parameters [5].
- After successful face learning, a driver's licence can be issued to a person.

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

1. The HuskyLens will scan and recognise the face of the driver.

2. The data will be sent to the Arduino.
3. Through the GSM module's internet, the Arduino will validate the recognised face with the learned face from the database of the traffic police department.
4. If the validation is successful, then the vehicle will start.

The status of the facial recognition function is indicated by the RGB LED indicator. Its colours are defined in table.3.1 as follows:

Table 2: LED indicators in HuskyLens

Colour	Status
Blue	Have not learned the face, but the face is detected.
Yellow	Acquiring a new appearance of face.
Green	Have learned and identified the face.

**1.3 Final Prototype and Testing**

**A. HuskyLens and Arduino Connection Prototype:**

The HuskyLens has 4 pins, i.e., the TX pin, the RX pin, VCC, and GND.

The following is the connection in UART mode (Refer Fig 3):

- HuskyLens TX pin is connected to Arduino's pin 10.
- HuskyLens RX pin is connected to Arduino's pin 11.
- The HuskyLens VCC pin is connected to the Arduino's 5v pin.
- The HuskyLens' GND pin is connected to the Arduino's GND pin.
- The VCC and GND pin of IR Infrared Board Module will be connected to 5v and GND pin of Arduino respectively. And IR Board Will be placed such that HuskyLens's camera will be in between the IR LEDs of IR Board Module.

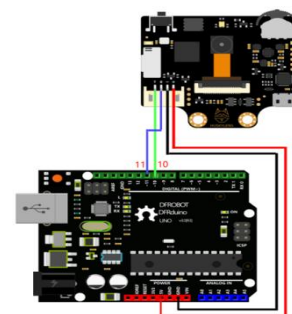


Fig 3: Final prototype design for Huskylens and Arduino connection

**B. GSM Module and Arduino connection Prototype:**

The GSM Module has 3 pins, i.e., RX, TX, and GND. Following is the connection of GSM Module to Arduino (Refer Fig 4):

- RX pin of GSM Module is connected to pin TXD of Arduino,
- TX pin of GSM Module is connected to pin RXD of Arduino,
- GND pin of GSM Module is connected to pin GND of Arduino,

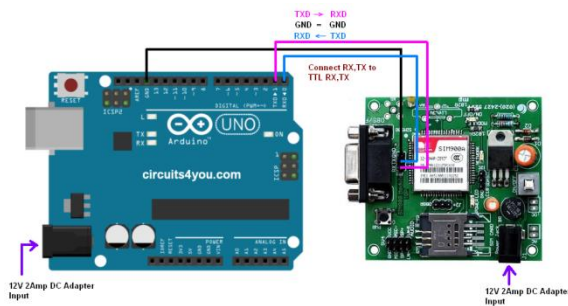


Fig 4: Final prototype design for GSM and Arduino connection

In order to verify the overall system functionality, some of the system tests can be performed, which are as follows:

- **Face Detection:** Any face can be viewed through the HuskyLens. When a face is recognized, a white frame with the word "Face" directly above the frame will automatically choose it.
- **Face Learning:** To learn a face, point the "+" sign at it and push the "learning button" quickly. If HuskyLens detects the same face, a blue frame with the words "Face: ID1" will appear on the screen, indicating that HuskyLens has previously learnt the face and can recognise it now.
- **Face Recognition:** The learned face data will be saved automatically. When HuskyLens identifies a learned face, and identifies it as face: ID1.
- **Forget the Learned Face:** You must remove the current face information if you want to recognize another face or re-enter the face information interface. When the HuskyLens is in face recognition mode, press and hold the "learning button" for a few seconds until the screen displays "click again to forget." Short tap the "learning button" again before the countdown ends to remove the learnt facial information, then the yellow "+" symbol appears. You may now teach HuskyLens a new face.
- In GSM Module the when blinking of network LED slows down. It means that it is registered on a network.

- If the face is recognized by HuskyLens you will get the output as shown in Fig 5 (This is only for testing purpose).

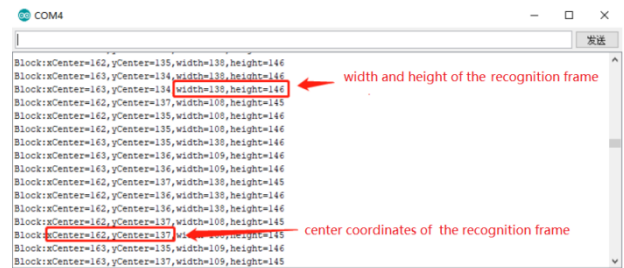


Fig 5: Face recognition results on Computer Screen

**1.4 CHALLENGES INVOLVED WITH IOT BASED DRIVING LICENCE HOLDER RECOGNITION**

There are many advantages to creating this system, like the reduction of road accidents, the reduction of corruption, and the fact that traffic police will not be able to take bribes. However, in addition to these beneficial consequences, the application of this technology comes with a variety of challenges and difficulties. Following are some of the major issues associated with the IOT based Driving Licence Holder Recognition.

- **GSM Internet Issues:** We can't find the internet connectivity across some areas. This may lead to a problem with recognising faces, which leads to not starting of vehicle. So, in such areas where internet connectivity is poor, the vehicles should be allowed to start without any face recognition.
- **Inability to Recognise the Face:** There is a change in the shape of the face with respect to time. In such cases, the AI tool will not be able to recognise the face. So the driver can go to the RTO office to learn the updated face after it has been approved by the RTO. The RTO will update the new learned face on the web server.
- **Unable to Recognise Face in Emergency:** If there is an emergency and for some reason the face is not recognised by the AI tool, then the vehicle will not start. So, in this case, the driver can make the request directly to the police department via mobile to start the vehicle, and the police department will decide whether to approve the request.
- **Cost:** The cost of implementing IOT-based tools will increase. Here, only the extra instrument of AI needs to be implemented in vehicles, so the overall cost of implementing this will not be so high. It only costs around 5000 INR to implement the proposed AI instrument.
- **Implementing it in existing vehicles:** The government should make it mandatory to

implement this system in all existing vehicles, as well as new vehicles for all automotive manufacturing industries. If the existing vehicles are left over under the same platform, then this may lead to unpredictable results. Therefore, the government should make a rule that if anyone is found not integrating this system into his/her existing vehicle, the traffic police will charge a huge fine against that person.

- **Security/Privacy Concerns: Security/Privacy Concerns:** The personal data linked to name, vehicle number, registration number, address, contact details etc. should be kept confidential. Only the required fields of data can be accessed by the traffic police department. As the system is connected to the internet, there are chances of hacking the system. For that reason, the web servers should be of high security.

## 1.5 CONCLUSIONS and FUTURE SCOPE

### CONCLUSIONS

As there is a huge demand for automation all around the world, our hon'ble prime minister's vision is to make India digital, and he also suggested focusing more on artificial intelligence technology [11]. According to the official assessment, by 2020, there will be a big number of autonomous cars on the market, both partially and fully autonomous. And by 2035, most of the cars around us will be autonomous, according to the predictions [3]. So, to reduce road accidents and get rid of bribes taken by traffic police, I have developed an IOT based Driving Licence Holder Recognition system where the face of the driver will be learned at the time of licence allocation and will be saved on the webserver. When the driver wants to drive the vehicle, the face of the driver will be scanned and matched with the saved face in the database of the traffic police department, and after verification, the vehicle will start. Since everything around us is becoming automated, we also emphasise the perspective of automating driving licence holder recognition.

### FUTURE SCOPE

In the future, we can also use the same AI tool for a head count of total people sitting in a vehicle. If the total number of people is greater than the vehicle's passing people, then the vehicle will not start. We can also use this same tool to check the driving skills of each and every driver, as it is not possible to perfectly determine the driving skills in the RTO office while allocating a driving licence.

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