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Aadhaar Based Authentication for Accessing Vehicle Ignition System

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Abstract— The aim of this paper is to propose a low cost and efficient system to authenticate a vehicle driver by using biometric parameters stored at aadhaar database. This eventually reduces the work load of license authentication by traffic police. The system comprises of a microcontroller, GSM/GPRS module and fingerprint sensor. To implement this system Authentication Service Agency (UIDAI) contract is required. Driving license is a necessary entity to drive a vehicle in India. Because of increasing number of vehicles, it is not possible for RTO officials to check everybody's license. By implementing this kind of systems in vehicles, only licensed persons can turn on vehicle engine. Also it will help to avoid misuse of vehicle.

Keywords-vehicle ignition system,GSM/GPRS,UIDAI,Fingerprint Sensor etc

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I. INTRODUCTION

Recent advances in the field of engineering technology given rise to increasing number of vehicles in the developing country like India. Because of this increasing number it is becoming more and more difficult for road transport authorities to issue the driving license as well as to check these licenses of vehicle drivers on the road, as the number of traffic policemen is not sufficient to verify each and everybody's license. Some non license holders are taking due advantage of this situation and using the vehicles on road without license, which leads to increasing number of road accidents. So to overcome this problem, this paper suggests a technical solution that uses aadhaar data of Indian citizens. Aadhaar project which is also known as UIDAI (Unique Identification Authority of India) is world's largest identity project initiated by government of India, which is based on collecting the biometric data of each and every individual in the country and to store this data on centralized database. Many mobile service providing companies are using this data to connect with their existing as well as new customers by linking the mobile numbers with aadhaar; government of India is providing different welfare schemes to the citizens of country by verifying the identity of a beneficiary using aadhaar data, Bank account numbers of citizens are also linked with the aadhaar database, so that government would be able to keep watch on transactional activities of the account holder. So it is possible to link driving license number of each and every vehicle user with aadhaar database so that along with the biometric identity the license number of driver could be identified.

This paper is proposing a system to turn on ignition system of vehicle based on biometric verification and license number stored at aadhaar database. The aadhaar database contains thumb impression and eye retina identity as biometric parameters. By interfacing fingerprint sensor with microcontroller and GSM module, identity of user will be verified. If biometric parameters match with the data on aadhaar database and if license no is linked with aadhaar then proposed system will startup the ignition of a vehicle.

II. LITERATURE REVIEW

A lot of research work is available on biometrics based vehicle ignition system. Authors in [1] have proposed a fingerprint based vehicle ignition system that uses 16 bit AVR AT89S52 microcontroller, R305 Fingerprint sensor, and GSM and GPS module. The fingerprint of vehicle owner is stored on flash memory of controller, if scanned fingerprint matches with the stored fingerprint then microcontroller sends a signal to the vehicle to turn on ignition system. Authors in [2] suggesting a fingerprint based license authentication system for Indian scenario which comprises of ATMEGA328 microcontroller and fingerprint reader. The system is used only, to authenticate the license holder. Authors in [3] proposing fingerprint based vehicle starting system comprising of Arduino UNO controller interfaced with fingerprint module, GSM and GPS module. The system works almost similarly with system proposed in [1]. All the systems reviewed are either working on biometrics stored in flash memory of microcontroller or either these systems are used just to authenticate the user's license.

III. SYSTEM ARCHITECHTURE

Here microcontroller is controlling the ON/OFF status of ignition system. Therefore if authentication message arrives from the aadhaar database then microcontroller sends on signal to the ignition system of the vehicle. So the core of this system is the biometric parameters of the user as well as linkage of license number with aadhaar database. The details of system components are given below.

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Authentication process at Aadhaar database

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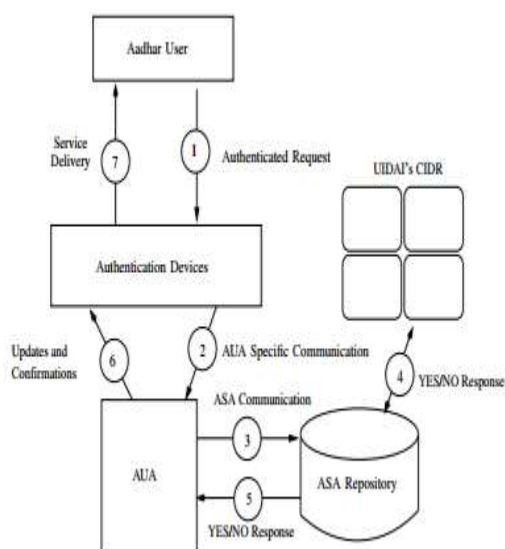The block diagram of aadhaar authentication process is shown following figure.

Fig.1 the Aadhaar authentication framework [4]

- Unique Identification Authority of India (UIDAI): UIDAI is the regulator and whole authority of the Aadhaar authentication system. UIDAI are the owners of Central Identities Data Repository (CIDR) which contains the biometric as well as other linked data of an individual personal.[5]
- Authentication Service Agency (ASA): ASAs are the part of Aadhaar system that has secure leased line to connect with the CIDR. ASAs are sending authentication requests to CIDR on behalf of one or more Authentication User Agency (AUA). An ASA has to be in formal contract with UIDAI.
- Authentication User Agency (AUA): An AUA is a component of the system that uses Aadhaar authentication to enable its services and connects with CIDR through an ASA.
- Sub AUA: it is the agency or a user willing to use Aadhaar authentication for their services through an existing AUA. UIDAI has direct contact with Sub AUAs.
- Authentication Devices: These are the devices that collects biometric data from Aadhaar holders, transmit the data for authentication in form of packets and receive the authentication results. For example Computers, mobile phones etc.
- Aadhaar holders: These are holder of valid Aadhaar numbers who wants authenticate their identity towards gaining access to the services offered by the AUA.[5]

The block diagram of proposed system is given below.

Fingerprint Sensor
The finger print sensor module used in the proposed system is R305 which is a 4 pin device. It is the cheapest fingerprint reader available in the market wit h low power consumption. Here this module is used to read the fingerprint of vehicle driver. When driver keeps the finger on reader a 3 dimensional image of fingerprint is captured.

GSM/GPRS Module
The proposed system uses SIM900A type GSM/GPRS module. It is also a low cost and low power consuming module through which it is possible to make calls, send SMS, and even one can send even emails by using internet activated SIM card. The purpose of using this module is to send the scanned image of fingerprint to the aadhaar database, where authentication of finger print takes place.

Microcontroller
A 16 bit AT89S52 microcontroller is used as central unit of this system. A finger print sensor, GSM/GPRS module and ignition coil switching system are interfaced with microcontroller. It receives the image from fingerprint module and sends it on GSM/GPRS module for Aadhaar authentication. If Aadhaar database sends an authentication done message then by using this signal microcontroller sends a ON signal to the switching circuit.
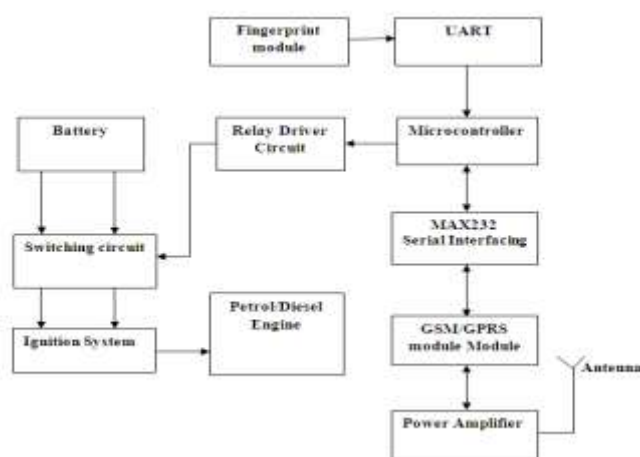

Fig.2 System Block Diagram [6]

Relay driver circuit:
Microcontroller sends the ON signal to the switching circuit connected between battery and ignition system by operating

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switching relays, which will eventually, turn on the vehicle engine. Since relays are electromagnetic devices, they will be driven with a sufficient amount of current; and signals generated through microcontroller are nor capable of driving such devices, therefore the output of microcontroller connected with relay driver circuit.

IV. WORKING MECHANISM OF SYSTEM

As per block diagram shown in above figure, the proposed system is authenticating the license holder vehicle driver using his biometrics stored at aadhaar database as well as verifying his license number linked with aadhaar. The biometric parameter used for this system is fingerprint of vehicle owner; therefore a fingerprint sensor module is mounted on steering wheel of the vehicle. Output of the sensor is connected with microcontroller through the UART, which sends the digital data of fingerprint image to the controller. A microcontroller AT89S52 is used for the interfacing of fingerprint module with GSM/GPRS module. The GSM/GPRS module is sending the fingerprint to the Aadhaar database by using GSM/GPRS module, where authentication process takes place, which shown in above fig.1. As the driver tries to start the vehicle, the system will request for the fingerprint impression of the driver. The user gets identified in aadhaar database by matching fingerprint impression arriving from proposed system with impression stored at database, if fingerprints are matching then Aadhaar system authenticates the user and if license number of identified/authenticated user is linked with the aadhaar database then aadhaar system will send authentication done signal to the proposed system, which will be received through the GSM/GPRS module interfaced with microcontroller. The fig.3 shows flowchart of working mechanism of the system.
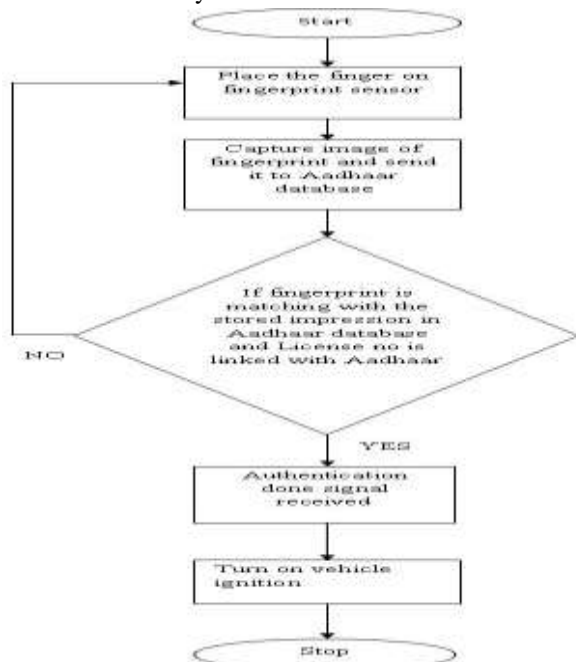

Fig. 3 Flow chart of system working mechanism

Fig. 4 shows interfacing of different hardware modules with microcontroller. Here the finger print sensor is interfaced with microcontroller through the UART. 5V DC power supply is applied to microcontroller. The GSM/GPRS module is interfaced through MAX232 with controller sending the data of captured image towards the Aadhaar database.
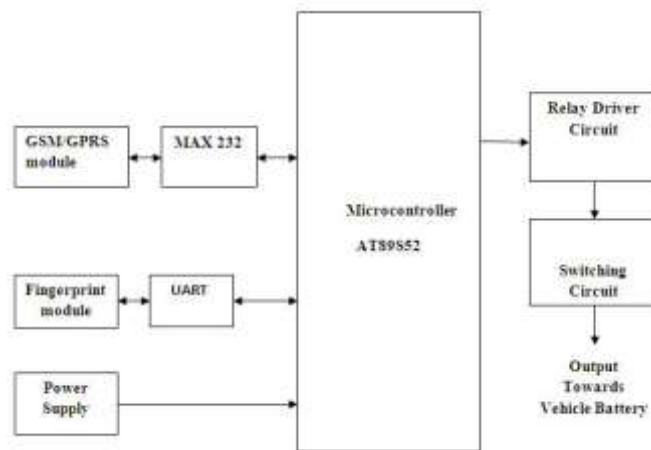

Fig.4. Interfacing of different modules with microcontroller

V. CONCLUSION

So the proposed system turns on vehicle engine by authenticating the biometric parameters as well as License number stored at aadhaar database. The system can be implemented efficiently with the sophisticated algorithm, hardware and software. The system is cost effective and it will reduce the extra load on RTO employees. If drivers are getting authenticated through this system then there is no need to check each and everybody's license on roads. So that RTO police can concentrate on effective management of traffic on roads, which reduces the number of accidents and chaos due to heavy traffic. Still there is scope to optimize the different methodologies and algorithm and can be used in wide variety of applications.

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