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BIOMETRIC AND RFID BASED VEHICLE SECURITY SYSTEM

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Abstract - **Vehicle thefts has been an area of concern in the recent years. Especially the count of car thefts has taken a massive leap in the previous years. This proposed project deals with this issue in a more preferable way and ensures the safety of the vehicle. This system aims to create a simple biometric security system that protects the vehicle from unauthorized users. This system comprises of Arduino Nano along with EM18 RFID (Radio Frequceny Identification) and R305 Fingerprint sensor. The RFID module checks for the validity of the RFID tag code and permits to proceed further. Proceeding further the fingerprint sensor checks for the authenticity of the fingerprint and ignition takes place. This proposed project paves way for stopping unauthorized users from operating the vehicle without the consent of the respective owner of the vehicle. In addition to this three repeated attempts to start the vehicle will result in rising of an alarm to alert the owner. Furthermore a text message regarding this will be sent to the registered user through the GSM module present in the system.**

Keywords – **Arduino Nano, R305 Fingerprint sensor, EM18 RFID Reader, SIM900A.**

I. INTRODUCTION

According to sources total number of cars that were produced in the calendar year of 2020 – 2021 was approximately 3,062,221. The press release of National Crime Records Bureau states that a total of 46,725 cases of vehicle thefts in New Delhi alone. This accounts for nearly 14% of the total crimes that take place in New Delhi and nearly 21.2% of total vehicle thefts that take place across the country. If these stats from just one particular state are a sign of worry then if we consider the whole of India this is surely a serious crime that has to be dealt with.If busted while stealing a vehicle, the accused will be charged under Section 378 of the Indian Penal Code. He/ She shall be punished with a jail sentence up to 10 years along with fine. In case of robbery the jail sentence may be increased to 14 years under the provision of IPC Section 390 and 382. The difference between theft and robbery is that theft becomes robbery when the offender in committing the theft causes or attempts to cause death or hurt the restraint. This proposed project deals with this crime by providing hardware integrated system that provides biometric security to the vehicle.

II. LITREATURE REVIEW

A. The author has proposed a way to locate the current location of the vehicle, Capture the thief's image and shutdown the engine. This system is built upon a mobile application that is used to control the entire system. **[1]**

B. The author has proposed a microcontroller system that informs the owner about the theft. This system is reliable and is cost efficient but does not deal with biometric access. **[2]**

C. The author has propsed a solution to lost or misplaced keys through fingerprints.**[3]**

D. The author proposed a bike security system that is based on password lock. A buzzer rises an alarm when the password is entered incorrectly.**[4]**

III. METHODOLOGY

1. Block Diagram–The system comprises of the following parts. Arduino Nano, R305 Fingerprint sensor, EM18 RFID Reader, 16*2 Alphanumeric LCD, SIM900A GSM Module, Buzzer, DC Motor, L293d Motor driver IC, Connecting wires, 12V battery. The parts are arranged as illustrated in the Fig.1. The RFID Reader, Fingerprint Sensor and buzzer are controlled by Arduino. All the modules are programmed in such a way that the entire system achieves synchronization. The Arduino microcontroller is programmed in such a way that the RFID Reader and the fingerprint sensor are made to work in the desirable way. The output from the RFID Reader will be displayed in the LCD that is connected to the system. If the tag verified by the RFID reader is valid then the system allows the operator to proceed further. The LCD displays "USER ID VERIFIED". Then the user has to place his finger in the provided fingerprint sensor. If the finger print is recognized by the sensor then the ignition starts. If the tag is not verified by the RFID reader then it will reject the permission requested by the RFID tag and the LCD will display "INVALID USER ID". In this case the ignition will not start. In case of three repeated attempts to operate the vehicle by an invalid RFID tag the buzzer rings raising the caution alarm. The GSM Module SIM900A sends an auto generated message stating that "YOUR CAR IS IN DANGER" to the updated mobile number. Furthermore the system locks the steering and the tires of the car, thereby providing complete security

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solution. The complete working of the system is illustrated in Fig 2.

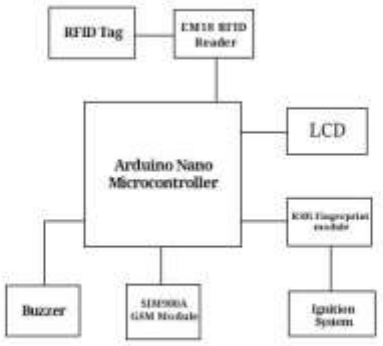


Fig. 1 Block diagram of the system.



Fig.2 Flowchart of working of system

2. Arduino Nano- The Arduino Nano is an ATmega38 based small and powerful microcontroller. This was launched by Interaction Design Institute Ivera (IDII) based in Italy in the year 2008. Arduino Nano single-board microcontroller that has 8-bit Microchip AVR as its CPU. This has 14 digital input/output pinsand 6 analog input pins. Arduino Nano has a flash memory of 32KB out of which 0.5KB is used by the bootloader. Arduino firmware is provided with 30 male input/output headers that can be programmed with the help of Arduino IDE (Integrated Development Environment). This receives power either from an external 9-volt battery or a type-B mini USB cable. Out of many other flagships of Arduino, the Nano variant stands out due to the fact that gives high performance and its bread board friendly size.

3. R305 Fingerprint Sensor – R305 is a biometric finger print sensor that has TTL UART interface. UARTs transmit one bit at a time at a precise rate using serial communication. Due to the presence of this UART the R305 sensor is known for its high precision, high performance matching algorithm. The R305 sensor can store up to 980 fingerprints. The baud rate of the R305 sensor is 57600 and it is fixed. It is mainly preferred for its security level (level 5), highest of the entire fingerprint sensors available in the market.

4. EM18 RFID Reader – RFID stands for Radio Frequency Identification. This uses radio wave frequency to identify the presence of RFID tags. EM18 RFID reader reads RFID tags of frequency 125 kHz. This technology is pretty similar to the barco9de scanner technology. The major advantage of this RFID over barcode scanner is that in order to be scanned the barcodes has to brought in front of the barcode scanner. But in case of the RFID readers the presence of the RFID tags within the range of the reader is enough. RFID tags have12 byte distinct identification number which is present in the radio antenna mounted in the tag. RFID reader is used to read the IDs of the tags and check the authenticity of the tags. Then the RFID reader converts this distinct ID in the form of a byte on the serial transmit pin.This data can be accessed by a microcontroller using a UART communication.

5. GSM Module - The GSM module used in this system is SIM900A. SIM900A is built with dual band GSM engine in a SMT module. This works on frequencies 900/1800 MHz. The main advantage of this is that it has provision for installing a sim card through which the auto generated message can be delivered to the registered mobile number.

6. Buzzer A buzzer is used as an alarm when the vehicle is tried to operate with an invalid RFID tag. The main use of the buzzer is to indicate the owner of this vehicle that his vehicle is in threat. This buzzer works when a potential is applied across the piezo crystals that are present in between two conductors. This creates a push pull action of the conductors resulting in a sound wave in the range of 2 to 4 kHz

IV. RESULT

When an unauthorized person bearing an invalid RFID tag tries to steal the vehicle, the RFID reader tests for the authenticity of the tag and turns down the request raised by the person to operate the vehicle. Upon three repeated invalid attempts the steering and the tires of the car are locked. In addition to this an alarm rings to warn the owner about the prevailing situation and also sends a message regarding this to their mobile number. Even if someone is able to steal the valid RFID tag and tries to steal the vehicle they will be unsuccessful as this



system requires both the valid RFID tag and authorized fingerprint to start the ignition and start the system. Only the individual with the valid RFID tag and authorized fingerprint is able to operate the vehicle.

V. CONCLUSION

We have proposed a practically efficient and feasible way to develop hardware integrated system to deal with the rising crisis of vehicle thefts that creates unrest in the society. Further approach of this system will be on reducing the crime rate and saving the manpower and time of the police personnel without going in vain. This proposed system not only improves the security of the vehicle by its biometric based security system but is also cheap and affordable that can be adopted by the vehicle manufacturers in upcoming days.

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