

# Enhanced Two Wheeler Security Systems using Biometric Sensor and Numeric Keypad

J. Niresh, R. Kirubakaran, D. Karthick, R. Jerrom Joshua, M. Mohana Praddeesh

**Abstract:** The main objective of the work is to eliminate the conventional method of unlocking a vehicle using keys. The work involves development of locking system in vehicles which includes the requirement of fingerprint and personal identification number to access the vehicle. This makes a two wheeler virtually unstealable. The idea of implementing both the fingerprint and PIN was created in order to ease the use of a two wheeler within the associated circle of people. Provisions will also be provided to change the PIN by the user itself. With this method of locking systems, we can eliminate the situational risk of losing a key. Moreover, digitizing the two wheelers may also aid in the reduction of weight and can support other electronic access in the future.

**Keywords:** Fps (Fingerprint Sensor), Matrix Keypad, Arduino Microcontroller, LED.

## I. INTRODUCTION

The Automobile industry produced a total 25,316,044 vehicles including passenger vehicles, commercial vehicles, three wheelers, two wheelers and quadricycle in April-March 2017 as against 24,016,599 in April-March 2016, registering a growth of 5.41 percent over the same period last year. Two Wheelers sales registered a growth at 6.89 percent during April-March 2017 over April-March 2016. Within the Two Wheelers segment, Scooters, Motorcycles and Mopeds grew by 11.39 percent, 3.68 percent and 23.02 percent respectively in April-March 2017 over April-March 2016. On the other side, a vehicle was stolen every thirteen minutes in the capital as reported in a recent survey, making a sharp rise over 44% on comparing with the previous years. Only around 4% of cars were recovered. With these rapid figures of production of vehicles in India, and vehicle theft rates it becomes a significant concept of providing security systems with a maximized efficiency to these vehicles. With the increasing technological concepts, the vehicle security systems are more advanced now than decades ago. But these sophisticated security systems were only limited to the passenger and commercial medium and heavy vehicles. Some of the commonly available security systems for the high end and also the passenger vehicles were listed below.

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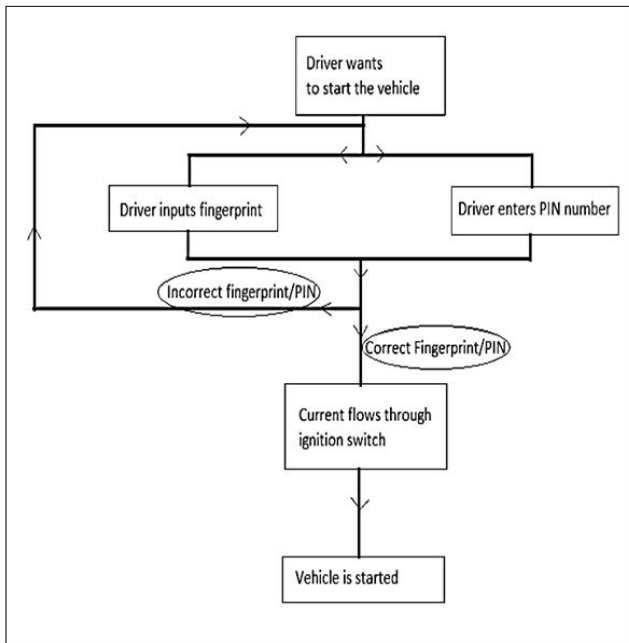
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- Anti-Hijack System
- Anti-theft system
- Car Alarm
- Smart key
- Immobiliser
- OBD
- Remote Keyless system
- Vehicle Identification Number
- Vehicle Tracking System

These high end security systems limit their application only to the high end cars and luxurious passenger vehicles. While taking the cases of two wheelers which is most used mean of transport in developing countries the security systems were limited with the conventional locks for ignition and vehicle steering locks. Hence it makes this category of vehicle vulnerable to the vehicle theft attacks and even permanent damage [2]. So developing an efficient and reliable mode of security systems to these vehicles have been a major requirement in the automotive industry. This work supports this requirement with a feasible solution that can be implemented in the existing two wheelers and can be even integrated with the production even in the future. Enhancing a security system using biometrics is the most feasible and reliable way of achieving the expected level of security. Among the various biometric components fingerprint is considered to be the most favourable and readily available technology to implement the system. This work requires a fingerprint from the user to access his vehicle and to start the ignition system of his vehicle. In addition to this method it also requires a personal identification number to facilitate the sharing of vehicles with the associated people. The ignition system is remodified to cope up with this technology. This method of security system helps achieving a better level of protection to the two wheeler segments.

## II. METHODOLOGY

The ideology of this paper is to allow the driver to lock and unlock the vehicle using the two other securities namely biometric fingerprint sensor [4] and the numerical keypad instead of conventional keys. This is done by using an Arduino microcontroller. The Arduino microcontroller is interfaced with the biometric fingerprint sensor and the numerical keypad and is programmed to control the locking and unlocking of the vehicle. The flowchart of the methodology is given below in the Figure. 1.



**Fig. 1, Flowchart of the Methodology**

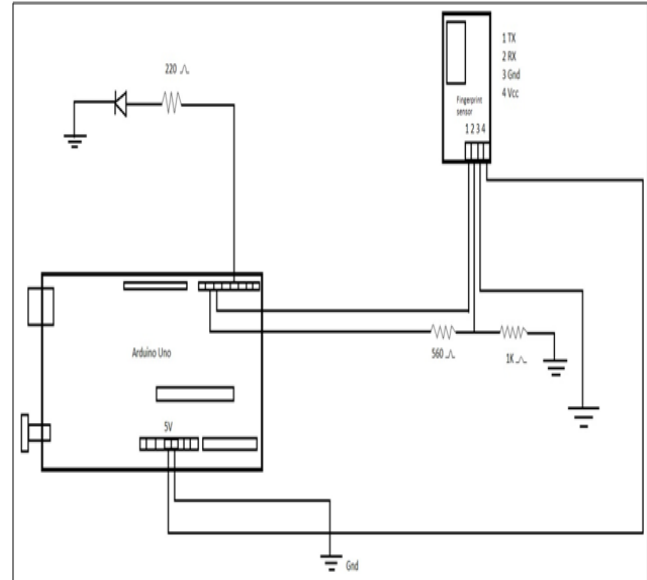
### III. BIOMETRIC FINGERPRINT SENSOR

This is the primary security system of our design which unlocks the vehicle only when the valid fingerprint is given as input. This system provides more confidentiality to the user as only he can access the vehicle with his fingerprint and no other can unlock his vehicle. There are two separate stages involved in using a fingerprint [1]. First process is called enrolment during which user's fingerprints are scanned, analysed and then stored in a coded form on a secured database. Once enrolment is complete, the system is ready to use and it is the second stage known as verification. Anyone who wants to gain access has to put their fingers on a scanner. The scanner takes their fingerprint, checks it against the print in the database stored during enrolment and decides whether the person is entitled to gain access or not granted access.

The finger print sensor GT511 C3 is a most commonly available and easy to interface type in the market. The fingerprint sensor has four pins in it. The pins were following,

- Transmitter
- Receiver
- Ground Pin
- Power Supply

The transmitter pin is the main pin of the fingerprint sensor as it transmits the recorded fingerprint templates to the micro controller and further allows for the processing of the same. The receiver pin aids in the process of receiving the information from the micro controller ports. The ground pin grounds the positive supply produced from the last pin and converts the electrical energy into useful form for fingerprint recognition. Moreover the output pins in the Arduino micro controller is 5V powered hence this cannot be directly given to the fps as it could fry the fps. Hence two resistors of resistance 560 ohm and 1000 ohm are connected in series and this ensures the proper amount of current supply. The program files for the fps are included in the Arduino library.



**Fig. 2, Biometric FPS Interfaced with Arduino Microcontroller**

### IV. MATRIX KEYPAD

This matrix keypad is used as a secondary security system of our design to enable the access of the vehicle to associated people without the user's fingerprint [3]. According to this technique, the I/O are divided into two sections: the columns and rows. This matrix keypad is controlled by the microcontroller. For the 16 button 4\*4 matrix we use, 8 pins of the microcontroller will be used. The first 4 pins will be outputs and will be connected with the column wires and the other 4 pins will be inputs and will be connected with the row wires. The outputs of the microcontroller will not all have power at the same time. The outputs will go HIGH one by one in cycle. This happens many times per second. The user presses the button to enter the pin. When the output in the respective column (of the pressed button) of microcontroller becomes HIGH, the signal arrives also at the input in the respective row (of the pressed button). The uC monitors the 4 inputs and detects that when the specific output is HIGH, there is a HIGH signal at the specific input. This is how this system reads the given input from the user. When the user enters the pin, the microcontroller detects the input and checks it with the correct pin to give access to the vehicle.

### V. ARDUINO

Arduino is an open source prototyping platform based on easy to use hardware and software. Arduino consists of both a physical programmable circuit board (microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write, upload computer code to the physical board. The Arduino is energized using a power supply. A password will be initially set while programming and the corresponding program will be fed to the Arduinomicro controller [7].

Whenever anyone presses the password on the keypad, the signal will go to the Arduino. In Arduino UNO, AVR RISC controller is used where the program for the project is already written. It is also used for the continuous monitoring the keypad for a match with the stored password which is stored in its flash memory and also to provide digital and analog signals to the device. The micro controller inside it will check whether the entered password is correct or not. If the entered password is correct the Arduino will send a signal to the LED which will glow. Any mechanisms connected will be started, which in this case is the starter system of a vehicle [5][6]. If the password is wrong then the LED will not glow.

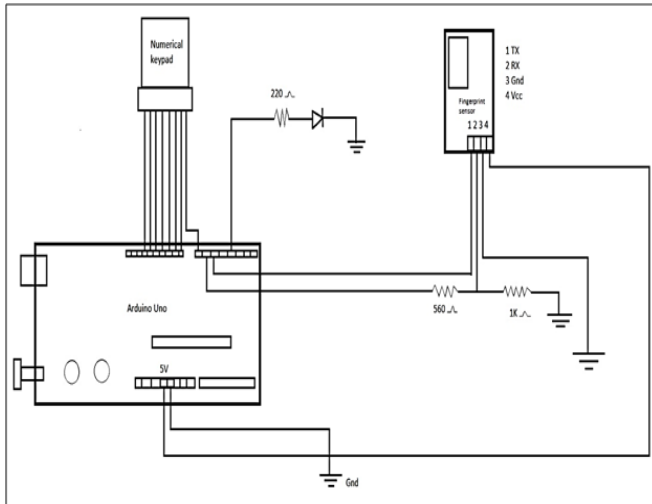


Fig. 3, Integrated System

## VI. RESULT AND CONCLUSION

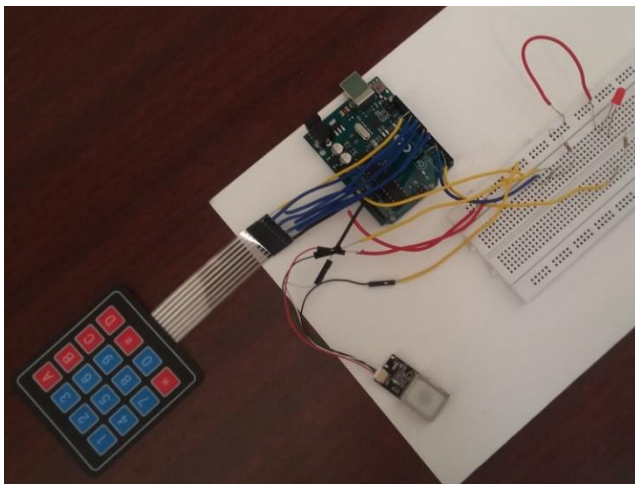


Fig. 4, Experimental Setup

From the above experiment it can be concluded that either the PIN input or Biometric Fingerprint is required to access the vehicle and thus the security system for two wheelers has been enhanced successfully. We ensure advanced protection for our two wheelers than the existing system. This system provides better protection and eliminates the need to carry key everywhere. The implementation of this security system in our two wheelers is easy compared to the conventional key security system and it is flexible to user's convenience. This system also avoids some inconvenient situations like losing the key and searching for it or to make

new key to move our vehicle again. The advantages of our security system prove that this is an enhanced security system compared to the existing system and is eligible to be implemented in every two wheeler for better security.

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