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Vehicle Ignition Using Biometric Data

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ABSTRACT

The main objective of this paper is to study the biometric vehicle ignition. Keys need to be carried and misplacing keys or losing them will cause a serious issue. Here we propose a solution to this problem by using a fingerprint authenticated vehicle starter system. The system provides a secure and hasslefree way to start/stop vehicle engine. User just needs to scan finger to start the car, no need to carry any key. The system only allows authorized users to start the vehicle. Users can first register into the system by scanning fingerprints. The system allows multiple users to register as authorized users. When into monitoring mode, the system checks for users to scan. On scanning, the system checks if user is authorized user and starts vehicle for authorized users only. Here we use pic16f72 microcontroller. The fingerprint sensor is connected to the microcontroller and, we have an LCD display along with push buttons and starter motor. The motor is used to demonstrate as vehicle starter. This system automates as well as vehicle security using fingerprint-based system.

1.INTRODUCTION

Because of increasing number of theft cases of the Automobile there is a need to enhance the security level of the vehicles. Traditional and commonly used key locks available in the vehicles are easily unlocked by the professional thieves. With the help of master key it becomes very easy to unlock the lock of the vehicles by the thieves. This creates the demand of such type of lock which is new and provides an additional security level. The new and modern lock must be unique i.e. it must be only unlocked by special and specific key. This type of feature is available in the biometrics locks i.e. the lock which can only be locked and unlocked by the human body features. Biometrics can include: face recognition, voice recognition, fingerprint recognition, eye (iris) recognition. Leaving that conventional method behind came in the concept of igniting the vehicles using key. And now, Keys are being replaced by Push start buttons. This paper was started with the sole purpose of eliminating keys as conventional method of starting the vehicle. With the introduction of Biometrics in the 18th century, security advancement in technology has gone up to various levels. In the 18th century it was used to verify the employees working for the British Empire. Since then Biometrics has taken its toll. Biometrics is formed from the Greek words 'Bio' and 'Metrics' where 'Bio' means 'life' and 'Metrics' means 'to measure'. Finger print of a person is read by a special type of sensor. Finger print sensor can be interfaced with a

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microcontroller. Through keypad we can, also identify the user by selecting corresponding option through keypad by the specific operational password.

2.EXISTING WORK OR LITERATURE SURVEY

The structure of the LED light is completely different than that of the light bulb. Amazingly, the LED has a simple and strong structure. The light-emitting semiconductor material is what determines the LED's color. The LED is based on the semiconductor diode.

When a diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is usually small in area (less than 1 mm^2), and integrated optical components are used to shape its radiation pattern and assist in reflection. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability. However, they are relatively expensive and require more precise current and heat management than traditional light sources. Current LED products for general lighting are more expensive to buy than fluorescent lamp sources of comparable output. They also enjoy use in applications as diverse as replacements for traditional light sources in automotive lighting (particularly indicators) and in traffic signals. The compact size of LEDs has allowed new text and video displays and sensors to be developed, while their high switching rates are useful in advanced communications technology. The electrical symbol and polarities of led are shown in fig

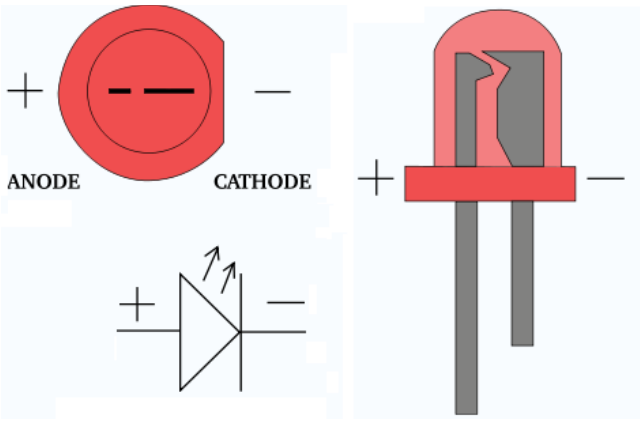

Fig 2.3.3: Electrical Symbol & Polarities of LED

LED lights have a variety of advantages over other light sources:

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- High-levels of brightness and intensity
- High-efficiency
- Low-voltage and current requirements
- Low radiated heat
- High reliability (resistant to shock and vibration)
- No UV Rays
- Long source life
- Can be easily controlled and programmed

Applications of LED fall into three major categories:

- Visual signal application where the light goes more or less directly from the LED to the human eye, to convey a message or meaning.
- Illumination where LED light is reflected from object to give visual response of these objects.
- Generate light for measuring and interacting with processes that do not involve the human visual system.

2.4. RESISTOR

A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current passing through it in accordance with Ohm's law:

$$V = IR$$

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance is determined by the design, materials and dimensions of the resistor.

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Resistors can be made to control the flow of current, to work as Voltage dividers, to dissipate power and it can shape electrical waves when used in combination of other components. Basic unit is ohms.

Theory of operation:

Ohm's law:

The behavior of an ideal resistor is dictated by the relationship specified in Ohm's law:

$$V = IR$$

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I) through it where the constant of proportionality is the resistance ®.

Power dissipation:

The power dissipated by a resistor (or the equivalent resistance of a resistor network) is calculated using the following:

$$P = I^2R = IV = \frac{V^2}{R}$$

Fig.2.4.1 RESISTOR

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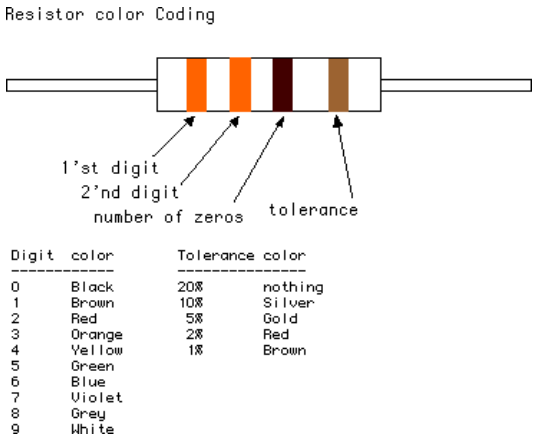

Fig2.4.2 : Color Bands In Resistor

2.5. FINGER PRINT MODULE:

2.5.1. HISTORY OF FINGERPRINT SCANNERS

This identification device has been commercialized from the late 19th century. The device is the most popular among all the identification devices because of its ease in acquisition, and also the number of sources that are available for its data collection. It has found its vast use in law enforcement and immigration purposes. The basics of this identification process comes from "Galton points" – a certain characteristics defined by Sir Francis Galton, through which the fingerprints can be identified.

The exact automation of this technology began in the year 1969, when the FBI wanted an identification system using fingerprints. For this the FBI made deals with the National Institute of Standards and Technology (NIST), to make developments on the searching, matching as well as scanning process.

For this, the NIST worked with the minutiae technology, which is actually a smaller version of Galton points to develop the fingerprint scanning technology. The two main problems they faced were extracting the minutiae from each fingerprint and also comparing, matching and also searching the lists of minutiae from large list of fingerprints. The best prototype was first exhibited in the year 1975 by the FBI. A capacitive scanning technique was used as its working basics. More work on making automatic digital inked fingerprints, compression of the image and so on is still being done.

2.5.2. WORKING:

The fingerprint identification process will change slightly between products and systems. Standard systems are comprised of a sensor for scanning a fingerprint and a processor which stores the fingerprint database and software which compares and matches the fingerprint to the predefined

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database. Within the database, a fingerprint is usually matched to a reference number, or PIN number which is then matched to a person's name or account.

The basic information about fingerprint is that it is unique for each person. Even a twin brother will not have the same fingerprint. Thus each fingerprint is used to store a unique identifiable piece of information. The uniqueness in each fingerprint is due to the peculiar genetic code of DNA in each person. This code causes the formation of a different pattern of our fingerprint.

A fingerprint consists of ridges and valleys. They together provide friction for the skin. The main identification of the skin is based upon the minutiae, which actually is the location and direction of the ridge endings and splits along a ridge path.

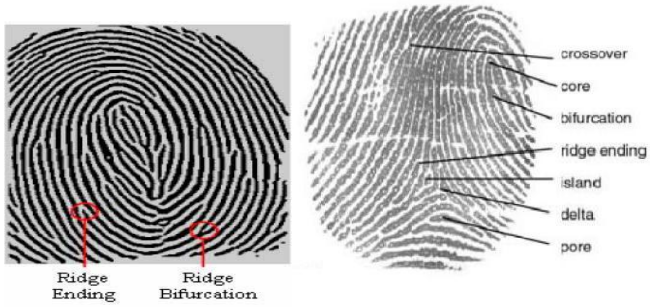

Fig: 2.5.1: fingerprint

The image shows all the other characteristics of a fingerprint. These characteristics may also be helpful during the process of minutiae extraction. The unique information used for the identification includes the flow of the friction ridges, the sequence and also the presence/absence of the individual friction ridge path features.

Working of Fingerprint scanner

There are mainly two types of scanning methods for this technology. Either an optical or capacitancescanner is used to scan and make a picture of your finger. Though both the methods produce the same type of image, the making of it is completely different.

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This scanned image is then compared with an earlier existing finger print of yours to get the correct identity. The comparison is carried out by the processor and the comparison is made between the valleys and ridges though your whole fingerprint is recorded, the computer takes only parts of the print to compare with other records.

Optical Scanner

The electrical signal created in response to the light hitting on the CCD (charge coupled device) forms pixels which are collectively joined to form an image. The heart of an optical scanner is a charge coupled device (CCD), the same light sensor system used in digital cameras. A CCD is simply an array of light-sensitive diodes called photosites, which generate an electrical signal in response to light photons. Each photosite records a pixel, a tiny dot representing the light that hit that spot. Collectively, the light and dark pixels form an image of the scanned scene (a finger, for example). Typically, an analogue to digital converter in the scanner system processes the analog electrical signal to generate a digital representation of this image.

The scanning device consists of a glass plate, on top of which you are supposed to place your finger. After the scanning takes place, an inverted image of the finger is stored. This image will show the ridges and valleys of your finger. The ridges can be spotted by the darker areas where the light reflection is greater. The valleys can be spotted by the lighter areas, where the light reflected is lesser.

The scanner is also designed to recheck the image captured. The scanner checks whether the image captured has satisfactory pixel darkness. If a problem is seen in the checking process.

The image will be rejected and the suitable adjustments will be made so as to get a better quality picture. After all these procedures, the image will be compared with the existing stored images.

Before comparing the print to stored data, the scanner processor makes sure the CCD has captured a clear image. It checks the average pixel darkness, or the overall values in a small sample, and rejects the scan if the overall image is too dark or too light. If the image is rejected, the scanner adjusts the exposure time to let in more or less light, and then tries the scan again.

If the darkness level is adequate, the scanner system goes on to check the image (how sharp the fingerprint scan is). The processor looks at several straight lines moving horizontally and vertically across the image. If the fingerprint image has good definition, a line running perpendicular to the ridges will be made up of alternating sections of very dark pixels and very light pixels. If the processor finds

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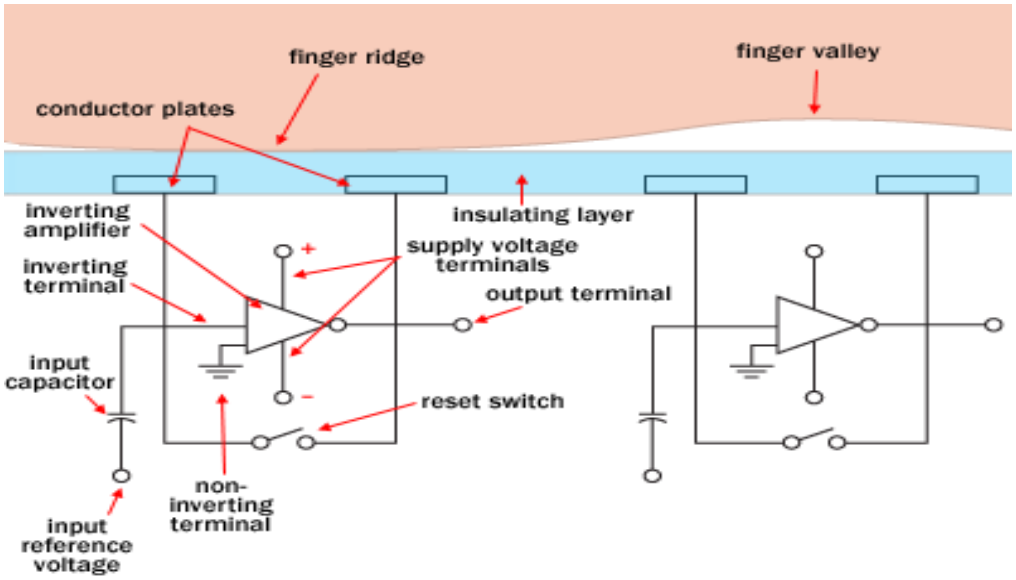
that the image is crisp and properly exposed, it proceeds to comparing the captured fingerprint with fingerprints on file. We'll look at this process in a minute.

Capacitance Scanner:

Capacitance scanner uses electrical current to display the image. The principle of capacitance is used in this device. As shown in the diagram, each sensor consists of arrays of cells. These cells have two conductor plates, which are covered with an insulating layer. Thus, they form a simple capacitor which is used to store the charge. The cells are so small that their actual size will be smaller than the width of a ridge from our finger. These sensors will then be connected to an integrator. The output of the integrator will be given to the input of an inverting operational amplifier. This op-amp will consist of hundreds of transistors, resistors and capacitors. This op-amp is alters the input voltage with respect to the reference voltage provided to the other input. The non-inverting input is connected to the ground. The inverting input is given to the reference voltage and then to the feedback circuit. This feedback circuit is given to the amplifier output and also includes the two conductor plates.



When the finger is placed for recognition, it acts as another capacitor plate. It is separated with

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the help of insulating layers. When moving the finger from one point to another, the capacitance changes due to the variation in distance between the capacitor plates Thus, the output voltage is recorded with the change in output voltage according to the appearance of ridges and valleys. A perfect output image of the fingerprint is thus obtained.

This device is much better than an optical scanner as it is very compact and harder to trick. The device needs a real fingerprint shape to get the output. The optical scanner a dark and light pattern is more than enough to make an output image. Though an optical scanner needs CCD devices for sensing, a capacitance scanner needs only semi-conductor chips

2.5.3. Pin description

Pin number	Name	Type	Function description
1	Vin	IN	POWER INPUT
2	TD	IN	DATA OUTPUT, TTL LOGIC LEVEL
3	RD	OUT	DATA INPUT, TTL LOGIC LEVEL
4	NC	---	NOT CONNECT
5	NC	----	NOT CONNECT
6	GND	----	SIGNAL GROUND CONNECTED TO POWER GROUND (COLOR: BLACK)

Table 2.5

2.5.4. Advantages of fingerprint reader:

- You are actually able to provide a physical evidence of yourself.
- This type of an identity cannot be easily faked like identity cards.
- Though you can guess a password of another person, it cannot be done so in the case of a fingerprint.
- You may lose your identity card. But, you are not going to lose your fingerprint the same will be the case of a password.

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2.5.5. Disadvantages:

- An optical scanner can be fooled by showing a picture of a finger instead of real finger. Capacitance scanners can also be fooled by swiping a mould of a finger by including ridges and valleys. If it is some serious business, a thief could also cut-off the person's finger and swipe it on the scanner.
- If you have misplaced your credit card you can easily get a new one. But, if someone has molded a same fingerprint as yours, there is no way to replace it

2.6. D.C.MOTOR

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa.The input of a DC motor is current/voltage and its output is torque (speed).

Fig :2.6.1 DC Motor

The DC motor has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator. Figure shows a picture of a typical DC motor, Figure shows a picture of a DC armature, and Fig shows a picture of a typical stator. From the picture you can see the armature is made of coils of wire wrapped around the core, and the core has an extended shaft that rotates on bearings. You should also notice that the ends of each coil of wire on the armature are terminated at one end of the armature. The termination points are

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called the commutator, and this is where the brushes make electrical contact to bring electrical current from the stationary part to the rotating part of the machine.

Operation:

The DC motor you will find in modem industrial applications operates very similarly to the simple DC motor described earlier in this chapter. Figure 12-9 shows an electrical diagram of a simple DC motor. Notice that the DC voltage is applied directly to the field winding and the brushes. The armature and the field are both shown as a coil of wire. In later diagrams, a field resistor will be added in series with the field to control the motor speed. When voltage is applied to the motor, current begins to flow through the field coil from the negative terminal to the positive terminal. This sets up a strong magnetic field in the field winding. Current also begins to flow through the brushes into a commutator segment and then through an armature coil. The current continues to flow through the coil back to the brush that is attached to other end of the coil and returns to the DC power source. The current flowing in the armature coil sets up a strong magnetic field in the armature.

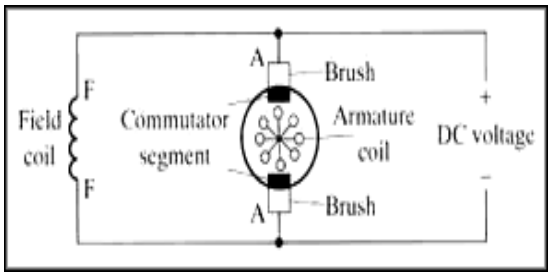

Fig : Simple electrical diagram of DC motor

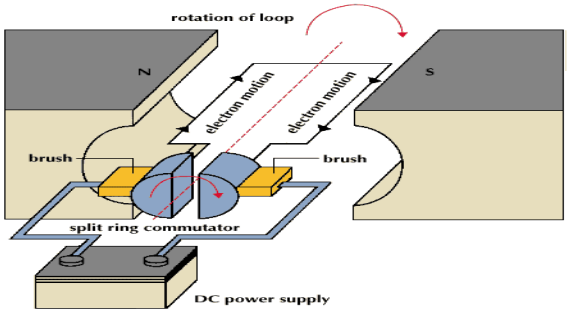

Fig 2.6.2: Operation of a DC Motor

The magnetic field in the armature and field coil causes the armature to begin to rotate. This occurs by the unlike magnetic poles attracting each other and the like magnetic poles repelling each other. As

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the armature begins to rotate, the commutator segments will also begin to move under the brushes. As an individual commutator segment moves under the brush connected to positive voltage, it will become positive, and when it moves under a brush connected to negative voltage it will become negative. In this way, the commutator segments continually change polarity from positive to negative. Since the commutator segments are connected to the ends of the wires that make up the field winding in the armature, it causes the magnetic field in the armature to change polarity continually from north pole to south pole. The commutator segments and brushes are aligned in such a way that the switch in polarity of the armature coincides with the location of the armature's magnetic field and the field winding's magnetic field. The switching action is timed so that the armature will not lock up magnetically with the field. Instead the magnetic fields tend to build on each other and provide additional torque to keep the motor shaft rotating.

When the voltage is de-energized to the motor, the magnetic fields in the armature and the field winding will quickly diminish and the armature shaft's speed will begin to drop to zero. If voltage is applied to the motor again, the magnetic fields will strengthen and the armature will begin to rotate again.

Types of DC motors:

1. DC Shunt Motor,
2. DC Series Motor,
3. DC Long Shunt Motor (Compound)
4. DC Short Shunt Motor (Compound)

The DC Series Motor:

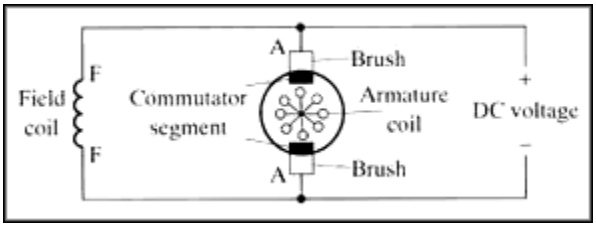

Fig: Diagram of DC series motor

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A DC Series Motor has its field coil in series with the armature. Therefore any amount of power drawn by the armature will be passed thru the field. As a result you cannot start a Series DC Motor without any load attached to it. It will either run uncontrollably in full speed, or it will stop.

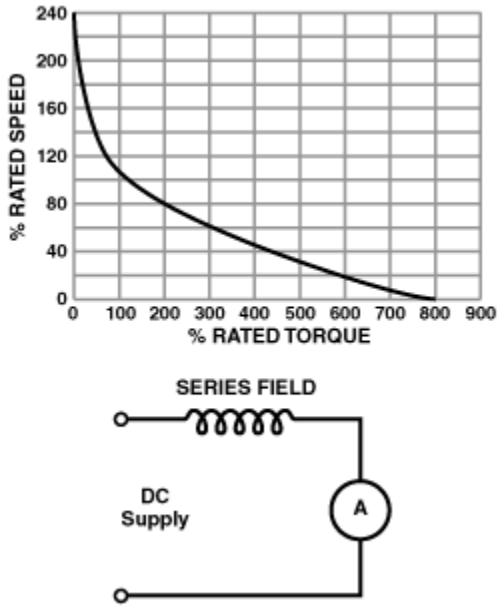

Fig: Diagram of DC series motor graph representation

When the load is increased then its efficiency increases with respect to the load applied. So these are on Electric Trains and elevators.

Applications

BLDC motors fulfill many functions originally performed by brushed DC motors, but cost and control complexity prevents BLDC motors from replacing brushed motors completely in the lowest-cost areas. Nevertheless, DC motors have come to dominate many applications, particularly devices such as computer hard drives and CD/DVD players. Small cooling fans in electronic equipment are powered exclusively by BLDC motors. They can be found in cordless power tools where the increased efficiency of the motor leads to longer periods of use before the battery needs to be charged. Low speed, low power BLDC motors are used in direct-drive turntables for "analog" audio discs.

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2.7. CRYSTAL OSCILLATOR

Fig: 2.7.1. crystal oscillator

•An oscillator is an electronic circuit that produces a repetitive electronic signal.

•The maximum operating frequency of arduino Microcontrollers is 16 MHz.

•Crystal oscillator is used in the project because of the fact that crystal is more stable to temperature than other types of oscillators.

2.8. TRANSISTOR

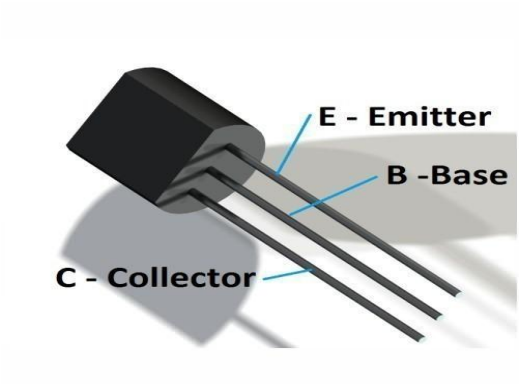

Fig: 2.8.1. transistor

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the

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controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

The transistor is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. Julius Edgar Lilienfeld patented a field-effect transistor in 1926but it was not possible to actually construct a working device at that time.

The first practically implemented device was a point-contact transistor invented in 1947 by American physicists John Bardeen, Walter Brattain, and William Shockley. The transistor revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers, among other things. The transistor is on the list of IEEE milestones in electronics, and Bardeen, Brattain, and Shockley shared the 1956 Nobel Prize in Physics for their achievement.

Most transistors are made from very pure silicon or germanium, but certain other semiconductor materials can also be used. A transistor may have only one kind of charge carrier, in a field effect transistor, or may have two kinds of charge carriers in bipolar junction transistor devices. Compared with the vacuum tube, transistors are generally smaller, and require less power to operate. Certain vacuum tubes have advantages over transistors at very high operating frequencies or high operating voltages. Many types of transistors are made to standardized specifications by multiple manufacturers.

2.9. BUZZER

Fig: 2.9.1. buzzer

Basically, the sound source of a piezoelectric sound component is a piezoelectric diaphragm. A piezoelectric diaphragm consists of a piezoelectric ceramic plate which has electrodes on both sides and a metal

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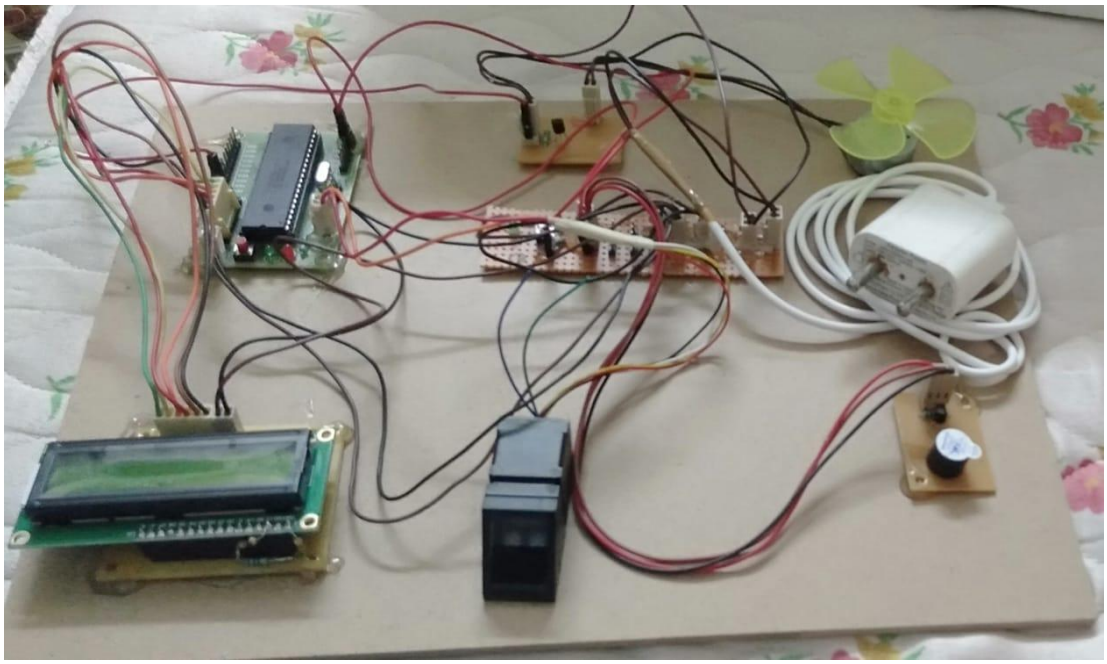
plate (brass or stainless steel, etc.). A piezoelectric ceramic plate is attached to a metal plate with adhesives. Applying D.C. voltage between electrodes of a piezoelectric diaphragm causes mechanical distorti

3.RESULTS AND DISCUSSION

The project "**Vehicle Ignition Using Biometric Data**" was designed such that the location and the position of the vehicle is transmitted to the owner on his mobile phone as a short message (SMS) at his request using GPS modems. This system also enables to monitor the accident situations and it can immediately alert the police/ambulance service with the location of accident. The system was also used in detecting of accident using MEMS Accelerometer sensor and alerts through buzzer alarm.



4.CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

Future Scope:

Our project "**Vehicle Ignition Using Biometric Data**" is mainly intended to find the location and we use a fingerprint module to read one's identity to start the equipment. For this we use a microcontroller to enable the ignition system if the matching between scanned data and the already

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existing data is correct. Comparison is done inside the fingerprint module itself and its output is given to microcontroller. The sensor used is R303A. Microcontroller used is PIC16F877A. The vehicle starts if the person is authorized. Fuel Indicator present in this system, tells us the amount of fuel contained in the vehicle. It also provides information about amount of distance it can travel with the remaining fuel.

This project can be extended using high efficiency GSM module. The GSM module gives the intimation of the person with this system through SMS. By interfacing MMC/SD card we can log the path of the vehicle being traveled on Google earth in the computer.

5.References:

The sites which were used while doing this project:

1. www.wikipedia.com
2. www.allaboutcircuits.com
3. www.microchip.com
4. www.howstuffworks.com