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ENHANCEMENT IN THE SECURITY FEATURES OF AUTOMOBILES

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ABSTRACT

Automobiles form the most important means of transport. The improper handling of automobiles is increasing the number of road accidents every year. In order to increase the security system in the automobiles, we are employing virtual security by using a couple of sensors like biometric, alcohol and a controller for the seatbelt. The biometric sensor checks for the license status of the driver. The breath analyzer checks the alcohol levels. Seatbelt controller gives the status of a seatbelt. If these three conditions are valid, then the engine starts. If anyone of the above condition is not satisfied, the engine doesn't start. Thus this project provides a safe and authorised access for automobiles. By using this prototype we can reduce theaccidents.Thus by using this product with an authorized supervision, we can avoid theft of vehicles, reduce the drunk and drive cases and thus reducing the accident rate. In addition to this, in case of occurance of any accidents, a message about the location is sent to the family member.

Keywords: *Alcohol sensor, Arduino, Biometrics, GSM module,Seatbelt.*

I. INTRODUCTION

The automobile industry accounts for 7.1% of the country's gross domestic product producing 24 billions of automobiles every year. With such a large automotive force in the country, the ease of transportation has been increased. At the same time, the rate of accidents due to lack of responsibility of the people is increasing day by day. Also, the accident records due to drunk and drive are also significantly high. According to the recent survey, 1.5 % of the total road accidents were happened because of alcohol consumption and driving.So in order to improve the vehicle security, we are here for an innovative project. This project mainly focuses on increasing the responsibility of the driver by monitoring some parameters accurately and strictly for a safer drive.So by implementing this prototype in a much larger level, we expect a decline in accidents because of the mere negligence of the drivers. This project mainly considers three aspects which are the main reasons for accidents. The first aspect is unlicensed drivers using the vehicle. The second one is alcohol consumption and driving. The third aspect is not following the safety measures like putting on the seatbelt. First of all, the fingerprints of the person who is driving are collected and these are fingerprints are checked with the fingerprints stored in the database. If this matches with the fingerprints in the database then the first parameter is verified. Next, the driver is checked for alcohol consumption by using an alcohol sensor. This sensor checks for an allowable range of alcohol. It analyses the breath of the driver and if the alcohol level of the person is in the permissible range, it shows 'No alcohol' on the screen and thus verifying the second parameter. In the last, the third parameter is checked. If the driver puts on the seatbelt, then this parameter is verified thereby starting the engine of the car. If in case any of the above parameters are not verified, the engine can't be started.Several methods are employed in the automobiles for implanting responsibility among the drivers. Individual measures like alcohol testing by the police are done to avoid drunk and drive cases. By applying such measures the accident rate because of mere negligence and irresponsibility of the people is reduced. While on the other hand, the theft of different automobiles is taking place in the country. These theft cases are due to lack of virtual security in the automobiles.

Alcohol sensors are also called as breath analyzers. The breath analyzer was first invented by Robert Frank Bronkenstein and was registered as a trademark in 1954. The conventional breath analyzer also called breathalyzer directly measures the blood alcohol levels directly from the breath of the person. It doesn't require any blood samples for testing the alcohol levels in the blood. The first practical breathalyzer was developed by Rolla Neil Harger in 1931. It is called drunkometer. It is based on the reaction of the breath with potassium permanganate. In this drunkometer the drunk person's breath is directly taken into a balloon and is reacted with potassium permanganate, which changes colour in the presence of alcohol.The trademarked version of the alcohol detector is designed by the Robert Frank Harger. It takes the breath of the driver and applies chemical oxidation and photometry operations and directly gives the alcohol concentrations that is the body alcohol concentrations. Theft is another major problem in automobiles. Various security measures are pre-installed on the vehicles to prevent unauthorized access. These systems include anti-theft installations and engine immobilizers. The engine cannot be started unless until the correct pass code or key is entered. Later on, fingerprints of the owners are used to unlock the keys. Finger prints of humans are unique and are unaltered. The evolution of fingerprints started very early in BC 200s in China. The main reason behind the evolution of the fingerprints is for identification of criminals. In early civilisations, different human parameters are used to identify the criminals.The criminals are initially identified by branding and maiming that is marking the thieves using needles for tattooing them. But as humans age there will be a change in the physical features. Hence these can't be considered as a base for identification. In later years a French anthropologist proposed a method of measuring certain body parts for identification of the criminals. But it was a disaster when an innocent person with similar body measurements of the criminal is sentenced to death in U.S. There will be persons with similar body measurements. Later on photography helped for identification of the criminal by sight. But all these methods have different types of disadvantages. The DNA of the crimanls can't be changed in a life time, hence they can be used for long time identification. But the checking of the DNA is expensive and complex. There comes the alternative for the DNA, the fingerprints of the person. While studying the different patterns present on human fingers we can observe different types of patterns on the skin.In a "Philosophical Transactions of the Royal Society of London" paper in 1684, Dr. Nehemiah Grew was the first European to publish friction ridge skin observations. Dutch anatomist Govard Bidloo's 1685 book, "Anatomy of the Human Body" also described friction ridge skin (papillay ridge) details. In 1686, Marcello Malpighi, an anatomy professor at the University of Bologna, noted fingerprint ridges, spirals and loops in his treatise. A layer of skin was named after him; "Malpighi" layer, which is approximately 1.8 mm thick. Some lines come from the same direction and take a U-turn and leave in the same direction. Such lines are called ridges. Some other lines form loops and are called as whorl. And the other lines just cross the fingers, they are called curves. These ridges form a impression on smooth surfaces. The different kinds of sensors widely used in the market are of four types. They are optical sensors, capacitive sensors, Ultrasonic sensors and thermal sensors. The biometric sensor used in this project is an optical sensor. The working of the basic fingerprint sensor can be seen as, the fingerprints are captured as a image by adigital camera and is compared with the fingerprints stored in the database of the biometric sensor. The image is not completely stored in the database. But only a few random points are stored in the form of binary numbers in the data base. Coming to the working of the optical scanner, an LED is used to illuminate the finger kept on the glass plate of the device. Then the light is reflected from the finger and falls on a Charged Coupled Device(CCD). These CCDs are present in many coders in digital cameras. The CCDs are basically an array of pixels. When light falls on these pixels they respond and generate proportional electrical signals which are processed to form a digital imprint of the finger known as" live scan". The ridges are potryed as the dark coloured regions and the valleys are potrayed as light coloured regions.

II. METHEDOLOGY

Coming to the methodology and working of the project, it is mainly divided into two parts.

- Checking the three parameters namely fingerprints, alcohol consumption and seatbelt.
- Directing the arduino to run the engine.

The figure shows the different sensors and hardware modules that are used in the prototype.The sensors used are fingerprint sensor, alcohol sensor and a switch.The hardware components are two arduino boards and a gsm module. A brief explanation about the parts is given in the following pages.The pictorial representation of the working of the

project is shown in the flow chart. According to the flowchart, in the execution of the first part, the driver opens the car and tries to start the vehicle. First he is required to give his fingerprints then he is checked for alcohol consumption and finally checked for wearing seatbelt. If any one of these conditions fails, then the engine doesn't start. If all these conditions are satisfied, then permitting messages are displayed on the led display accordingly. The functioning of each of these sensors is described in the following pages

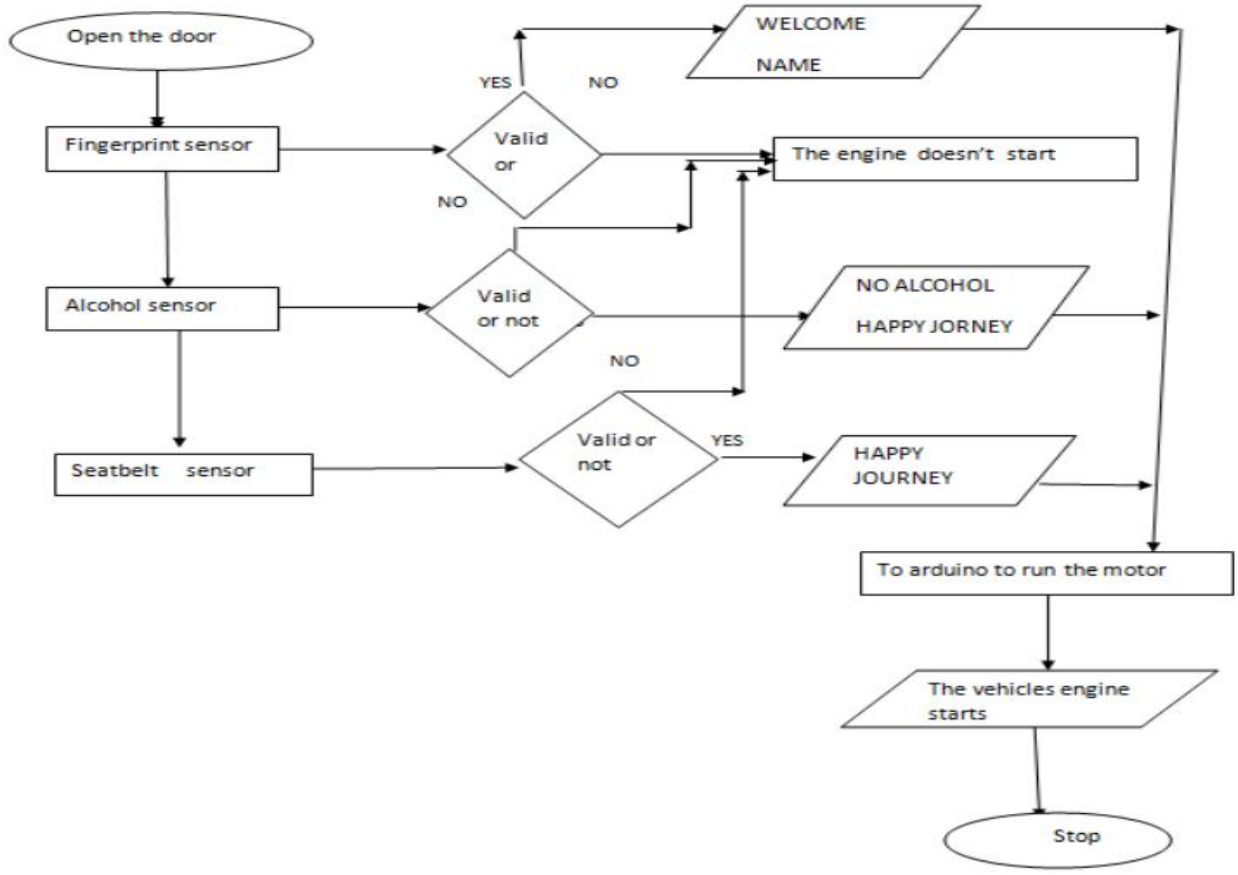

Figure 1: Flow chart

The complete model of the project is shown in figure 1 and its working is represented in the flow chart.

Fingerprint sensor

The human fingers have friction ridges which causes an impression. These fingerprints can be collected from suitable surfaces like glass polished metal etc. The finger prints can form an important part both for security purposes and for detections of crimes. For detection of finger prints in the crimes scenes, forensic studies are done. While on the other hand, there are certain devises that will capture the finger prints of the humans and store them in the data base. The fingerprints are produced because of the secretions of the eccrine glands that are present in the epidermal ridges. The human fingerprints are unigue and detailed. These differ from person to person and can't be altered, hence they can be used as long term markers of humans. These fingerprints can be used for securing our valuebles and acting as passcode for different locks. Some devices are developed to capture these fingerprints and these are called biometric sensors. These sensors store the finger prints of the person in their data base andwhen they are used as lock, they check the persons fingerprints and cross checks the fingerprints stored in data base. If both the fingerprints coincide the lock unlocks. This unique feature of the fingerprints can be used and exploited in the automobile industry for secured access of the vehicles. These fingerprint scanners are now being widely used in all

the security industries and even in police stations. Thereare four different types of fingerprint scanners. They are capacitance scanner, optical scanner, Ultrasonic scanner and thermal scanner. The scanner used in this project is an oprical scanner. These all sensors commonly capture the image of the finger prints placed on the scanners and checks for them in the database. In the optical sensor , a digital scanner is used to capture the image. In the capacitive scanners, capacitors are used and electric currents are used to print the fingerprints. In unltrasonic and thermal scanners, high frequency waves and temperature differences in the ridges are used to form the fingerprints.
The role of the fingerprint sensor shown in Figure 4, is to identify the fingerprint of the person and it displays the name of the person, who is going to drive the car. It checks the database where the fingerprints of the licensed persons were stored. If not the engine does not start. From this, we can eradicate the access of the vehicle by the unlicensed people. Hence we can eradicate the unmatured driving in public.

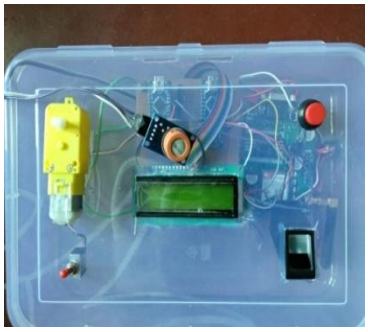

Figure 2

Figure 3

Figure 4

Alcohol Sensor

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analogy voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers. The MQ-3 alcohol gas sensor consists of total 6-pins we use only 4 pins .The two pins A,H are used for the heating purpose and the other to pins are used for the ground and power. There is heating system inside sensor, which is made up of aluminium oxide, tin dioxide. It has heat coils to produce heat, and thus it is used as a heat sensor. The MQ-3 alcohol sensor which is used to detect the alcohol concentration on your breath. This sensor provides an analogy resistive output based on alcohol concentration. When the alcohol gas exist, the sensor conductivity gets higher along with the gas concentration rising. It is suitable for various applications of detecting alcohol at different concentration.It exactly works as a breath analyzer and is shown in figure 3. When the fingerprint is verified the immediate condition that needs to be checked is alcohol levels of the person who is going to drive the car. When the alcohol levels of the driver areacceptable then the engine starts. Otherwise, it does not start, when the alcohol level is acceptable then the sensor sends the active high signal to the arduino controller which gives power supply to the engine in order to start. When the alcohols levels are not acceptable then it sends the active low signal to the arduino controller, which does not send any power to ignite the engine.

Switch as Seat belt

In the cars a safety device is arranged to protect the driver. It is called seat belt. When the vehicle is met with an accident or it suddenly crashes with another vehicle, a great force will be experienced by the driver. Sometimes the force may be too great that the driver moves away from the seat and msy hit the glass door leading to severe head injuries. Every day many cases are registered due to accidents, the victims may die on the spot of the accident because of these head injuries. Reportedly many of the people who met with these accidents are found to be not wearing of their seat belts. Losing life because of mere negligence is a pity. By wearing the seat belts when the the driver is moving a high speed , the seat belt puts pressure in the opposite direction on the driver and the passengers and when the vehicle mets with an accident ,it protects the people from crashing with the interior of the car. The air bags in combination with the seat belt provides a good safety measure.

The switch acts as the seat belt when the switch is on then that indicates that the driver wore the seat belt. Then the engine gets on or else it gets off. We will connect one terminal of the switch to the aurdino to any of the pins and the other terminal to the ground such that the circuit should close. The switch is shown in Figure 4

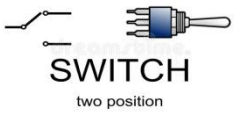

Figure 5

GSM Module

We use this GSM module for the two reasons, Firstly when the driver is drunk than by using GSM module we generate the SMS stating the location and position of the driver to his family, Secondly if when the vehicle met with an accident it sends the last location to the family with a caution message stating that vehicle met with an accident. Itgives message about the location in using gps. The GSM module is shown in Figure 6.

Figure 6

AURDINO Module

Figure 7

Aurdino is a microcontroller which contains a microprocessor ATMega328, shown in figure 7. It is an interface between hardware components and software code, which makes the interfacing easy. It receives data from the other electronic components and activates the corresponding pins based on the code written in the interface window. It sends the information to the cloud and it retrieves the information when needed. In this, the main theme is when the three conditions fingerprint, alcohol, and seat belt conditions satisfy then only the aurdino makes the motor pin high

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such that engine starts. Anyone of the condition becomes false then the motor pin becomes low and the engine does not start. We use two aurdino nano boards in this project because the fingerprint sensor and GSM module transfer data in a serial manner but aurdino can take only one serial data at a time. In order to process both the sensor information, we use two aurdino nano boards. Hence this controller is a like a hub which connects subsystems.

III. RESULTS

The results can be divided into 3 parts. The first one is the detection of the fingerprint of the driver and displaying the phrase "WELCOME" followed by name of the driver from the database. It is shown in figure 8.

Figure 8

The second part includes checking the alcohol levels of the driver driving. After checking it a message will be displayed on the LCD like "NO ALCOHOL HAPPY JOURNEY". This is shown in figure 9

Figure 9

The third part includes checking the seat belt.If the person wears the seat belt, it shows "HAPPY JOURNEY". This is shown in figure 10

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Figure 10

IV. CONCLUSIONS

This prototype stands as a unique model for improving the security in the automobiles. It checks all the required safety measures that a driver should strictly follow. In any case of violation of any of these parameters, the driver can't access the vehicle. Thus by using this product with an authorized supervision, we can avoid theft of vehicles, reduce the drunk and drive cases and thus reducing the accident rate. It also gives information of the location of the vehicle when an accident occurs

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