

Ignition Inducing Seatbelt Using Relay and Microcontrolling Programming Structure For Automobiles

K. Arjun¹, S. Lakshmi Kanth¹, S. Pranav Balaji¹ and L. Rahul^{1*}

¹Student of Mechanical Engineering, Velammal Institute of Technology, Panchetti, Thiruvallur, India

ABSTRACT: Safety is a precaution taken to live our life to live in a better way. Safety is a main concern while considering automobiles too. Basically, our little carelessness has led to many accidents in roadways. Negligence of wearing seatbelt is also a major reason for the fatal accident. To prevent that we are making the seatbelt as a mandatory one. Unless or until the seatbelt the driver will not be able to start the vehicle. Our innovation is done by placing the heartbeat sensor in the seatbelt and the heartbeat sensor is connected to the microcontroller. The microcontroller is connected to the ignition coil. When the heartbeat sensor senses the heartbeat the signal is transmitted to the micro controller which makes the ignition coil to ignite and the spark plug sparks and the car starts. By making our innovation in seatbelt, carelessness transforms into mandatory and it also increase the safety level in the automobile.

KEYWORDS: Seatbelt, safety, heartbeat sensor and microcontroller.

I. INTRODUCTION

Road accidents are increasing every day and various reasons are involved in it. Many people do lose their lives on the roads and it is very difficult to resolve this problem which affects almost everyone. There are several causes of road accidents and one among the major reasons is people forget to wear seat belt. Initially if we want to solve this problem, we have to realize that to drive is not a play. We manage a machine which is very dangerous, that it could kill anybody and there are laws which we need to carry out. So in order to make aware of seat belts, mandatory system has been introduced. This system basically aims at bringing the rule into act such that seat belt must be worn by every individual who drives the car.

Carelessness which has always been a part of driving system in our system and surrounding, such that people tend to defy wearing helmets in two wheelers and so in the case of car they tend not to wear seat belt. Seat belts have been designed on the basis to serve as a purpose of safety to safeguard people from accidents such as at the time of collision or during sudden braking. Thus wearing will always avoid people from getting injured at an adverse rate compared to not wearing them. Thus this topic will be a lifesaving and effective too.

Electronics has always served the world as a medium to empower them in their way. Mechanical uses their mechanics as their medium to perform the task in efficient way. The combination of both mechanical and electronics which gave a new form to the industry as 'Mechatronics' which uses the base of mechanical with an upright from electronics to perform any function or action in an elevated way. Incorporation of Mechatronics in the field of automobile has revolutionised the whole industry in a big stream. One of the main incorporation is the automation and Electronic Control of mechanical parts. The same way this Ignition Inducing Seat belts using relay and microcontrolling programming structure for automobiles(IIS) will be one among the mechatronics process to control the engine using micro-controller. This micro-controller will act as the main controlling unit to regulate the basis of engine based upon the inputs given.



Figure 1. Facts about seat-belt

II. MATERIALS AND METHODOLOGY

MATERIALS:

Heartbeat Sensor:

The heartbeat sensor works on the principle of photo plethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ. For heartbeat sensor the timing of the pulse is more important. The rate of heart pulses is calculated by the rate of blood flow. Since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

Microcontroller:

Microcontroller is an electronic device used to display information in a microwave LED or receiving information from a television's remote control. Microcontrollers are mainly used in equipment that need a degree of control to be exerted by the user. The microcontroller that we are using in our project is Arduino.

Relay:

Relay is a kind of switch that operates electrically. It works on the electromechanical concept and a set of contacts. Relays are mostly hidden in all sorts of devices. The important parts of a relay are electromagnet, armature, spring and set of electrical contacts.

Integrated Circuit:

An IC is a chip made up of semiconductor wafers on which resistors, transistors, and capacitors are fabricated. In our IC buzzer is connected to alert the driver to wear the seatbelt.

Ignition Coil:

An ignition coil is generally used in automobile for the ignition of spark from sparkplug. An ignition coil is used to transform the low voltage of a battery into high voltage which makes the sparkplug to spark the fire in the engine.

Methodology:

A seat belt, also known as a safety belt, is a vehicle safety device designed to secure the occupant of a vehicle against harmful movement that may result during a collision or a sudden stop. A seat belt functions to reduce the likelihood of death or serious injury in a traffic collision by reducing the force of secondary impacts with interior strike hazards. According to the section 177 motorist act the government has laid a rule to wear the seat belt. Still people forget to wear them. This carelessness has led to many accidents over time and time. So what we have made is mandatory seat belts in order to prevent accidents. The innovation is to provide seat belts using sensor circuits which are called as Ignition Inducing Seat belts using relay and microcontrolling programming structure for automobiles(IIS). In IIS we use Heartbeat sensor to start the car when you buckle the seatbelt. By buckling the seatbelt Heartbeat sensor detects presence of seatbelt. Now Heartbeat sensor transmits the signal to the Microcontroller. Initially the Microcontroller at low state but after the signal has been received ATmega328P goes to the ON state. When ATmega328P goes to the ON state, the relay connected in between the ignition system and battery. In real time methodology we connect the Heartbeat sensor in between the ignition switch and the car battery. Heartbeat sensor is placed under the bottom of the seatbelt. So the car doesn't ignite until the sensor reads the heartbeat.

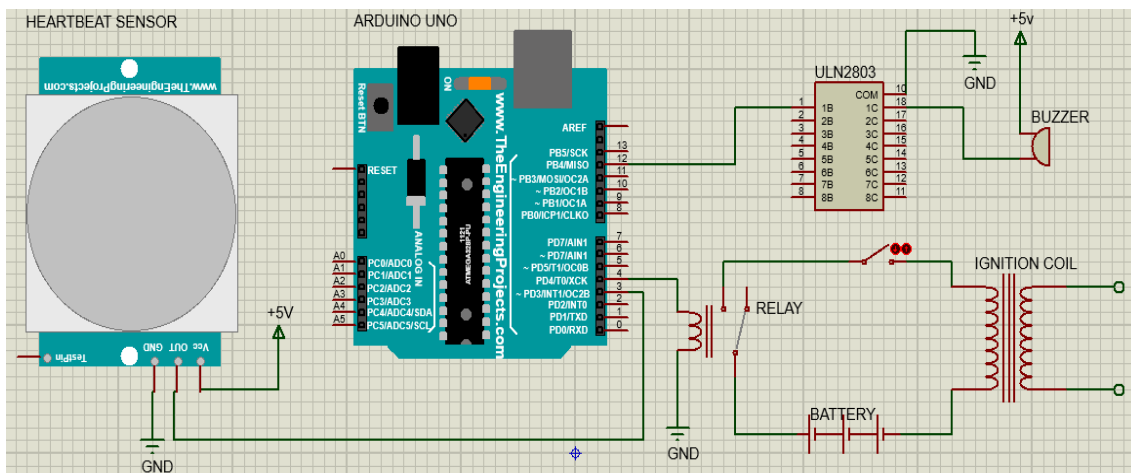


Figure 2. Circuit diagram in proteus

III. EXPERIMENTAL SET UP

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control system, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded system. Many microcontrollers are currently available such as Arduino, raspberry pi and many more. ATmega328P (It has 14 digital input/output pins of which 6 can be used as PWM outputs) is the central processing unit of our system which controls the power supply to the ignition coil for the spark plug. The heartbeat sensor is attached to the driver’s seatbelt so that it can detect the presence of the driver. The heartbeat sensor is based on the principle of photo plethysmography. The basic heartbeat sensor measures the difference between the intensity of the Infrared light emitted and IR light after reflection which is directly proportional to the heartbeat rate. Coding for the microcontroller was programmed and installed in the ROM of Arduino using a computer.

As all the input and output signals are completely digital signals we can use any pin between 3 to 13 as input/output pin. But, in our system we have coded pin 3 as digital input signal from the heartbeat sensor and pin 4 and 12 as digital output signal for the relay and buzzer. A generic single pole close/open (SPCO) relay was used to connect the supply from vehicle battery to the ignition coil which will energize the spark plug. This SPCO relay was connected to the digital pin 4 of the ECU which is controlled based on the input signal from the heartbeat sensor. The supply from the battery is connected to the common (COM) terminal of the SPCO relay and the ignition coil is connected to the normal open (NO) terminal of the SPCO relay. Also a buzzer is connected to the digital pin 12 as a warning indication to wear the driver’s seatbelt during the start and movement of the vehicle.

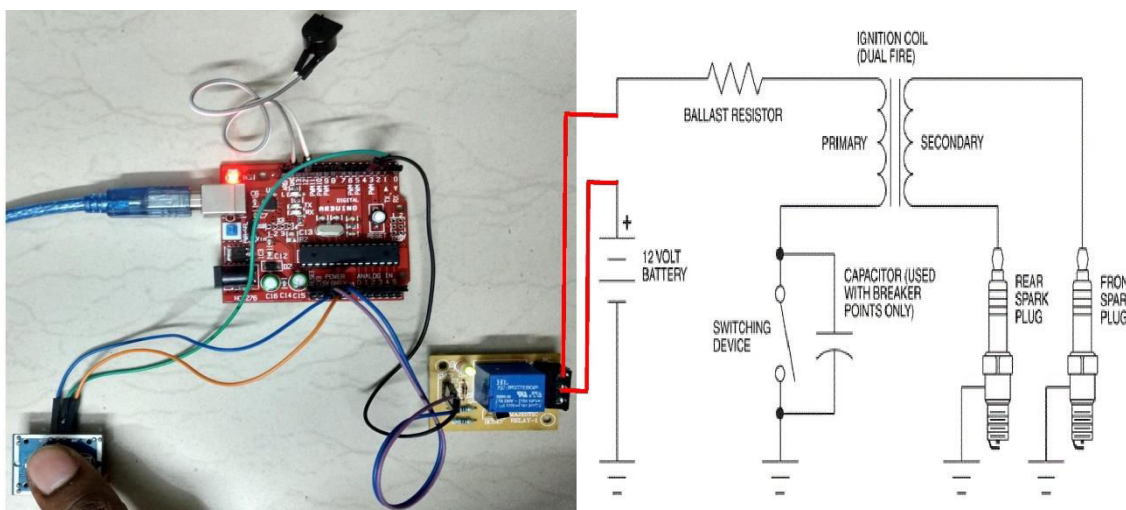


Figure 3. Experimental setup

Experimental Procedure

The output to pin 4 and 12 are based on the input to pin 3, if the input to pin 3 is low then the output for pin 4 will be low and pin 12 will be high. When a heartbeat pulse is detected by the heartbeat sensor, the input sent to pin 3 of ECU will be high and hence the output at pin 4 will be high which will energize the SPCO relay coil and connect the battery to the ignition coil. The pin 12 will change its state to low during high state of pin 3 in ECU. In case the seatbelt is removed during the movement of vehicle a warning sound to wear the driver’s seatbelt will be given for 60 seconds and vehicle will come to rest after sixty seconds.

IV. RESULTS AND DISCUSSION

The above experimental setup was carried in an automobile and derivative result would be the same as the experimental one, this is because it was carried out using the computer analyzing software and embedding codes into it, a simulation type of experiment as real was carried out and the result was checked. The driver before switching on the engine, he must be in position of contact with the seat belt, as it can detect the heartbeat of the fellow passenger and detect that it has been worn properly. At the time of malpractice, the sensor will be on its play and sends a signal to the micro-controller stating that it hasn’t been worn properly, the driver will not be able to switch on the car i.e., engine. This is possible because of the interlinking of micro-controller where the codes have been embedded in them for the following processes with the mechanical components which act according to the electrical pulses from its sources.

For further and future uses of this project in automobile can be carried out using this system. The future use of this system has bigger picture and scope in automobile sector. This system is very much cheaper than ABS nor air bags compared. Also this system will make the seat belt mandatory to everyone where it will serve reduction of deaths during accidents. According to survey 50% of injuries can be prevented because of wearing seat belts, so in order to be preventive this must be made more evident to people. The main success of this process is when automobile industries start acquiring this system and implementing them in their automobiles.

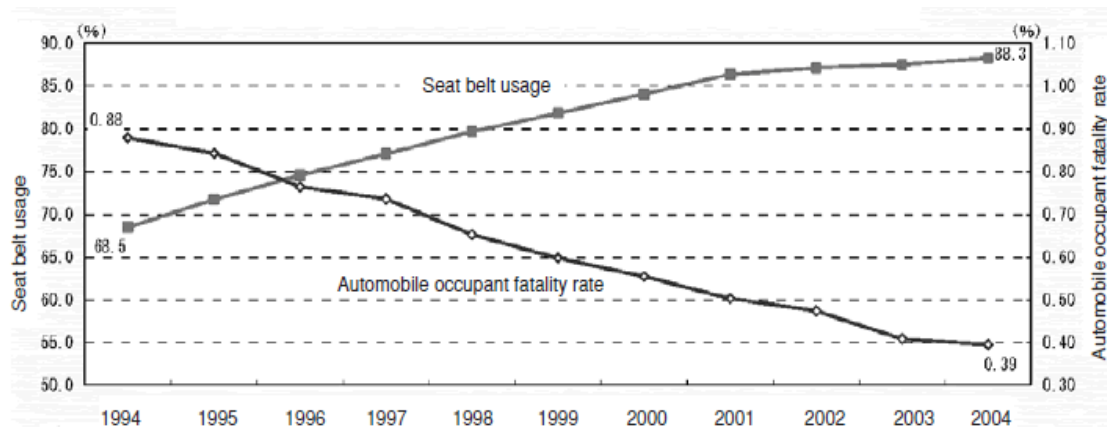


Figure 4. Seat belt usage and reduction fatality rate chart

V. CONCLUSION

Thus from the above discussion and testing using the codes, the implementation of this project can be declared as successful and it can be further used in the future coming vehicles. This project and from its result is always a lifesaving one for the driver in terms of an accident. The efficiency and excellence is at its fullest due to the proficiency undergone to make the system top notch to prevent it from malfunction or any other error while execution. The number of hours went in for the implementation and its detailing is the outcome of this project. This wouldn’t be possible without the combination of mechanical and electronics which gave rise to a new form of mechatronics which was so efficient in doing this project. The Ignition Inducing Seat belts using relay and microcontrolling programming structure for automobiles(IIS), as the name suggest safety measure and being an important one in life’s necessity. We here by provide the optimum amount of safety using this innovative idea. We ensure that all those data given above are reliable and verified with the sources and references listed above. There is a say “PREVENTION IS BETTER THAN

CURE”, we like to be the preventer. Hope our new ideas bring out a new dawn to the field of automobile and in terms of safety too.

VI. ACKNOWLEDGEMENTS

The design process is not a single handed effort and so it is my team, whom I want to thank for standing with me under all circumstances. I would also like to express my gratitude towards our Mechanical Engineering Department and on whole towards the college for supporting us and believing in us.

REFERENCES

1. Alaa k Abbas, et al. 2011. Seatbelts and road traffic collision injuries. World journal of emergency surgery, Vol 6.
2. Olumuyiwa Joshua ogundele, et al. (2013) “The impact of seat-belts in limiting the severity of injuries in patients presenting to a university in the developing world”, Nigerian medical journal. Vol 54, pp. 17-21.
3. Kulanthayan S and Law T.H (2004) “Seatbelt use among car users in Malaysia”, IATSS research, Vol 28, pp. 19-25.
4. “Automobile Engineering” by Dr.Kripal Singh
5. “Vehicle Dynamics” by Reja N. Nazar
6. <http://www.team-bhp.com/forum/indian-car-scene/136525-2013-who-report-road-safety-eye-opening-figures.html>
7. http://www.who.int/roadsafety/projects/manuals/seatbelt/seat_belt_manual_module_3.pdf?ua=1
8. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=17&ved=0ahUKEwjB0e_bnXTAhWFOI8KHSOxBMs4ChAWCD0wBg&url=https%3A%2F%2Fone.nhtsa.gov%2FDOT%2FNHTSA%2FCommunication%2520%26%2520Consumer%2520Information%2FTraffic%2520Tech%2520Publications%2FAssociated%2520Files%2Ftt379.pdf&usg=AFQjCNHnpF56maId9GqjS6xmII_KYNextg&sig2=FUAnawuFQFtYOp6Krv3GA
9. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/811518.pdf>
10. <https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=48&ved=0ahUKEwiD492JoeXTAhXBN48KHcaEBxY4KBAWCEwwBw&url=http%3A%2F%2Fwww.uky.edu%2FClasses%2FNUR%2F883%2FRTF%2Fseatbelt.rtf&usg=AFQjCNEh5XLbJ8edE-u3VsLbo38knc8-RA&sig2=C-XN3yjuA2-vPHegcWueEw>