

A study of two wheeler & rider safety system

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Abstract: *The Indian two wheeler industry still seems to overlook two most important aspects related to two wheelers viz. security of the vehicle and safety of the rider. Statistics reveal that as many as 1.65 lakh vehicles were stolen in a single year—2013. Since two wheeler users are directly exposed and come in direct contact with the impacting vehicle or obstacle during a collision resulting in severe injuries and fatality, their safety becomes the most important factor to be looked upon at. It is therefore important to design a system that would ensure not only the security of the vehicle but also the safety of its rider. One way of enhancing the security of the system could be replacing the traditional lock and key system with biometrics system. And the safety of the rider can be ensured by the fact that the system must incorporate in it an intelligent system which does not allow the rider to start the ignition of the vehicle if he is not wearing a helmet or is not sober. This paper incorporates in it the literature surveys carried out on several researches conducted on fingerprint locking system in two wheelers and some additional features related to the safety of the rider. It also gives its readers a vision of the entire system because the paper has a complete block diagram of the system.*

1. INTRODUCTION

As a matter of fact two wheeler sales in the past six to seven years has increased at a very fast rate. In fact market experts claim that India's two-wheeler industry is set to record its fastest growth in the next five years. However the two most important aspects related to two wheelers are security of the vehicle and safety of the rider still seem to be overlooked.

Despite tall claims made by law-enforcement agencies about their success in controlling automobile thefts, statistics reveal that as many as 1.65 lakh vehicles were stolen in a single year--2013. Uttar Pradesh achieved the dubious distinction of leading the states with the highest

number of vehicle theft cases. The alarming increase in the number of two wheeler road accidents has also been a matter of great concern globally because two wheeler users are directly exposed and come in direct contact with the impacting vehicle or obstacle during a collision resulting in severe injuries and fatality. Every day as many as 140,000 people are injured on the world's roads; more than 3000 die and some 15,000 are disabled for life.

Where on one hand the lack of deterrence has emboldened thieves so much that they are using techniques and gadgets to override the lock and key systems (methods like using duplicate keys helps them unlock the vehicle in few minutes), the lack of awareness among the riders and their carelessness which exposes them to fatal accidents (which by fluke are survived only by few of the victims of such accidents) also gives a hike to the figures in such statistics.

This project entitled "Two Wheeler Anti-Theft and Rider Safety System" thereby aims at designing a system that ensures not only the security of the vehicle but also the safety of its rider. The system uses intelligent fragmented modules which keeps a check on the security of the vehicle and the safety of its rider. The security of the system is enhanced by replacing the traditional lock and key system with biometrics system. Biometric system includes various types such as face recognition, voice recognition, fingerprint recognition, eye (iris) recognition. Among these techniques the fingerprint recognition technique is most widely used because fingerprint biometrics are easy to implement. However, an alternate of the lock and key system could have been the password system, but passwords can also be the weakest component of any security systems because passwords security is entirely based on confidentiality and the strength of the password and they do not provide strong identity check.

The two wheeler anti-theft and rider safety system provides three layers of vehicle security. First by restricting the number of people who can

access the vehicle i.e. the access to the vehicle is limited only to some authorized people whose information is stored in the database beforehand. Then in order to get access to the vehicle, the engine particularly, scanned fingerprints are cross checked with the database. The biometric scheme is used as the primary layer of protection against vehicle theft. The second layer of protection is achieved by using GSM (Global System for Mobile Communication) technology. It sends SMS (Short Message services) to the owner of the vehicle in case of any attempted theft. The third layer of protection is the GPS system which can detect the exact location of the vehicle in case it is somehow stolen.

This was all about the security of the vehicle. Now coming to the safety of the rider, the two wheeler anti-theft and rider safety system incorporates in it an intelligent system which does not allow the rider to start the ignition of the vehicle if he is not wearing a helmet or is not sober. This feature of the system is achieved by using an alcohol detector which detects the content of alcohol in the breath of the rider. If the rider is found drunk, the engine of the vehicle would not start. Similar would be the case if the rider is not wearing a helmet. With the two wheeler anti-theft and rider safety comes a smart helmet which completes this system. The smart helmet is equipped with sensors and other circuitries which does not allow the rider to start the vehicle unless he does not have his helmet put on.

2. Literature Survey

Jennifer William et al [13] this report focuses on the importance and need of the helmet while driving any two wheeler also the lack of prompt medical attention needed by the injured person. A module affixed in the helmet is such that, the module will sync with the module affixed on bike and will also ensure that biker has not consumed alcohol. Additional feature of accident detection module will be installed on the bike, which will be able to detect accident and will be able to notify quickly the accident to police control room and in case if the accident is minor, rider can abort message sending by pressing the abort switch.

Priyanka Rani et al [14] Fingerprint authentication is most sophisticated method of all biometric techniques & has been thoroughly verified through various applications. A finger print occurs uniquely to an individual & remains unchanged for lifetime. Priyanka Rani (M.Tech Scholar) and Pink Sharma (Assistant Professor) of H.C.T.M Kaithal, Haryana India worked on finger print identification system

& on the basis of their study & research they published a Review Paper titled "A Review Paper on Finger Print Identification system".

Their paper defines various aspects & methods to be used for finger print identification.

In this paper, they have shown different methods & techniques which can be used to identify a person through his fingerprint. These methods conclude that fingerprint is fast, secure, accurate & reliable system. Gabor filter method is applied for feature examination. Methodology for this technology is represented with the help of block diagrams & flowcharts.

Future research can be carried out to improve quality of image for image enhancement and to develop better matching techniques.

Ashutosh U. Jadhav et al [15] automotive electronics sector is nowadays becoming more in demand due to its increasing technology. As more and more applications are available on vehicle information system, connection between the vehicle bus network and information system is becoming a trend. The proposed system presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver vehicle interface. The system is able to monitor road lane violation, drowsiness and alcohol with the help of camera and sensor.

On July 7 2015, Ashutosh U Jadhav and N.M Wagdarikar PG Student[VLSI & Embedded system], dept. of E & TC, smt Kashibai Navale College of Engineering-Pune, Maharashtra, India studied & worked on this system.

The main objective of this system is to provide safety to avoid road accidents. The system uses two ARM microcontroller that is Master for detection and Slave for controlling the parameters. CAN protocol is used for communicating between microcontrollers.

A system is developed on which camera is mounted for lane detection sensor for alcohol and drowsiness detection and a GPS & GSM Modules are also mounted for tracking purposes.

Future work research can be done on driver's health monitoring system.

Arsalaan. F. Rashid et al [16] the authors of the paper entitled "Biometric Finger Print Identification- Is It a Reliable Tool or Not?" presented a study which was undertaken on the employees and students of a University undergoing biometric verification for purpose of attendance. A total of 3250 staff and non-staff members of this University campus who were taking biometric identification for daily attendances were analyzed for this study. The key tool of their study was the biometric fingerprint identification method which compared to a visual comparison of signatures or

photo IDs is more accurate and less time consuming making it less fallible and potentially much faster.

As a result of this study, it was observed and noted that the error rate in biometric identification significantly increases with increase in age group because aging results in loss of collagen. Compared to younger skin, aging skin is loose and dry, and decreased skin firmness directly affects the quality of fingerprints acquired by sensors. An important conclusion of the study is that biometric identification is not infallible and is prone to non-correctable errors. Wearing down of fingerprint pattern was found to be a major source of errors in registering biometric fingerprint attendance.

Also in agrarian rural economies like India where hard manual labor may be the only means of subsistence for a large population, this inaccuracy can be a source of problems for poor and hardworking people. Databases developed by such methods are prone to limitations which have to be thoughtfully corrected before the system is fully institutionalized. Therefore the authors concluded that, excessive reliability on such systems needs to be re-evaluated and possible corrections should be made in technology to address these problems.

Kajal Thakre et al [17] in this paper the authors have a smart helmet system using microcontroller in which they have placed vibration sensors in different places of a helmet where the probability of getting hit is maximum, so when a rider crashes & the helmet hits the ground, the sensor senses it, when the stress is over a certain limit the GSM module automatically sends the message to the ambulance or family member numbers. The demerit of this system is the unavailability of GPS module because informing the family members or ambulance that an accident has occurred is not enough as they will not be knowing where it has happened. With the use of GPS the location of the rider will also be sent in the message through GSM module therefore increasing the efficiency of this system.

R. Prudhvi Raj et al [18] this report includes a system which is made for rider security purpose in case of road accidents leading to death. The project creators used Peltier module and GPS system to upgrade a normally used helmet into a smart-Tec helmet. Generally people do not wear helmet because of excessive increase in the temperature

between the scalp and the helmet. Thus a Peltier module is attached to control the temperature making it favorable to wear. Also in case of accident the accelerometer will detect the condition of accident and the microcontroller will send a signal to GSM module which will send the information of the rider's location attained by the GPS to the mobile number saved already using SIM inserted externally to the GSM module.

3. Proposed Model

The proposed model of this project is an intelligent two wheeler ignition system with an additional intelligent helmet for the safety of the rider. The system ensures the safety of the vehicle and the rider both at the same time. The system firstly, requires to authenticate the rider from the preloaded fingerprints from the database of the microcontrollers also making it compulsory for the rider to wear the helmet as per the government's guidelines.

A module fixed on the helmet will synchronize with the module fixed on the vehicle's side. The system will show the following functions:

- To start the vehicle at the initial - the rider has to authenticate through fingerprint firstly.
- To ensure that the rider has worn the helmet, if he fails the bike will not get started.
- It will also ensure that the rider has not consumed alcohol. If the rider is drunk then the bike won't start.
- If unknowingly the bike gets drifted it will immediately send a text message to the owner of the bike that the bike is shifted, also giving the coordinates of the present location of the bike.

The model will consist of two modules:

1. Bike Module
2. Helmet Module

The signals will be transmitted wirelessly to the bike's receiver and accordingly, the microcontroller will take the actions to control the other blocks of the system.

4. Block Diagram

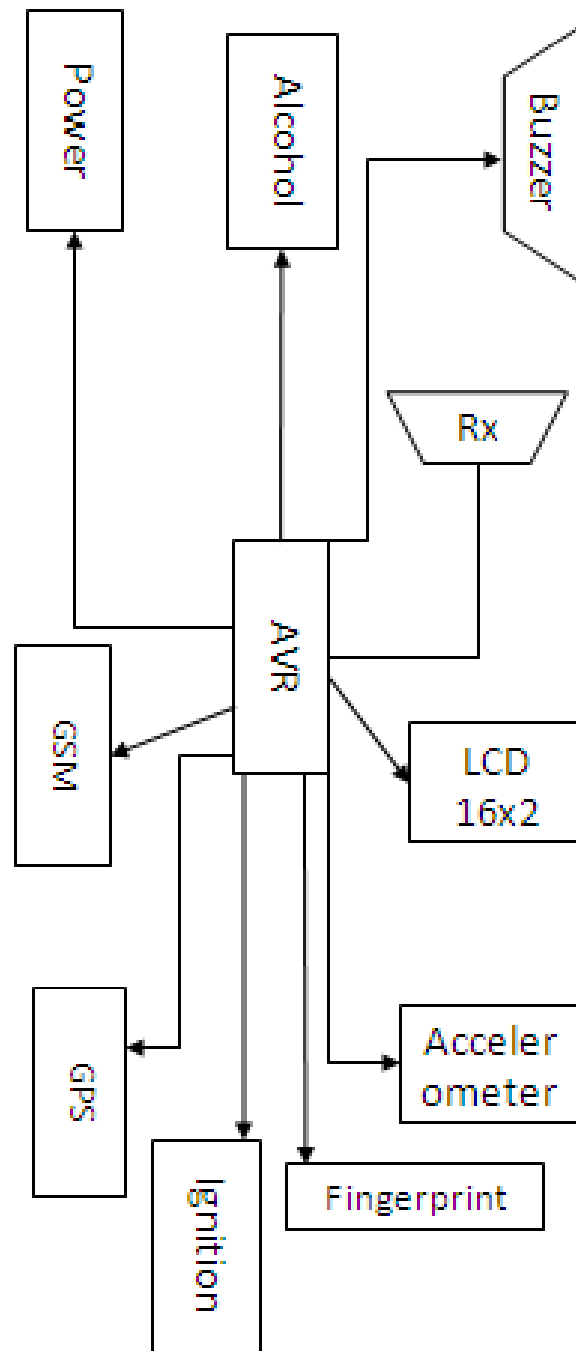


Figure 1 : Bike Side

This above shown figure 1 is the block diagram of the transmitter side attached to the bike side. Power block is the power supply supplied to the circuit. Alcohol block is the alcohol sensor attached used to sense the content of alcohol consumed by the rider. Buzzer is used as an alarming device used in case of theft. Rx is the receiver attached to receive signals from the helmet. GSM is the cellular module used to send a text message to the number predefined. LCD is used to show the status of the

system. GPS module is used to get the information of the position of the bike giving the information of the longitude and the latitude of the bike. Accelerometer is used to detect the tilting (change in its state) of the bike also if the bike is dragged then it will also detect it. Ignition is the bike's ignition. Fingerprint is the fingerprint testing module used to detect the authenticity of the rider.

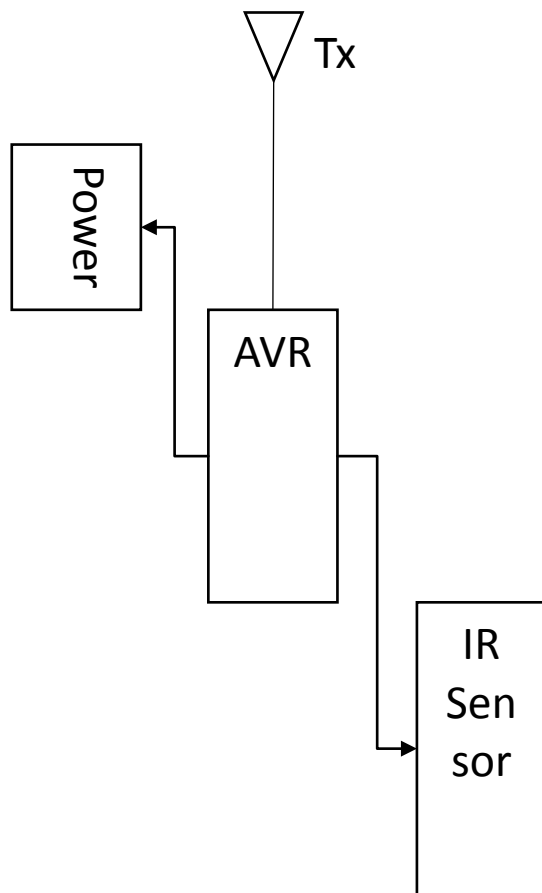


Figure 2: Helmet Side

The above figure 2 shows the helmet side it contains power supply, the IR sensor to detect whether rider is wearing the helmet or not. The central block is of the microcontroller (Arduino NANO) that is being used here.

5. Expected Result

This project as presented in this paper is expected to definitely prevent the stealth of the vehicle and ensure the safety of the rider. The project is absolutely feasible under all circumstances because of its less complexity and simpler structure and can be implemented at a greater level. It is expected that our proposed system will work efficiently to ensure the safety of the rider and the security of the vehicle.

The result which is expected to be yielded from this project is that the motorcycle will be ignited only when the rider scans his/her finger on the fingerprint module and a match is found between the given scan to the one already stored in the system. When the match condition occurs, the microcontroller ignites the bike otherwise the bike won't start. Also the smart helmet and the alcohol

detector module integrated in this system will control the ignition of the vehicle.

If the model works as per our expectations, it can be implemented efficiently in every two wheeler manufactured today in terms of security of the vehicle and safety of the rider.

6. Conclusion

Fingerprint identification enhances the security of a vehicle and makes it possible only for some selected people to start the vehicle. The rider safety system ensures that the rider cannot start the vehicle unless he is not wearing a helmet and is sober. This system can offer a number of advantages when implemented in two wheelers, like-only some authorized people will be able to ignite the vehicle. Because the access to the vehicle will be only granted to the user when his fingerprint matches with the one already stored in the database and only under the conditions that the user is wearing a helmet and has not consumed alcohol. Thus, by implementing this relatively cheap and easily available system on a vehicle one can ensure greater security of the vehicles as well as safety of the rider. The thief would have to do a great deal of homework to steal the bike, and it is unlikely that they have the fingerprint technology needed to fake your fingerprint. And also the chances of the rider to being posed to accidents.

The entire system on a whole would prove to be of great use to every person who owns a two wheeler as they can enjoy both the security of their vehicle and reduce the risk of being more prone to accidents. This system at a greater level will help reduce the rates of two wheeler thefts and most importantly the two wheeler accidents rate and the death rate due to such accidents where the recklessness of the rider costs him his death and misery to his family. Therefore the system can ensure that both the rider and the vehicle can be saved from all sorts of possible harms.

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