Journal of Control & Instrumentation
Volume 1, Issue 1-3 Compilation 2011

STM JOURNALS

RFID BASED PROTOTYPE DEVELOPMENT OF IMMOBILIZER FOR TWO WHEELER VEHICLE SECURITY

*Sandeep Kumar[1], Asutosh sevak[1], Abhishek Shukla[*1], S.S.Pujari[1]*
[1] Department of Embedded Systems Design
International Institute of Information Technology,
Pune-411057

ABSTRACT

An immobilizer is an electronic device fitted to an automobile which prevents the engine from running unless the vehicle has the proper access to it. The main use of this system is to protect the vehicle from being stealth as it deactivates the engine. The immobilizer security system is mainly seen in four wheeler vehicles. The same idea can be implemented for 2 wheeler vehicles which are in huge number in countries like India and Japan, as the vehicles are being stolen very frequently. Early models of immobiliser used a static code in the ignition key itself in place of a remote RFID tag, which was recognized by an RFID loop around the lock barrel and checked against the vehicle's Engine Control Unit (ECU) for a match. If the code is unrecognised, the ECU will not allow fuel to flow and ignition to take place. When the ECU determines that the coded key is valid then the ECU activates the fuel-injection sequence. The aim of this paper is to develop a prototype for immobilizing the vehicle with the help of RFID. The tag should be in the pocket of the vehicle owner, when the tag comes into the EMF field which is surrounded around the bike. The ID present in the tag has to be read by the reader and compare the id present in the controller. If the ID gets matched then the ignition will turn on or else not. The owner will be having only one ID. In any case if some other tries to start the bike by using other tag having different ID it will not work and the bike will not get started. This unique feature of the prototype adds more security for two wheeler vehicles.

Key words: *RFID, Immobilizer, UID, Vehicle Security,=*

* ***Author for correspondence*** E Mail: abhisheks@isquareit.ac.in Tel: +91-9767791535

INTRODUCTION:

The motor cycle is one of the most marvellous vehicles ever invented. When riding one feel as if they were flying. Japan is a sort of paradise for motor cycles. Men, women, young and old enjoy motor cycles almost all the year round in the mild climate.

This paradise for motor cycles is at the same time a paradise for robbers. As per one survey motor cycles are stolen so often so easily that two hundred forty thousand bikes are stolen per year in Japan. The stolen motor cycles are seldom recovered so are the robbers seldom arrested. It is hard to accept the fact that a machine number with an ID (chassis number) shouldn't be located on the earth in this age of GPS and internet. Most of the bikes are not fitted with extra security measures as standard. The numbers of motor cycles stolen are more than the number of motor cycles bought in UK. It takes hardly 20 seconds to steal a motorcycle. India also is no exception for this menace. The number of motor cycles stolen every year is going up unabated. In India the usage of premium brand motor cycles are not much higher. The usage of; motor cycles costing between 20 to 50 thousand is much higher in India. So the security system should also be cost effective more efficient and

reliable. Nowadays a large number of two-wheelers are being stolen in our cities and towns. As per the survey in 2008 more than 8,000 vehicles have been stolen in the state Maharashtra. Many a times the stolen vehicles are transported to other states and are sold. Many other times the vehicle is stripped down and the spare parts are sold as junk separately. It is reported that one can buy a stolen two-wheeler for as low as Rs 5,000. Hence detection of motor vehicle theft case is very difficult indeed.

The existing ways to provide security for the two wheelers are like the handle lock and the alarm system. Transponder immobilizers are easier to use because the electronically coded key fob sends a wireless signal to the ECU to let you start it normally by turning the ignition key. ECU will match the received ID code with actual code. If both codes are matched then only ECU will allow the vehicle to ignite. Most commonly used by manufactures when the vehicle is built.

The loop holes in the existing systems are they can be easily damaged by the thieves. So this paper came up with a solution by using the RFID reader and the tag for starting the bike. The owner of the bike will be having the tag in his pocket, when he comes into the range of the reader it has to detect the UID and then the bike gets started. Once the tag is lost the bike cannot be started again.

The paper is organized as follows; in section II discuss regarding the RFID based immobilizer. In section III Discuss the implementation. In section IV Discuss the result of the prototype. In section V Concluding remark of the paper is given followed by reference.

RFID BASED IMMOBILIZER:

The microcircuit inside the key is activated by a small electromagnetic field which induces current to flow inside the key body, which in turn broadcasts a unique binary code which is read by the automobile's ECU. When the ECU determines that the coded key is valid then the ECU activates the fuel-injection sequence.

The RFID based immobiliser system is shown in Figure 1. It comprises of an RFID tag or transponder, an RFID transmitter/reader connected to a Microcontroller. The microcontroller compares the received RFID with a locally stored ID and on match drives the relay. The relay connects the battery supply through the ignition switch to fuel injection system.

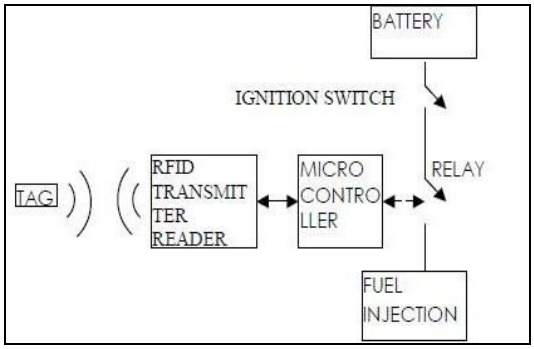

Fig. 1 RFID Based Immobilizer System

The tag is made up of a microchip with an antenna, the transmitter/reader also has an

antenna with an external coil that sends out electromagnetic waves to tag. The tag antenna is tuned to receive these waves. A passive RFID tag draws power from the field created by the transmitter/reader and uses it to power the microchip's circuits. The tag chip then modulates the waves with stored data and sends back to the reader, which demodulates the new waves into digital data. RFID transmitter/reader is composed of three parts: an antenna, RF electronics module, which is responsible for communicating with the RFID tag, and an electronics module, which communicates with the microcontroller.

The RFID tag located in the pocket of the owner as shown in Figure.2, when comes into the EMF field of the transmitter located near the ignition switch, sends back the Unique ID (UID) through the same EMF field.

The UID is read by the RFID reader is sent to microcontroller, which compare the ID stored permanently in its ROM. If the ID matches then the relay is turned on which in turn will turn on the ignition else not. The vehicle owner will have the right ID. In case if some other tries to start the bike by using other tag having different ID it will not work and the bike will not start.

Fig. 2 look of immobilizer system in a bike

IMPLEMENTATION:

The development approach adopted was the V-model shown in Figure.3. The V-Model demonstrates the relationships between each phase of the development life cycle and its associated phase of testing. The software flow chart shown in Figure.5 was designed using Keil compiler then simulated on Proteus tool shown in Figure.6 and Figure.7.

Design and development of an immobiliser system as lab prototype as shown in Figure.8 was taken up for proof of concept using Commercial Off-The-Shelf (COTS) modules such as Microcontroller KIT, RFID reader KIT, Relay, Ignition switch,

DC Motor and Power supply. This arrangement was considered to quickly demonstrate the principles of operation.

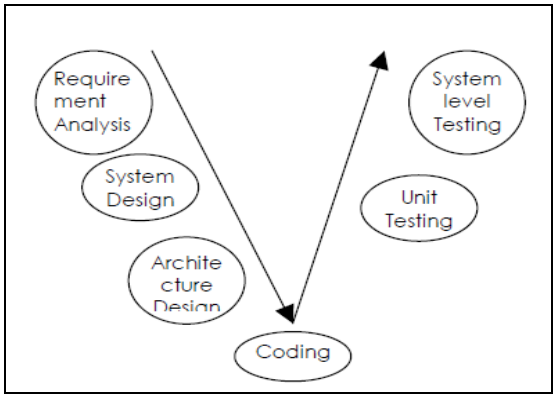

Fig. 3 V-Model Diagram

The Figure 4 shows the block diagram which gives the complete overview of the system. The system consists of P89C51RD2XX controller; one RFID reader and RFID tag and relay circuit for turning on/off the ignition system.

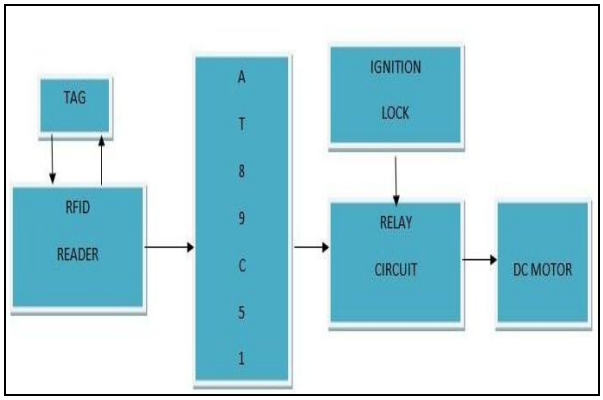

Fig. 4 Block Diagram of the System

The owner inserts the key and turn on the ignition lock then the reader will turn on. The reader will be generating the EMF once the tag comes to the reader range it will detect the UID and will send it to the controller through serial communication. The UID is already dumped to the controller. If the id gets matched which is stored in the controller then through one of the port the relay will be turned on. In turn the relay will turn on the DC motor. If the id does not get matched the relay will not turn on the motor. To save the power of the battery the reader will be emitting the EMF form some time period after that it will be turned off. If the reader is continuously turned on and checks in interval if the tag is in the reader range or not may cause some problems. The main problem is the electromagnetic field which can even damage the vehicle.The implementation of the software flow is as follows.

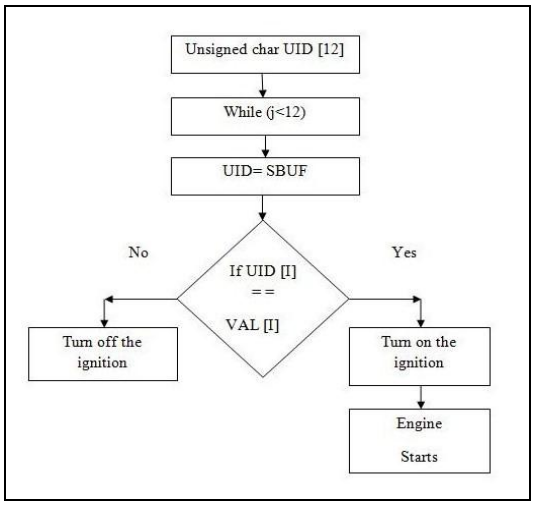

Fig. 5 Logic Flow Chart

The tag has the unique ID of 12 bytes, we will compare each byte and store in some memory location. If the id is matched the ignition will turn on else not.

RESULT

This paper discusses the successful implementation of prototype on 8 bit platform and shows the simulation part in Proteus. From this hyper terminal the user will be

entering the ID of the tag. The entered ID will compare with the ID already stored in the controller. If the ID gets matched the relay turns on or else not.

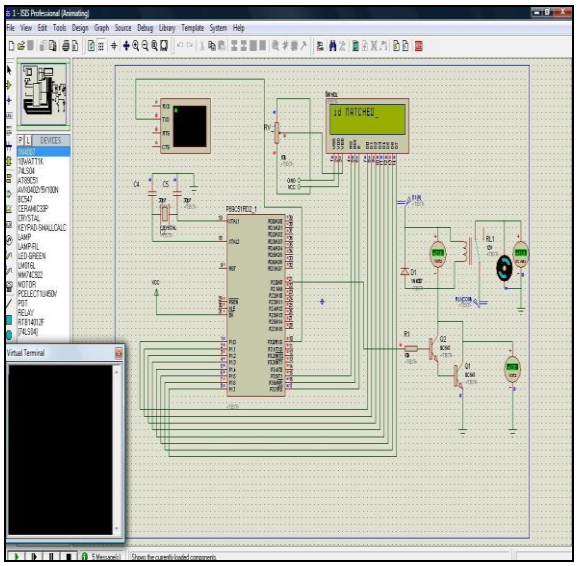

Fig. 6 Test Case 1 ID Matched

Here this figure shows that when the ID is entered through the hyper terminal it will compare with the ID stored in the controller. If the id is matched with the ID in the controller the relay is turned on and the green LED in on.

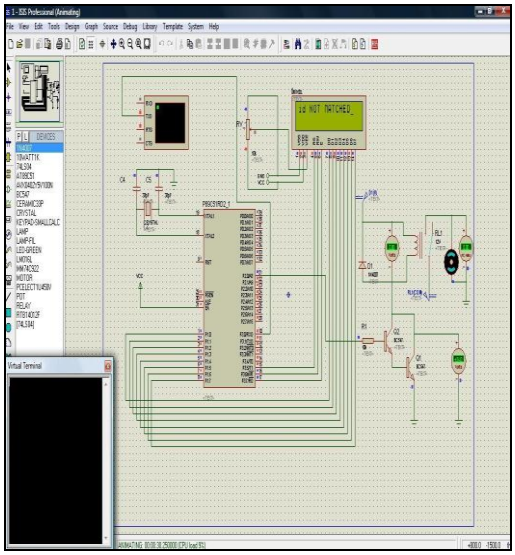

Fig. 7 Test Case 2 ID Not Matched

In this figure the ID is entered through the hyper terminal where it will compare to the ID stored in the controller. There is mismatch in the ID so the relay is turned off and even green LED in off.

The figure shows the overview hardware prototype. Where the reader will detect the id of the tag and send it to the controller, in the controller one id is already dumped, if the id gets matched with that in controller the relay is turned on and the DC motor starts rotates else not.

Fig. 8 Complete Overview of The System

CONCLUSION:

This immobilizer of two wheeler s is more efficient and even cost efficient. It even provides more security to the vehicles. Here we can see the RFID is used in another form of security system. Immobilizer technology is most commonly seen in four wheeler vehicles where the vehicle cannot be stolen. So the same immobilization can also be used for two wheelers, as the vehicles are stolen easily in countries like India. And even the RFID

technology has been popular since long back and the security for the RFID is even better.

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