Smart Security System For 2-Wheeler

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Abstract— We come across several cases of 2-wheelers getting stolen from parking area or sometimes we forgot to remove the key. In such cases it is really difficult, time taking and needs help from law enforcement authority to trace and recover the vehicle. This project is aimed at designing a suitable security system to solve this problem. Main concept behind this project is to provide security to 2-wheelers using a 4 digit password entered through a keypad. The ignition system is enabled only through the password. This system disables the ignition system and turns on the buzzer when wrong password is entered for 3 times successively to attract attention of people nearby and locks also the keypad. User can change the password anytime. This project is implemented using ATMEGA2560 Controller. 2-wheeler security system installed in the vehicle also enables tracking the location of the vehicle in case of theft. The location of the vehicle is obtained with the help of Global Positioning System (GPS) and Global System Mobile communication (GSM). The proposed security system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purpose-designed computer software to enable the owner or a third party to track the vehicle's location, collecting data in the process. Vehicle information can be viewed on electronic maps via the Internet or specialized software.

Index Terms—2-Wheeler Security, ATMEGA2560 Microcontroller, Google Maps API, Ignition disable, GPS and GSM Technology

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I.   INTRODUCTION

2-Wheelers are generally vulnerable for theft as they are easy to unlock using a duplicate key. It also possible some times that the owner forgets to remove the key from the vehicle after parking. There are also occasions where the 2-wheelers get lifted and carried away even when they are locked. It is therefore essential to design a security system using embedded systems technology to overcome this problem. A 4 digit password system is thought of an additional security feature in this project. It also enables the owner to find out the location of the vehicle using GPS and GSM system, in case of a theft. The proposed system is also useful for transport operators to monitor the location of the vehicle without knowledge of the user.   The system can be augmented to obtain vehicle information like vehicle speed, distance traveled, time stopped at a location etc,. The ignition system of the vehicle is disabled if correct password is not entered. The proposed system allows a maximum of three attempts to enter correct password. The proposed solution is a robust and cost effective system to overcome the problem of theft of 2-whelers. The system can be extended to 4-wheelers with minor modifications.

II.   PROPOSED SYSTEM

The system proposed in the paper has following features:

- This project is implemented using ATMEGA2560 Micro Controller.
- A 4X4 key pad is used to enter password.
- An Ignition system control circuit to disable or enable ignition system of the vehicle.
- GPS to obtain the coordinates of the vehicle location.
- GSM to receive and send the sms messages.
- The Vehicle location is monitored on Google maps in real-time using Google Maps API in the user's android mobile.

III. BLOCK DIAGRAM OF THE SYSTEM

Vehicle location updating system is based on GPS and GSM technology. Vehicle monitoring system is based on android application with The Google Maps API to display the vehicle on the map in the Smartphone. The Block diagram of the system is given as Fig 1.
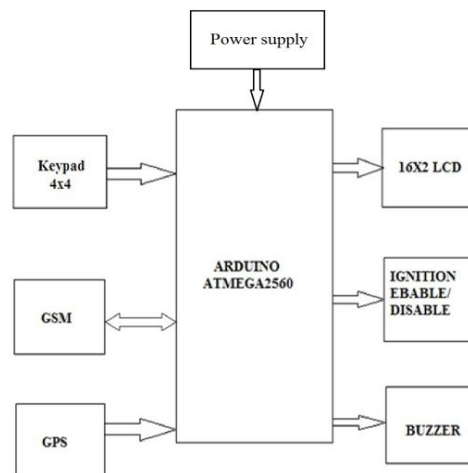

Figure 1: System Block Diagram

IV. ARDUINO MEGA (ATMEGA 328P) MICRO CONTROLLER

The Arduino Mega is a microcontroller board based on the ATmega328P which is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs close to 1MPS per MHz. This empowers system designer to optimize the device for power consumption versus processing speed. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

V. GPS 65 MODULE

The Global Positioning System in vehicle tracking systems is commonly used to provide users with information such as the location coordinates, speed, time, and so on, anywhere on the Earth. The GPS module [2] consists of GPS receiver with antenna.

The GPS 65 series is a complete GPS module that features super sensitivity, ultra low power and small form factor. The GPS signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol.

Features
- High sensitivity: -165 dBm
- Extremely fast TTFF at low signal level
- Built in high gain LNA
- Low power consumption: Max 30 mA@3.3 V
- NMEA-0183 compliant protocol or custom protocol
- Operating voltage: 3.0V to 3.6V
- SMD type with stamp holes
- Small form factor: 13x15x2.6mm
- RoHS compliant (Lead-free) Performance Specification

Once the PIC microcontroller and the GPS module are interfaced, the GPS module is ready to get the vehicle location information.

VI. GSM 800 MODULE

The GSM/GPRS module [3] is responsible for establishing connections between an in-vehicle device and a remote server for transmitting the vehicle location information, using TCP/IP connection through the GPRS network. GSM is a standard set developed by the European Telecommunications Standards Institute (ETSI), as a replacement for First Generation (1G) cellular networks. This GSM modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this

modem will be that one can use its RS232 port to communicate and develop embedded applications. Applications like SMS control, data transfer, remote control and logging can be developed easily. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging. This GSM modem is a highly flexible plug and play quad band SIM 800 GSM modem for direct and easy integration to RS232 applications. Supports features like voice, SMS, data/fax, GPRS and integrated TCP/IP stack. In our project we are using sim 800 to send alert SMS to the concerned department.

Table 1.1 AT Commands

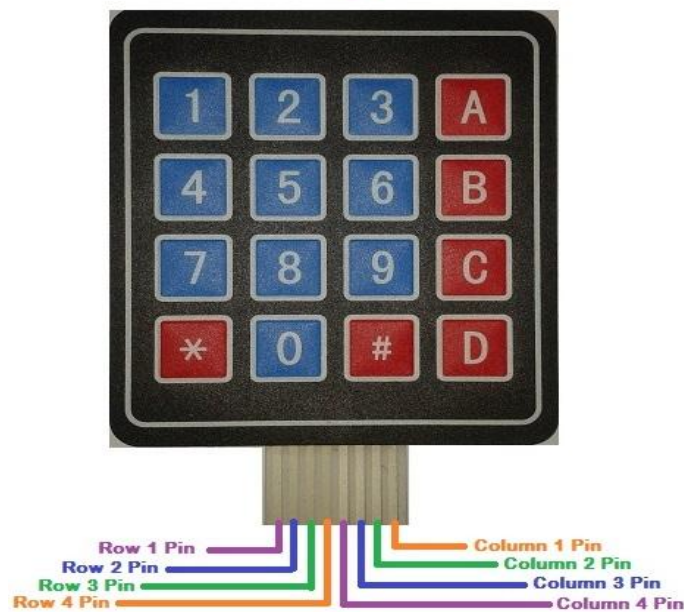| Commands	Description
ATA	Answer Incoming Call
AT+CMGD	Delete SMS Message
AT+CMGF	Select Message Format
AT+CMGL	List of SMS Message
AT+CMGR	Read the SMS Message
AT+CMGS	Send SMS Message
AT+CPIN?	To Check SIM is Ready

VII. 4 X 4 KEY PAD

Figure 2: 4X4 Hex Keypad

A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Pads mostly containing numbers are called a numeric keypad. Numeric keypads are found on alphanumeric keyboards and on other devices which require mainly numeric input such as calculators, push-button telephones, vending machines, ATMs, Point of Sale devices, combination locks, and digital door locks. Many devices follow the E.161 standard for their arrangement.

Features
- Ultra-thin design Adhesive backing
- Excellent price/performance ratio
- Easy interface to any microcontroller
- Example programs provided for the BASIC
- Stamp 2 and Propeller P8X32A microcontrollers

Key Specifications
- Maximum Rating: 24 VDC, 30 mA

- Interface: 8-pin access to 4x4 matrix
- Operating temperature: 32 to 122 °F(0 to 50°C)
- Dimensions: Keypad, 2.7 x 3.0 in (6.9 x 7.6 cm)
- Cable: 0.78 x 3.5 in (2.0 x 8.8 cm)
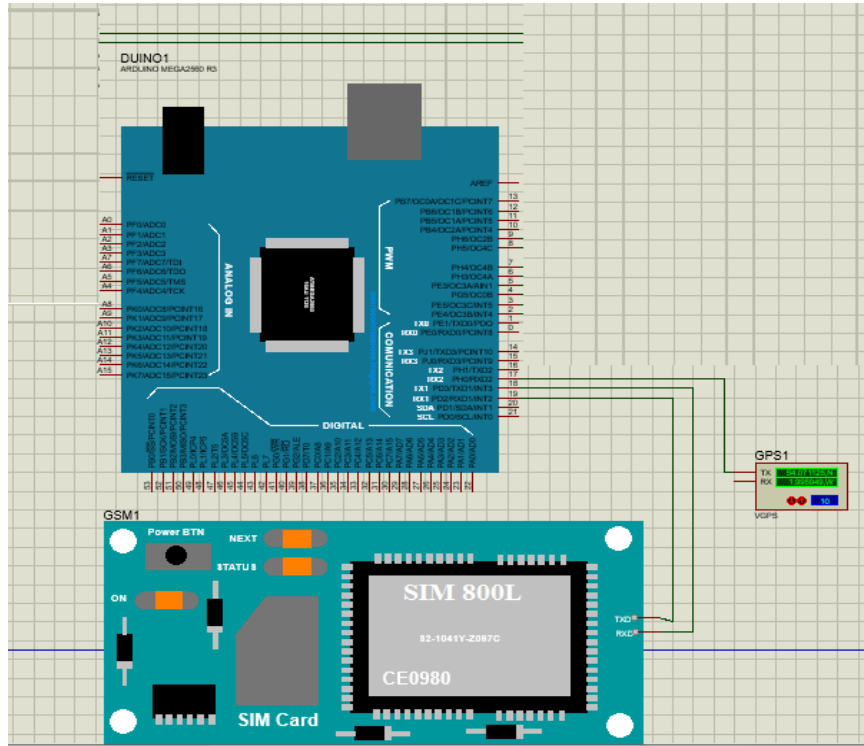
VIII. INTERFACING

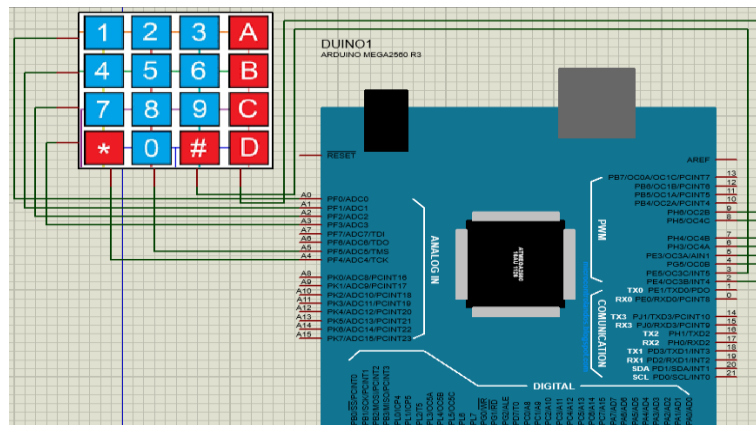*Figure 3:* Interfacing GSM and GPS to ATMega 328P.

Figure 4: Interfacing Keypad to the ATMega 328P

IX. SOFTWARE USED

This project is implemented using following software:
- Arduino C
- Google Maps API

X. GOOGLE MAPS API

Google maps API is used to display the Vehicle location on a Smartphone application in real- time using an HTTP request. The Google maps API [4] automatically handles access to the Google Maps servers, displays map, and responds to user gestures such as clicks and drags. The legs array contains information about two locations within the given route. "Distance" and "Duration" fields from the legs array are used in the

Google directions API. Those fields provide users with the calculated distance and time information between the current location of a vehicle and the user location within the given route.

XI. FLOW CHART

The Flow Chart of the System is given below. The System after initializing all the devices will wait for entering the password. On entering the password it verifies with set password and enables the ignition system of the vehicle is password matches. I case of mismatch it allows 3 successive attempts before locking the password.

If the vehicle is lifted, the owner can find the location of the vehicle by sending a sms. The owner on receiving the message can see the location of the vehicle in the Google Maps using Google Maps API on clicking the coordinates.
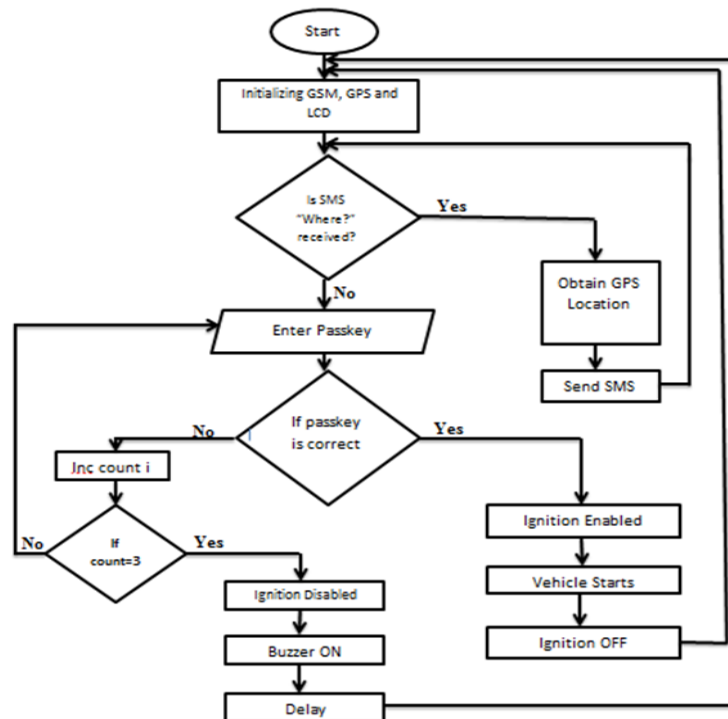

Figure 5: Flow Chart

XII. CONCLUSION

The system proposed "Smart security system for 2-Wheeler" is a cost effective solution for vehicle security with an additional feature of vehicle tracking with the help of GPS receivers and GSM modem. Vehicle Tracking System resulted in improving overall productivity with better fleet management that in turn offers better return on your investments. Low cost ATmega 328P Microcontroller has been used along with keypad and buzzer to incorporate security by disabling vehicle ignition system. The system presented in this paper has been successfully implemented.

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