Tracking and Theft Prevention System for Two Wheeler Using Android

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***Abstract* – In automobile field, the security and theft prevention are one of the main areas in current scenario. The security goals are achieved by the GSM, GPS technology. But it is commonly used for the four wheeler and not in the two wheeler. Using these technologies, we can only track and monitor the vehicle. Previously, GPS is used to get the current position of the two wheeler and that data will be send to the user mobile phone through the GSM. This paper implements for theft prevention in two wheeler using GSM, GPS and Android technology. We can track, monitor and stop the stolen two wheeler too by this system. The two wheeler position is obtained by the GPS module, which is send to the microcontroller, which then sends the message to the user smart phone through the GSM module. Here Atmel microcontroller, air solenoid and water solenoid valves are interfaced with GSM modem and GPS module which will be fixed in the two wheeler. User can stop the vehicle under theft by android application.**

***Keywords*: GPS, GSM, Android, Two wheeler, solenoid valve.**

I. INTRODUCTION

This paper introduces an Android based tracking and theft prevention system. Vehicle tracking system is a miniature model of Global Positioning System(GPS). GPS is used to find out the position or location of the vehicle around the world. The peltier unit is attached at the exhauster along with the Thermal Electric Generator (TEG). Through this unit the heat energy is converted into power using the peltier effect. The generated power will be stored in battery used in two wheelers. GPS will be fixed in the vehicle to monitor current position of the vehicle. With the help of the GPS value, we can calculate the distance with respect to time. The direction and the distance are fed into the microcontroller and that will be transmitted to GSM through digital modulation techniques. At the receiver end the signal will be detected and demodulated with digital demodulation technique. Then the signal will be given to Android mobile. Android mobile is used to control the air solenoid, water solenoid and power cable in vehicle engine system.

II. SYSTEM ANALYSIS

Despite the various technologies that have been introduced in recent years to deter car thefts and tracking, it was reported that as many as cars were stolen yearly across the world. According to National Crime Information Center (NCIC), in 2006, 1,192,809 motor vehicles were reported stolen, the losses were 7.9$ billion. Several security and tracking systems are designed to assist corporations with large number of vehicles and several usage purposes. They can't permit the owner to communicate with the vehicle online, even if the owner is certain that his vehicle was stolen. The proposed security system in this project is designed to track and monitor vehicles and also to stop the vehicle if stolen and to track it online for retrieval. This system is an integration of several modern embedded and communication technologies.

Fig 1 Block diagram of security system.

To provide location and time information anywhere on Earth, the Global Positioning System (GPS) is commonly used as a space-based global navigation satellite system. The location information provided by GPS systems can be visualized using Google Earth. In wireless data transporting, GSM and SMS technology is a common feature with all network service providers. Utilization of SMS technology has become popular because it is an inexpensive, convenient and accessible way of transferring and receiving data with high reliability. As shown in Fig 1, when the car starts running, the client receives a confirmation SMS that it is running now. If this is illegal operation or any intruders try to run the car, the owner can send SMS to switch off the car. Afterwards, the system will check the mobile number for received message, to confirm that the phone number could access the security system.

1. Structure of anti-theft tracking system

The system has two main units. The first is security unit which is embedded in the vehicle. This unit consists of a GSM modem, GPS receiver, control relay, current sensor and Microcontroller. The current sensor will send an analog signal to the microcontroller when the car is running. The microcontroller will send SMS directly to the owner for conformation. NC control relay contacts are connected with the hot line that powers the fuel pump and ECM. The microcontroller can send a signal to the relay to cut off the

power, when received SMS contains code from owner mobile to stop it. The GPS Receiver retrieves the location information from satellites in the form of latitude and longitude readings in real-time. The Microcontroller processes the GPS information and transmits it to the user using GSM modem by SMS for every 10 minutes.

2. Vehicles retrieval

When the car is in motion, the client receives a confirmation SMS indicating the status. If this is illegal or any intruders tries to run the two wheeler, the owner can send SMS to switch off the two wheeler the system will also check the mobile number of the message sender, to confirm that the phone number is legal or illegal to access the system and if the phone number is legal the system will turn off the two wheeler.

III. DESIGN METHODOLOGY

The aim of this paper is to implement miniature model by using a single chip microcontroller in the vehicle. GPS will be fixed in the vehicle to monitor and to find out location of the vehicle. With the help of the GPS value ,the distance can be calculated with respect to time. The direction and the distance are fed into the microcontroller and that will be transmitted to GSM through digital modulation techniques. At the receiver end the signal will be detected and demodulated with digital demodulation technique. Then the signal will be given to Android mobile. Android mobile is used to control the AIR solenoid, water solenoid and power cable in vehicle engine system. The two wheeler engine is an internal combustion engine. The peltier unit is attached at the exhauster along the Thermal Electric Generator (TEG). Through this unit the heat energy is converted into power using the peltier effect. The generated power will be stored in battery used in two wheelers.

Tracking location date will be send to android mobile through the GPS device from the two wheeler frequently. When the command is activated from the android mobile then the command received by the microcontroller through the GSM modem. Then it will be given to the relay after processing through the driver circuit.

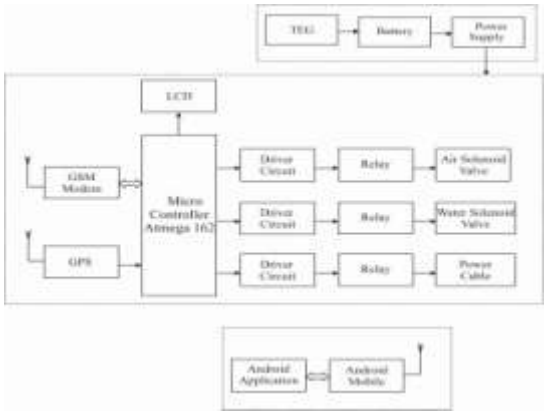

Fig.2 Block diagram for the proposed system

The relay controls the power supply of the solenoid valve and power supply of two wheeler. Solenoid has the battery power. When the power is on, solenoid valve is closed and stops the petrol circulation and exhaust air of the two wheeler. So the two wheeler is automatically stopped by the consumer with help of this system. After deactivating the command the solenoid valve will be opened because the battery power goes off.

IV. HARDWARE IMPLEMENTATION

In this paper GPS, GSM is interfaced with atmega162 v microcontroller. A 16x4 LCD display is used to show some message to the user. First the thermal electrical generator is attached with battery. Small amount of power is generated from the silencer of the bike. AIR solenoid and Then the microcontroller cut the fuel supply into the engine by solenoid valve operation. The solenoid valves are operates by the microcontroller output.

1. ATmega162/V

The ATmega162 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 ATmega162 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed. The ATmega162 provides the following features: 16K bytes of In-System Programmable Flash with read/write capabilities, 512 bytes EEPROM, 1K bytes SRAM, an external memory interface, 35 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary-scan, On-chip Debugging support and programming, four flexible Timer/Counters with compare modes, internal and external interrupts, two serial programmable USARTs, a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and five software selectable power saving modes.

2. GSM SIM 900

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design. SIM900 is designed with a very powerful single-chip processor integrating AMR926EJ-S core. Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm. SMT type suit for customer application. An embedded Powerful TCP/IP protocol stack. Based upon mature and field-proven platform, backed up by our support service, from definition to design and production.

3. GPS

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular

(GPRS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real-time or when analyzing the track later, using customized software. The Global Positioning System (GPS) is actually a constellation of 27 Earth-orbiting satellites (24 in operation and three extras in case one fails). Each of these 3,000- to 4,000-pound solar-powered satellites circles the globe at about 12,000 miles (19,300 km), making two complete rotations every day. The orbits are arranged so that at anytime, anywhere on Earth, there are at least four satellites "visible" in the sky. A GPS receiver's job is to locate four or more of these satellites, figure out the distance to each, and use this information to deduce its own location. This operation is based on a simple mathematical principle called trilateration.

4. Thermoelectric Generator

Thermoelectric generators are all solid-state devices that convert heat into electricity. Unlike traditional dynamic heat engines, thermoelectric generators contain no moving parts and are completely silent. For small applications, thermoelectric can become competitive because they are compact, simple (inexpensive) and scalable. Thermoelectric systems can be easily designed to operate with small heat sources and small temperature differences. Such small generators could be mass produced for use in automotive waste heat recovery or home co-generation of heat and electricity. When high quality combustible fuel is available, internal combustion engines are cost effective and reasonably efficient in the 100 W to 100 kW range but tend to be noisy. For applications requiring less than 100W, the scalability of thermoelectric gives them a clear advantage.

5. Solenoid control valve

A solenoid valve is an electro mechanical valve for use with liquid or gas controlled by running or stopping an electrical current through a solenoid, which is a coil of wire, thus changing the state of the valve. The operation of a solenoid valve is similar to that of a light switch, but typically controls the flow of air or water, whereas a light switch typically controls the flow of electricity. Solenoid valves may have two or more ports. In the case of a two-port valve the flow is switched on or off, in the case of a three-port valve the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold

Fig 3 Auto part solenoid valve

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, close and distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. Besides the plunger-type actuator which is used most frequently, pivoted-armature actuators and rocker actuators are also used.

6. Relay Driver Circuit

Relays are components which allow a low-power circuit to switch a relatively high current on and off, or to control signals that must be electrically isolated from the controlling circuit itself. For a relay to operate, you have to pass a suitable pull-in and holding' current (DC) through its energizing coil. Generally relay coils are designed to operate from a particular supply voltage often 12V or 5V, in the case of many of the small relays used for electronics work. In each case the coil has a resistance which will draw the right pull-in and holding currents when its connected to that supply voltage. So the basic idea is to choose a relay with a coil designed to operate from the supply voltage using for the circuit control (and with contacts capable of switching the currents you want to control), and then provide a suitable 'relay driver' circuit so that your low-power circuitry can control the current through the relay's coil. Typically this will be somewhere between 25mA and 70mA.

V.SOFTWARE IMPLEMENTATION

AVR Studio is a Development Tool for the AT90S Series of AVR microcontrollers. This manual describes the how to install and use AVR Studio. AVR Studio enables the user to fully control execution of programs on the AT90S In-Circuit Emulator or on the built-in AVR Instruction Set Simulator. AVR Studio supports source level execution of Assembly programs assembled with the Atmel Corporation's AVR Assembler and C programs compiled with IAR Systems ICCA90 C Compiler for the AVR microcontrollers. AVR Studio runs under Microsoft Windows95 and Microsoft Windows NT. AVR Studio enables execution of AVR programs on an AVR in-Circuit Emulator or the built-in AVR Instruction Set Simulator. In order to execute a program using AVR Studio, it must first be compiled with IAR Systems C Compiler or assembled with Atmel's AVR Assembler to generate an object file which can be read by AVR Studio.

AVR Studio incorporates a number of different commands. The commands can be given in various ways: through menu selections, toolbar buttons and by keyboard shortcuts.

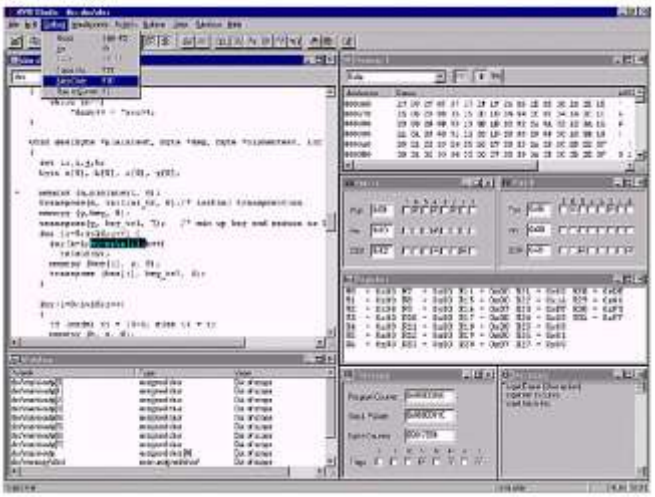

Fig 4. AVR Studio during execution.

The key window in AVR Studio is the Source window. When an object file is opened, the Source window is automatically created. That is shown in Fig 4. The Source window gives information about the control flow of the program. In addition, AVR Studio offers a number of other windows which enables the user to have full control of the status of every element in the execution target.

VI. EXPERIMENTAL PROCESS

The execution starts from the GSM modem. When the two wheeler engine starts, it will send the message to owner mobile. Then GPS sends the location of the two wheeler to the owner smart phone frequently. If the owner wants to stop the stolen two wheeler, he activates the command from the android mobile. Activated command will be received in the microcontroller through GSM module.

Fig 5.GSM and GPS interfaced with microcontroller and solenoid valves connected with driver relay circuit.

Then the microcontroller cut the fuel supply into the engine by solenoid valve operation. The solenoid valves are operated by the microcontroller output.

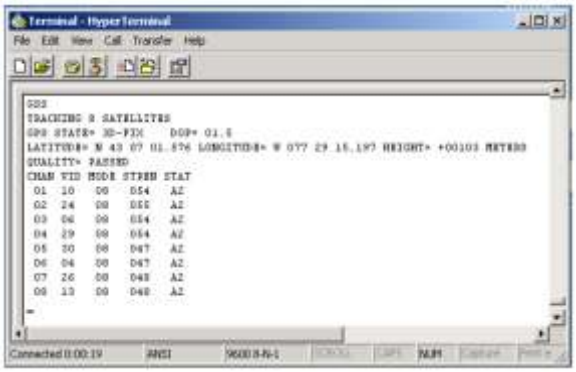

Fig 6. GPS simulation output at hyperTerminal.

Enter the GPS Signal Status command ***GSS<enter>***, to view the satellites currently tracked by the GPS receiver. Figure 6 shows a typical response from GPS.

Fig 7.GSM data transmission simulation result.

HyperTerminal software is now ready for sending and receiving serial data. Fig 7 show how to use two different terminal program to exchange data with embedded application.

VII.CONCLUSION

In this paper, theft prevention system for two wheeler based on GSM is implement. Dedicated android application is designed for control the solenoid valves through the atmega microcontroller. Thermal electrical generator is also fixed on the heat surface and it will generate small amount of the power according the peltier effect. GSM and GPS are interfaced with microcontroller and GPS device sends the value to the microcontroller frequently. Then the GSM get the GPS value and it will send the location of the two wheeler to the owner mobile through SMS. Android application is designed for control the solenoid valve. Finally the theft is directly prevented by the two wheeler owner itself.

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