Design and Implementation of a Wi-Fi Based Encryption System

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Abstract*: This paper presents a design and prototype implementation of new home automation system that uses WiFi technology as a network infrastructure connecting its parts. The proposed system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. Users and system administrator can locally (LAN) or remotely (internet) manage and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on WiFi network coverage. System supports a wide range of home automation devices like power management components, and security components. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.*

Keywords: *FPGA, Temperature sensor, ADC, LCD, buzzer*

1. INTRODUCTION

NOWADAYS home and building automation systems are used more and more. On the one hand, they provide increased comfort especially when employed in a private home. On the other hand, automation systems installed in commercial buildings do not only increase comfort, but also allow centralized control of heating, ventilation, air condition and lighting. Hence, they contribute to an overall cost reduction and also to energy saving which is certainly a main issue today.

Existing, well-established systems are based on wired communication. Examples include BACnet, LonWorks and KNX [1]. Employing a traditional wired automation system does not pose a problem as long as the system is planned before and installed during the physical construction of the building. If, however, already existing buildings should be augmented with automation systems, this requires much effort and mush cost since cabling is necessary.

Obviously, wireless systems [1] can come to help here. In the past few years, wireless technologies reached their breakthrough. Wireless based systems, used every day andeverywhere, range from wireless home networks and mobile phones to garage door openers. As of today, little comparative research of wireless automation standards has been done, although such knowledge would provide valuable information to everyone looking for the most suitable system for given requirements.

Our attempt is to display the distance measurement of oil level in truck by ultrasonic sensor and also, measures the current temperature of oil tank as measured degree in Celsius by using temperature sensor and LCD display is used to monitoring the details. From security point of view, fuel level indication and alarm system will be used to indicate fuel level Whenever fuel level will drop below the reserve level, alarm will be activated and the theft will be identified by the system sends the SMS notification and make the call to the driver and oil terminal owner. If the temperature will be very high , then the SMS notification sends to the driver and oil terminal owner by using wi fi

Instead of using the conventional methods like use of popular 8051 series microcontroller, that offers embedded in to other system to function as processing /controlling units. Many new features are being added to enhance the monitoring and tracking operation using recent technologies. The system will help the owner vehicle who is at remote location to perform the task of detecting the fuel theft and tracking the vehicle accurately and continuously.

2. LITERATURE SURVEY

"VEHICLE TRACKING AND LOCKING SYSTEM BASED ON GSM AND GPS"

This proposed method have focus on vehicle tracking and locking system. Currently almost of the public having an own vehicle, theft is happening on parking and sometimes driving insecurity places. The safe of vehicles

is extremely essential for public vehicles. Vehicle tracking and locking system installed in the vehicle, to track the place and locking engine motor. The place of the vehicle identified using Global Positioning system (GPS) and Global system mobile communication (GSM). These systems constantly watch a moving Vehicle and report the status on demand. When the theft identified, the responsible person send SMS to the microcontroller, then microcontroller issue the control signals to stop the engine motor. Authorized person need to send the password to controller to restart the vehicle and open the door. This is more secured, reliable and low cost.

"PETROL LEVEL DETECTION USING ULTRASONIC SENSOR"

This proposed method has mainly focuses at many of the petrol pumps wouldn't fill the exact amount of petrol as shown by the filling machine. The amount of petrol we get is somewhat less than the amount we should actually get. In today's modern and digital world, if the fuel indicator in the vehicles is made digital, then it will help us to know the exact amount of fuel available/filled in the tank. The above fact is considered in our project. The exact amount of fuel available in the tank will be displayed digitally by making the use of Ultrasonic sensor. The ultrasonic sensor is a non-contact sensor, with low power requirement and good accuracy. It overcomes the problems faced by other gauges and is suitable for the non-contact measurement of the fuel inside the tank. This project mainly concentrates on the digital indication of fuel in vehicle's tank.

"FUEL MONITORING AND VEHICLE TRACKING USING GPS, GSM AND MSP430F149"

This proposed method mainly focuses the fuel monitoring and vehicle tracking. In today's world, actual record of fuel filled and fuel consumption in vehicles is not maintained. It results in a financial loss. To avoid this we are implementing a microcontroller based fuel monitoring and vehicle tracking system. We have used the reed switch which works according to the principle of Hall Effect for sensing the amount of fuel filled in the vehicle and amount of fuel consumed. Then this record is stored in the system memory. We have used the MSP430F149 microcontroller for our system. It is a ultra low power, 16 bit RISC architecture controller. It contains inbuilt 12 bit ADC, serial communication interface. Real Time Clock (RTC) is also provided to keep the track of time. Also we have used the GPS technology to track the vehicle. In this paper, the implementation of embedded control system based on the microcontroller is presented. The embedded control system can achieve many tasks of the effective fleet management, such as fuel monitoring, vehicle tracking. Using GPS vehicle tracking technology and viewing interactive maps enable us to see where it was losing money, time and wasting fuel (such as on duplicated journeys).

3. SYSTEM ARCHITECTURE

3.1. Introduction

This design consists of TWO sensor, GSM module. The sensors used are ultrasonic sensor and temperature sensor. Output of sensor will send to the AT89C51 Microcontroller for further process. These all nodes of sensors are connected to the Microcontroller of the system architecture.

3.2. Block Diagram

Below is the block diagram showing the function of the system.

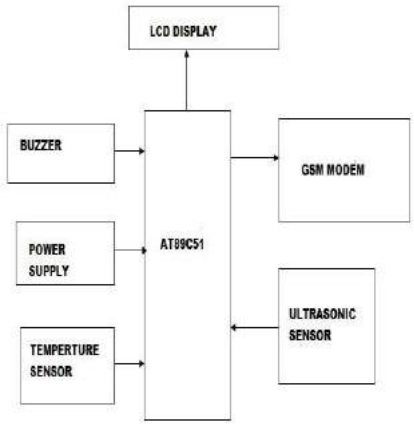

Fig1. *Block diagram of The system*

AT89C51 Microcontroller: In this hardware we have used AT89C51 microcontroller. It is 8 bit microcontroller having four ports. Each port is 8 bit. It has 4K bytes of flash, 128 bytes of RAM two 16-bit timer/counters. We have

written the program in assembly languages. This program is compiled and Hex code is generated by software. This hex file is burnt into the microcontroller by universal ROM burner. As this microcontroller has some memory space so we can store large number of data. The Microcontroller is the main control unit which will monitor the data from Ultrasonic sensor and temperature sensor and control the LCD and GSM modem.

Ultrasonic sensor: Ultrasonic sensor is used to sense the distance, this is interfaced to micro controller. The Ultrasonic sensor's echo and trigger pins are connected to the controller. Ultrasonic sensor works on the principle of echo. The ultrasonic transmitter periodically emits ultrasonic signals waves to fuel of the tank and the reflected waves are received. Time required for the reflected waves is recorded and accordingly the distance is calculated by knowing the speed of transmitted waves.

ADC: ADC is analog to digital converter. Output of temperature sensor is in analog

LM35 Temperature Sensor : The LM35 is a temperature sensor, whose output voltage is linearly proportional to the Celsius temperature. This sensor will sense the temperature in the fuel tank. LM35 gives analog reading and microcontroller process digital data so we have to use a midway converter from Analog to Digital i.e. AD0804.

form and the 8051 microcontroller is not able to read the analog voltage signal, so we have used analog to digital converter. ADC reads the analog input voltage and gives digital output data which is corresponding to the analog data received. The output of ADC is 8bit format which is compatible to the microcontroller.

GSM Modem: GSM modem is used to send messages and make the calls to the oil terminal owner and driver. We have to insert a GSM simcard into this GSM modem. Microcontroller sends the commands for sending SMS and Call to the GSM modem. These commands are sent through serial communication port. Whenever the fuel level is decreased and the temperature level is

4.CIRCUIT DIAGRAM

This design consists of TWO sensor, GSM module. The sensors used are ultrasonic sensor and temperature sensor. Output of sensor will send to the AT89C51 Microcontroller for further process. These all nodes of sensors are connected to the Microcontroller of the system architecture.

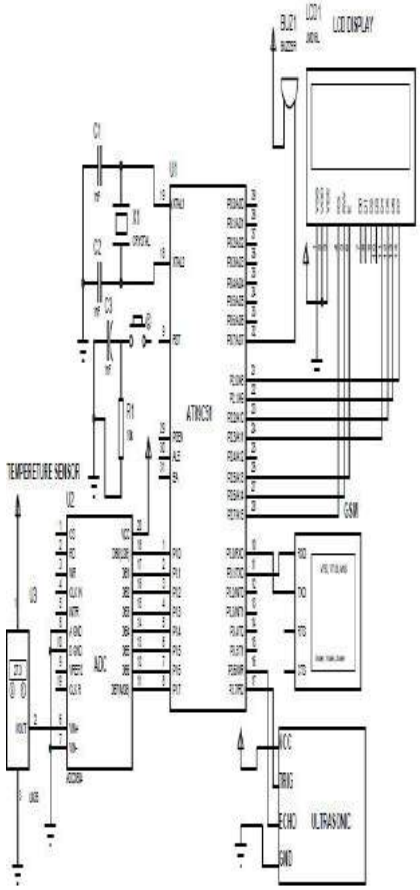

Fig 2.circuit diagram

increased, then the SMS will send to the driver and owner.

LCD Display: Display units shows the amount of fuel and temperature of the fuel digitally it also used to show the location of the truck by using GPS receiver.

Buzzer: It is an audio signaling device. It is used as a alarm to prevent the fuel theft. If the theft will be occurred, then the alarm will ring.

5. HARDWARE DISCRIPTION

In this design a system that can alert before if the theft is occurred.

5.1. AT89C51 Micro Controller

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4Kbytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard MCS-51™ instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. The AT89C51 provides the following standard features: 4 K bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator and clock circuitry.

AT89C51 has an inbuilt UART for serial communication. It can be programmed to operate at different baud rates. In addition, the AT89C51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The Power Down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

5.2 Ultrasonic Sensor

HC-SR04 ultrasonic module is designed to measure the range of the object in the embedded projects. It offers excellent range detection with high accuracy and stable readings. The operation of the module is not affected by the sunlight or black material. Its compact size, higher range and easy usability make it a handy sensor for distance measurement and mapping. The distance can be measured using pulse echo and phase measurement method. The ultrasonic module transmits a signal to the object, then receives echo signal from the object and produces output signal whose time period is proportional to the distance of the object. The mechanism of the ultra sonic sensor is similar to the RADAR (Radio detection and ranging). Ultrasonic transducers were chosen for this because they are more reliable and have a greater range than IR sensors (effectiveness of IR sensors varies with ambient light level).

Fig 3 Ultrasonic sensor

5.3 Temperature sensor

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level.

The LM35 device draws only 60μA from the supply. It has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy). This sensor is connected to pin number 6 of the PIC controller

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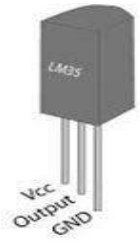

fig 4 pin diagram of temperature sensor

5.4 ADC

To be able to implement analog to digital conversion using the ADC0804LCN 8-bit A/D converter. The temperature sensor gives the analog output voltage based on the temperature of the room.This analog voltage is fed to the A/D converter. The A/D converter then converts the analog input voltage from the temperature sensor into equivalent binary bits. The converted binary data from the A/D converter is applied to microcontroller. The microcontroller reads binary data from A/D converter, convert it to suitable form and performs different operations based on the value of temperature read from A/D converter.

5.5 GSM

GSM modem is similar to mobile phone without any display, keypad and speakers. This accepts a SIM card, and operates over a subscription to a mobile operator. GSM modem can accept any GSM network operator SIM card and act just like a mobile phone. More than 690 mobile networks provides GSM services across 213 countries and GSM represents 82.4% of all global mobile connections . Besides the voice communication it also offers short messages services (SMS) and General packet radio services (GPRS) to transfer data. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot.

It operates at either the 900 MHz or 1800 MHz frequency band, in addition there are two others frequency bands but most common are mentioned above. The transmission rate of GSM is 270 kbps. The GSM modem utilized the GSM network to send the location of the theft and send alert SMS to the driver . The modem can be controlled by the microcontroller. The GSM modem has capacitors and resistors for their proper working and LEDs for indicating the network status. The network status pin does depict the status of accessing network right away when we turn the circuit "ON". To represent it we used a green LED whose status will be that it will blink rapidly when like to acquire network and blink slowly after the assessment of network.

5.6 Magnetic Buzzer

It is an audio signaling device. It is use as a alarm to avoid petrol theft.

5.7 Display

Display units shows the amount of fuel digitally and also the distance the vehicle can cover

5.8 Power Supply Regulation Stage

All digital circuits require regulated power supply. Fig. shows the basic block diagram of a fixed regulated power supply. Let us go through each block.

Step down Transformer: Step down transformer is used to reduce the voltage according to therequired voltage of the circuit. Most of the circuit needs 5V to 12V only. Here it used 12V transformer to get 12V as output by giving 230V as input.

Bridge Rectifier: The output from the transformer is in AC, but the supply for circuit in DC. So it needsto rectify the AC output to DC output. So the diodes are used to build a Bridge rectifier circuit to convert the 12VAC to 12VDC. A smoothing capacitor can be used at the output side of the rectifier to get a constant voltage. Bridge Rectifier consists of four diodes namely D1, D2, D3 and D4. During the positive half cycle diodes D1 & D4 conduct whereas in the negative half cycle diodes D2 & D3 conduct.

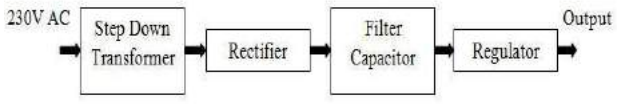

Fig5. *Block diagram of power supply*

Voltage Regulator 7805: The output DC voltage now available is 12V but it has to be converted into5V since the transistor base voltage should be in the range of 5V-6V. Voltage regulators are used in the circuits to provide a constant required voltage and to avoid major fluctuations in the voltage to the circuit. It has 3 pins. The input pin, ground pin

and output pin. The input voltage must be within the range of 5V to 30V. So the voltage regulator regulates the voltage to 5V.

6. SOFTWARE DISCRIPTION

KEIL µ VISION 3

Keil software provides the premier MCS51 development tools to industry .The keil software comprises of different tool kits. A tool kit consist of several application program that we can use to create our MCS51 application .When we use keil software for our project the development cycle is some what similar to a software development project .It consist of creating source file in C or assembly language compiling or assembling the source files debugging error in the source file, linking file from complier and assembler and finally building a project linking all the files and testing the linked application.

7. RESULT

Fig 6 snapshot of the project

Fig 7 shows the distance and temperature

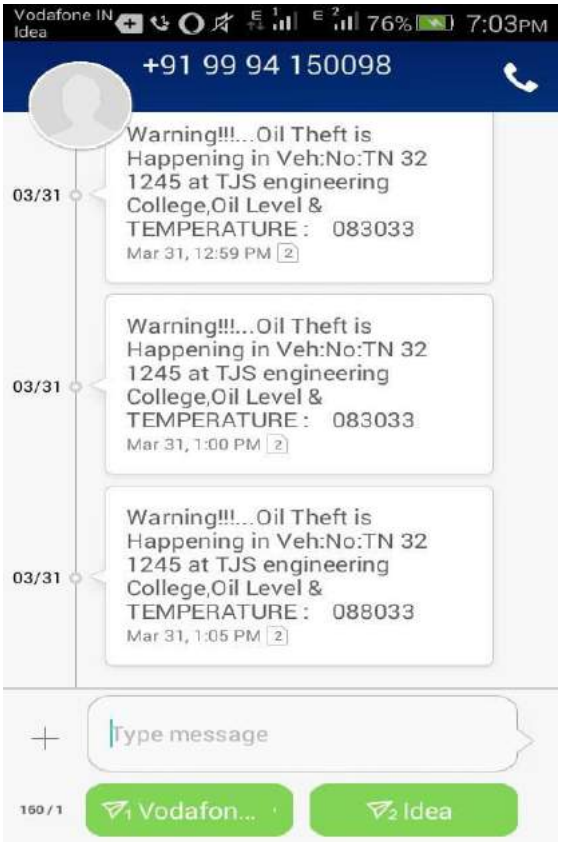

Fig 8 shows the alert message to the driver and owner of the terminal

8. ADVANTAGES

In this system, Ultrasonic sensor is used to detect the exact amount of available fuel in the loader truck. Temperature sensor is used to detect the temperature inside the fuel tank. Cost is very reliable. Temperature sensor is used to identify the temperature. In this system , the oil theft is identified and the SMS notifications will be send to the oil terminal owner.

9. CONCLUSION

This model proposed in this paper, the automatic oil tank truck alarming system from illegal fuel hoarding and oil smuggling is present. . The system use GPS receiver to retrieve coordinate of illegal fuel hoarding while the GSM module send that coordinate through warning SMS. The GSM module send that warning SMS and make the call to the driver and oil terminal . Ultrasonic sensor is used to detect the opened bottom loader trunk. Testing conducted on the prototype shows that

the prototype can automatically do a basic task to protect oil distribution from oil terminal to gas station, gas station to gas station, then go back to oil terminal. The prototype is able to detect illegal fuel hoarding and oil smuggling then send warning SMS that included the illegal fuel. The prototype is also detect the temperature level inside the fuel tank and send SMS to the driver and owner. This system is expected to be much cheaper and effective than previous method.

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