IJMTARC – VOLUME – IV – ISSUE - 16 - DEC 2016 ISSN: 2320-1363

AN IOT BASED ANTI-THEFT VEHICLE TRACKING & ACCIDENT PREVENTION BY VEHICLE HEALTH MONITORING

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Abstract: 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.

1. INTRODUCTION

Fatal road accidents can be easily avoided by understanding the psychological parameters of the driver and by continuously monitoring the parameters of the vehicle. In some cases, the vehicle can be theft by some another person's when the vehicle can parking at parking place or another place. In a critical situation many vehicles faces accident, due to this lot of person lost their lives. After that accident also some life can be saved but due to lack of information, time and place it may not be possible. My project will provide an optimum solution to that draw back. Suppose when a person met with an accident, at that time ignition switch can activate and gives location information through SMS to the number stored in the micro-controller will send a SMS message through GSM modem. The micro-controller based system in the vehicle is provided with an interface that connects to a mobile phone through GSM. The software inside the micro-controller is programmed to send alert message to the stored mobile number automatically, in case of an accident or collision. The system will send a message to the stored number as an SMS message. and also sends accident location based on longitudinal and latitudinal values through

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GPS.So, our project entitled "An IOT based anti-theft vehicle tracking & accident prevention by vehicle health monitoring" aims to avoid accidents by continuously monitoring almost all the possible parameters of the vehicle that are responsible for occurring accidents. An Internet of Things (IOT) enabled sensors are used to transmit the entire data collected by sensors over a smart grid network for quick response team actions under emergency conditions.

1.1 INTERNET OF THINGS:

The proposed project is an "IOT based vehicle accident prevention & vehicle health monitoring". The IOT is an "interconnection of uniquely identifiable embedded computing devices within the existing internet infrastructure" it makes use of IP protocol version 6 as it has large address capability. Typically, IOT offers advanced connectivity of devices, systems and services that goes beyond machine to machine communications (M2M) and covers a variety of protocols, domains and applications. The interconnection of these embedded devices is implemented in nearly all fields of automation like industries, home automation, medical and health care enabling advanced applications like a smart grid. The term THINGS in the IOT refers to a wide variety of devices such as automobiles with built-in sensors etc.

1.2 OVERVIEW OF EMBEDDED SYSTEMS:

An embedded system is a special purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.An embedded system is some

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combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation.

1.3 APPLICATIONS OF EMBEDDED SYSTEM: In recent days, you are showered with variety of information about these embedded controllers in many places. The computer you use to compose your mails, or create a document or analyze the database is known as the standard desktop computer. These desktop computers are manufactured to serve many purposes and applications. You need to install the relevant software to get the required processing facility. So, these desktop computers can do many things. In contrast, embedded controllers carryout a specific work for which they are designed. Most of the time, engineers design these embedded controllers with a specific goal in mind. So these controllers cannot be used in any other place.

1.3.1 Military and aerospace software applications: From in-orbit embedded systems to jumbo jets to vital battlefield networks, designers of mission-critical aerospace and defense systems requiring real-time performance, scalability, and high-availability facilities consistently turn to the Lynx OS® RTOS and the LynxOS-178 RTOS for software certification to DO-178B.Rich in system resources and networking services, Lynx OS provides an off-the-shelf software platform with hard real-time response backed by powerful distributed computing (CORBA), high reliability, software certification, and long-term support options.

1.3.2 Electronics applications and consumer devices:

And as the wireless appliance revolution rolls on, web-enabled navigation systems, radios, personal communication devices, phones and PDAs all benefit from the cost-effective dependability, proven stability and

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full product life-cycle support opportunities associated with Blue Cat embedded Linux.

2. BLOCK DIAGRAM

The block diagram of an IOT based anti-theft vehicle tracking & accident prevention by vehicle's health monitoring is as shown in the below fig:

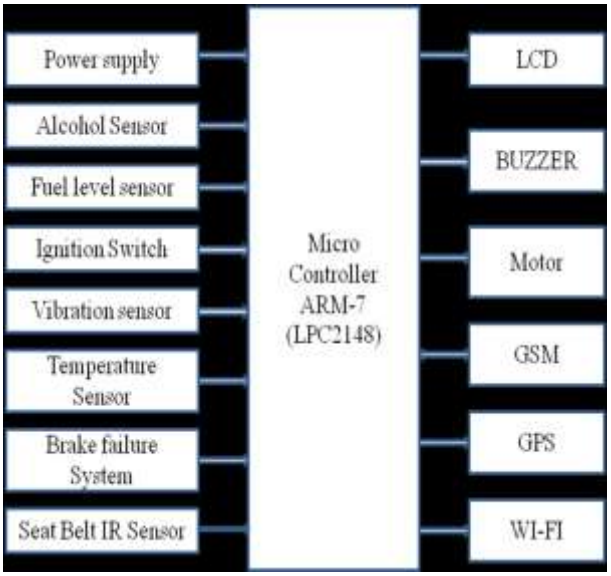

Fig 2.1 Block diagram

2.1 PROJECT DESCRIPTION:

To monitor the parameters of the vehicle we use different sensors. They are:

1. Temperature sensor
2. Fuel Sensor
3. Gas Sensor
4. Brake Failure system
5. Seat belt IR sensors
6. Alcohol Sensor
7. Vibration sensor

And the microcontroller which we are going to use is "ARM7(LPC2148)", and the display device which we use is LCD, to run the vehicle we will use engine motor, to indicate the abnormal conditions we use buzzer. to make the communication possible between the embedded computing devices we use WI-FI module.

Fig 2.2 Circuit Diagram of the Project

Power supply: Switch on the power supply, the voltage which we get from the power supply is 230 volts a.c. But, the voltage which we need is 3.3 volts dc. So, by

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connecting the adapter the voltage gets converted into 9 volts d.c.to convert 9 volts into pure d.c we will use rectifiers and filters. The output of rectifier is pulsating d.c, to get pure d.c we will make use of capacitor filter.The voltage regulator is used to convert 9 volts d.c to 5 volts dc, the operating voltage of ARM is 3.3 volts, so to convert 5 volts into 3.3 volts we use LM1117 IC.

Ignition switch: Ignition switch acts like a normal key which is used to start the engine motor and stop the engine motor. As we switch on the power supply, after the driver gives the ignition key all the sensors starts monitoring the parameters of the vehicle.

Vibration Sensor: Whenever glass of the vehicle will breaked, at that time vibrating sensor activated and sends SMS through GSM.

Alcohol sensor: Alcohol Sensor is a complete alcohol sensor module for Adriano or Seeding. If the person consumes alcohol the alcohol sensor activated and the information will send to the owner through GPS.

Temperature sensor: The temperature will continuously monitors the status of the engine. If the engine gets heated the temperature sensor will be on and it will indicate it to the driver through buzzer sound and send the information through GSM and Wi-Fi.

Seat belt IR sensor: If the person do not wear the seat belt it will be indicated to the driver through buzzer sound.

Fuel level sensor: If the fuel level in the vehicle is less than the desired level then it will be indicated to the driver through buzzer sound and also sends information like fuel empty through the GSM and Wi-Fi.

Brake failure system: A brake failure is a mechanical device used to connect and disconnect an electric circuit. If any brake fails then there is possibility of occurrence of accidents. So, to avoid the accident the brake failure system is used.

LCD: LCD is stands for liquid crystal display. LCD display used here is having 16X2 size.it means 2 lines each with 16 character, which is used to display to which we are sending and receiving the messages.

Motor: Motor is a device which can coverts electrical energy to mechanical energy. In this project, whenever ignition switch is

ON, engine motor should be ON which is used to move the car.

GSM: In this project, we are using GSM which is used to transfer the alert messages to the owner of the car. Whenever vibrating sensor or crudle switch or ignition switch is activated, at that time message can be send through GSM.

GPS: The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.

3. MICRO CONTROLLER

3.1 INTRODUCTION:

This chapter consists of all the hardware components required for the project implementation. The component selection place in a vital role in the result. Some of the project components are ARM processor, LCD, light sensor, humidity sensor, temperature sensor.

3.2 MICROCONTROLLER(ARM7):

3.2.1 INTRODUCTION:

The ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry's most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications.

The ARM7EJ-S processor is a synthesizable core that provides all the benefits of the ARM7TDMI low power consumption, small size, and the thumb instruction set while also incorporating ARM's latest DSP extensions and enabling acceleration of java-based applications. Compatible with the ARM9™, ARM9E™, and ARM10™ families, and Strong-Arm® architecture software written for the ARM7TDMI processor is 100% binary-compatible with other members of the ARM7 family and forwards-compatible with the ARM9, ARM9E, and ARM10 families, as well as products in Intel's

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Strong ARM and x scale architectures. This gives designers a choice of software-compatible processors with strong price-performance points.

3.3ARM7 TDMI:

The ARM7TDMI core uses a three-stage pipeline to increase the flow of instructions to the processor. This allows multiple simultaneous operations to take place and continuous operation of the processing and memory systems. The instructions are executed in three stages: fetch, decode and execute.

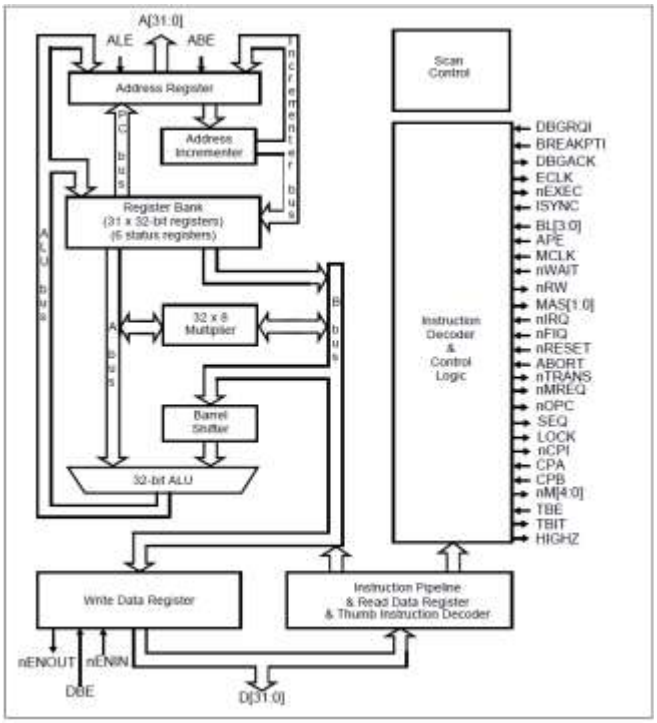

Fig 3.1: ARM7TDMI Core Diagram

Operating modes:

The ARM7TDMI core has seven modes of operation:

User mode is the usual program execution state

allow very fast interrupt processing and to preserve values across

interrupt calls

System mode is a privileged user mode for the operating system

Undefined mode is entered when an undefined instruction is executed.

3.3.1 ARM7TDMI processor core:

The ARM7TDMI processor core implements the ARMv4T Instruction Set Architecture (ISA).This is a superset of the ARMv4 ISA which adds support for the 16-bit Thumb instruction set. Software using the Thumb instruction set is compatible with all members of the ARM Thumb family, including ARM9, ARM9E, and ARM10 families.

Load and store instructions:

Single or multiple registers can be loaded and stored at one time. Load and store single register instructions can transfer a 32-bit word, a 16-bit half word, or an 8-bit byte between memory and a register. Byte and half word loads can be automatically zero

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extended or sign extended as they are loaded. Load and store instructions have three primary addressing modes:

- offset
- pre-indexed
- post-indexed.

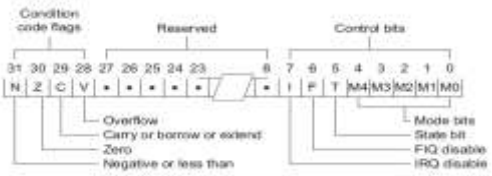

Fig 3.2: Load and store instructions

4.3.2 Advantages:

- Simple hardware
- Small die size
- Low power consumption
- Simple decoding
- Higher performance
- Easy to implement an effective pipelined structure.

3.3.3 Disadvantages:

- Performance depends on compiler
- Poor code density
- RISC has a fixed size of instruction format

3.3.4 Applications:

Using the ARMv7 architecture, ARM can strengthen its position as a low-power/performance leader while conquering new markets to carry its cores up in high performance and down in the low-cost high-volume domain of the microcontroller ARM designs the technology.

3.4 LPC2148 MICROCONTROLLER:

LPC2148 microcontroller board based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

3.4.1 LPC2148 microcontroller architecture

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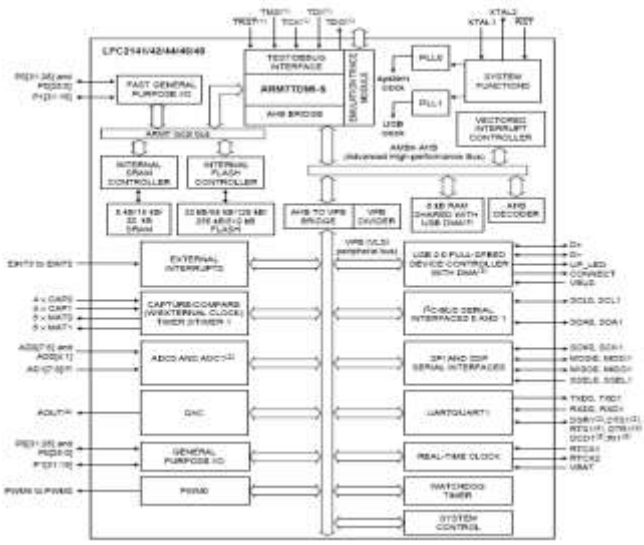

Fig 3.3: LPC2148 Microcontroller Architecture

3.4.2 PIN diagram:

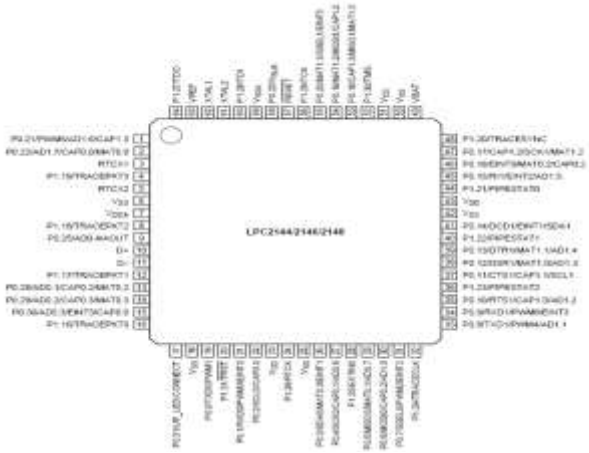

Fig 3.4: LPC2148 Microcontroller Pin Diagram

On-chip static RAM:

On-chip static RAM may be used for code and/or data storage. The SRAM may be accessed as 8-bit, 16-bit, and 32-bit. The LPC2141, LPC2142/44 and LPC2146/48 provide 8 KB, 16 KB and 32 KB of static RAM respectively. In case of LPC2146/48 only, an 8 KB SRAM block intended to be utilized mainly by the USB can also be used as a general purpose RAM for data storage and code storage and execution.

Fast general purpose parallel I/O (GPIO):

Device pins that are not connected to a specific peripheral function are controlled by the GPIO registers. Pins may be dynamically configured as inputs or outputs. Separate registers allow setting or clearing any number of outputs simultaneously.

4. HARDWARE MODULES

4.1. REGULATED POWER SUPPLY:

There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function. For example consider a 5V regulated supply:

Each of the blocks is described in more detail below:

Transformer - steps down high voltage AC mains to low voltage AC.

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Rectifier - converts AC to DC, but the DC output is varying.

Smoothing - smoothes the DC from varying greatly to a small ripple.

Regulator - eliminates ripple by setting DC output to a fixed voltage.

Power supplies made from these blocks are described below with a circuit diagram and a graph of their output:

Transformer + Rectifier + Smoothing + Regulator

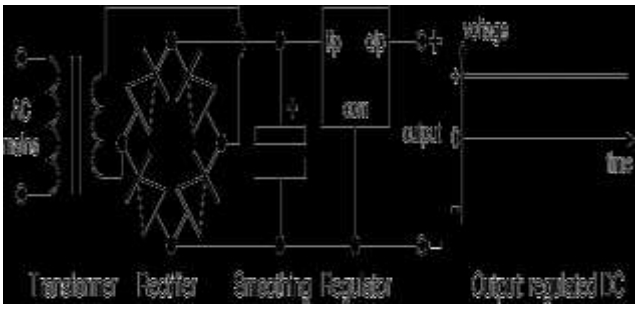

Fig4.1: Block Diagram of a Regulated Power Supply

Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection'). Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right.

Circuit Features:

Brief description of operation: Gives out well regulated +5V output, output current capability of 100mA

Circuit protection: Built-in overheating protection shuts down output when regulator IC gets too hot

Circuit complexity: Very simple and easy to build

Circuit performance: Very stable +5V output voltage, reliable operation

Availability of components: Easy to get, uses only very common basic components.

4.2 GSM MODEM:

4.2.1 Definitions:

The words, “Mobile Station” (MS) or “Mobile Equipment” (ME) are used for mobile terminal Supporting GSM services. A call from a GSM mobile station to the PSTN is called a “mobile originated call” (MOC) or“Outgoing call”, and a call from a fixed network to a GSM mobile station is called a “mobile Terminated call” (MTC) or “incoming call”.

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GSM (Global System for Mobile communications) is an open, digital cellular

Fig.4.2:GSM

4.2.2 History:

In 1980's the analog cellular telephone systems were growing rapidly all throughout Europe, France and Germany. Each country defined its own protocols and frequencies to work on.

4.2.3 Basics of working and specifications of GSM :

The GSM architecture is nothing but a network of computers. The system has to partition available frequency and assign only that part of the frequency spectrum to any base transreceiver station and also has to reuse the scarce frequency as often as possible.

5. ADVANTAGES & APPLICATIONS

5.1. Advantages:

It provides high security and also easy to identify accident location.

Detection of the vehicles when they are theft.

Location of the vehicle can easily find out by using GPS.

We can stop the vehicle if any intrusion is identified.

5.2. Applications:

Solution for rash driving by automatically controlling the vehicle speed.

Tracking and locating the location of accident using GPS and observed details about vehicle through wi-fi

6. CONCLUSION & UTURE SCOPE

This project describes a design of effective security system that provides security to vehicle. prevent the accidents and also intimate the accident location. we can also

monitor the vehicle's health condition.A wireless webcam can be added in this for capturing the images which will help in providing driver`s assistance

7. REFFERENCES

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