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"Theft Detecting Device Based On Internet Of Things"

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Abstract: The main purpose of this project is to prevent vehicle theft. This functionality is achieved by detecting vehicle status in theft mode and by sending an SMS which is generated automatically. This SMS is then sent to the owner of the vehicle. The owner can then send back the SMS in orderto disable the ignition of the vehicle. Thus, in this way crimes can be reduced to a great extent as vehicles today are being stolen in large number. Hence, vehicles today require high security which can be achieved with the help of this application. How the system works is when a person tries tosteal the vehicle, the microcontroller is interrupted and the command is sent to the GSM modem to send SMS. On the receipt of the message, the owner sends back the SMS to the GSM modem. This is done in order to stop the engine. This GSM modem is interfaced to the Arduino. This Arduino on the receipt of the message uses a mechanism that helps to stop the engine. Motor is being used in this project in order to indicate vehicle ON/OFF state. In this project we are using aGPS system that helps to find out the exact position of the vehicle with the help of its latitude andlongitude which then can be sent to the owner of the vehicle via SMS. This data can be then entered by the owner on Google map to find out the exact location of the vehicle.

KEYWORDS: IOT, GSM, GPS

I. INTRODUCTION

Embedded systems are electronic devices that incorporate microprocessors with in Their implementations. The main purposes of the microprocessors are to simplify the system design and provide flexibility. Having a microprocessor in the device means that removing the bugs, making modifications, or adding new features are only matters of rewriting the software that controls the device. Or in other words embedded computer systems are electronic systems that include a microcomputer to perform a specific dedicated application. The computer is hidden inside these products. Embedded systems are ubiquitous. Every week millions of tiny computer chips come pouring out of factories finding their way into our everyday products.

Embedded systems are self-contained programs that are embedded within a piece of hardware. Whereas a regular computer has many different applications and software that can be applied to various tasks, embedded systems are usually set to a specific task that cannot be altered without physically manipulating the circuitry. Another way to **think of an embedded system** is as a computer system that is created with optimal efficiency, thereby allowing it to complete specific functions as quickly as possible.

Embedded systems designers usually have a significant grasp of hardware technologies. They used specific programming languages and software to **develop embedded systems** and manipulatethe equipment. When searching online, companies offer embedded systems development kits andother **embedded systems tools** for use by engineers and businesses.

Embedded systems technologies are usually fairly expensive due to the necessary development time and built in efficiencies, but they are also highly valued in specific industries. Smaller businesses may wish to hire a consultant to determine what sort of **embedded systems** will add value to your organization.

Characteristics

Two major areas of differences are cost and power consumption. Since many embedded systems are produced in the tens of thousands to millions of units range, reducing cost is a major concern.Embedded systems often use a (relatively) slow processor and small memory size to minimize costs.

The slowness is not just clock speed. The whole architecture of the computer is often intentionallysimplified to lower costs. For example, embedded systems often use peripherals controlled by synchronous serial interfaces, which are ten to hundreds of times slower than comparable peripherals used in PCs. Programs on an embedded system often must run with real-time constraints with limited hardware resources: often there is no disk drive, operating system, keyboard or screen.

A flash drive may replace rotating media, and a small keypad and LCD screen may be used insteadof a PC's keyboard and screen. Firmware is the name for software that is embedded in hardware devices, e.g. in one or more ROM/Flash memory IC chips.
Embedded systems are routinely expected to maintain 100% reliability while running continuously for long periods, sometimes measured in years. Firmware is usually developed and tested too muchstricter requirements than is general-purpose software, which can usually be easily restarted if a problem occurs

Platform

There are many different CPU architectures used in embedded designs. This in contrast to the desktop computer market, which as of this writing (2003) is limited to just a few competing architectures, mainly the Intel/AMD x86, and the Apple/Motorola/IBM PowerPC, used in the Apple Macintosh.

One common configuration for embedded systems is the *system on a chip*, an application-specificintegrated circuit, for which the CPU was purchased as intellectual property to add to the IC's design.

Tools

Like a typical computer programmer, embedded system designers use compilers, assemblers anddebuggers to develop an embedded system.

Those software tools can come from several sources:

Software companies that specialize in the embedded market Ported from the GNU software development tools. Sometimes, development tools for a personal computer can be used if the embedded processor is a close relative to a common PC processor.

Embedded system designers also use a few software tools rarely used by typical computer programmers. Some designers keep a utility program to turn data files into code, so that they can include any kind of data in a program. Most designers also have utility programs to add a checksumor CRC to a program, so it can check its program data before executing it.

Operating System

They often have no operating system, or a specialized embedded operating system (often a real- time operating system), or the programmer is assigned to port one of these to the new system.

Debugging

Debugging is usually performed with an in-circuit emulator, or some type of debugger that can interrupt the micro controller's internal microcode.

The microcode interrupt lets the debugger operate in hardware in which only the CPU works. TheCPU-based debugger can be used to test and debug the electronics of the computer from the viewpoint of the CPU. This feature was pioneered on the PDP-11.

Developers should insist on debugging which shows the high-level language, with breakpoints and single stepping, because these features are widely available. Also, developers should write and use simple logging facilities to debug sequences of real-time events.

PC or mainframe programmers first encountering this sort of programming often become confused about design priorities and acceptable methods. Mentoring, code-reviews and ego less programming are recommended.

PROBLEM STATEMENT

- Problem statement of this project is that, once the vehicle is being stolen, owner cannot track and lock their vehicle. The chances to get their vehicle back is very difficult.
- It makes so hard to track the vehicle when there is no evidence. So, this system will track and monitor the vehicle's location using the android application and remotely locking the engine.
- Vehicle tracking system has been nominated as one of the best tracking systems for the losses of the vehicle.
- Generally, GPS tracking uses a system which is useful to find the actual location. So, by improving this system we make use of GPS and android based smart phones.

OBJECTIVES

- IoT based vehicle theft detection system. Inform the owner if intrusion detected
- Smart surveillance system for burglar image capturing
- Autonomous communication between the car and the car owner using Global positioning system (GPS) and Global system mobile communication (GSM) with the help of ESP32 Cam.

GPS Tracking Devices market for commercial vehicles will be a major market in 2020. Deployment of GPS tracker helps to track and monitor commercial vehicles such as trucks, buses, heavy commercial vehicles, Logistics and construction vehicles. The increasing sales of commercial vehicles would increase the adoption of GPS Tracking Devices.

The worldwide vehicle tracking systems market size is expected to reach $15,957.5 million by 2025, from $4,765.0 million in 2017, growing at annual growth rate of 19.9% from 2018 to 2025.

Vehicle Tracking Systems Market comprises the revenue generated from the sales of the complete solution, which includes hardware, software, and other subscription fees associated with the tracking and data reporting technology. This solution takes into the loop the different aspects such as GPS, GSM/ GPRS, digital maps, specialized software, and others.

By tracking and managing these vehicles in real-time, enterprises can efficiently utilize their resources. Vehicle tracking System by Utrack ensures the safety of vehicles. In case of an emergency, untrack helps to locate the vehicles and show the exact location from where a distress signal was received.

Smartphone plays an important role in the day-to-day life. Technological revolution helps manufacturers introduce a variety of smartphones at lower prices. Advancements in technology and different software applications allow smartphone users to access GPS signals to track vehicles, etc

II. LITERATURE REVIEW

Advanced Vehicle Tracking System on Google Earth Using GPS and GSM

In this paper GPS based vehicle tracking/navigation system is implemented. This is done by fetching the information of the vehicle like location, distance, etc. by using GPS and GSM. The information can be transformed with the following features: The information of the vehicle like location, etc. is obtained after every specified time interval defined by the user. Then this periodicinformation of location is transmitted to monitoring or tracking server. This transmitted information is displayed on the display unit by using the google earth to display vehicle location in the electronic google maps.

Vehicle tracking and accident warning System using GPS and its implementation in FPGA

In this paper also the location of the vehicle is determined by using the Global Positioning System.The information from the GPS receiver is sent in the form of SMS to the user with the help of GSM. Once this SMS is received from the user, a response type of message is sent to the owner ofthe vehicle through the GSM modem. A sensor which is named as accelerometer sensor is then used to detect any kind of mishaps or accidents happened with the vehicle also it will trigger somekind of signal in case of any mishappenings. Unlike the microcontroller used in many system thissystem also uses a FPGA Spartan processor is used which manages all the parts responsible in system as according to the program done.

Design and development of GPS-GSM based Tracking system with googlemap based Monitoring

This system uses Global Positioning System (GPS) which is used to receive the coordinates of latitude and longitude form the satellite during the critical information. We all know that tracking system is now-a-days a very important in modern world. This system can be used in the monitoringof soldiers, also in tracking the theft of the vehicle and in many more other applications. This system uses microcontroller, Global Positioning System (GPS) and Global System for Mobile Communication (GSM). This system uses only one GPS device and GSM enable a two-way communication process. GSM modem is providing with a SIM card which uses the same and regular communication process as we are using in regular phone.

GSM and GPS based vehicle location and tracking System

This paper uses to a RF transmitted; the RF transmitter is attached with the vehicle which consistsof its own identification. The data which will be continuously transmitting to the RF receiver thatis connected to the microcontroller. The GPS will receive the location of the vehicle and will transmit this data to the microcontroller. Supposedly the RF transmitter is not receiving the signal from the RF transmitter then the receiving unit triggers a signal to the microcontroller, and from this signal we can identify the theft. If it is identified that the vehicle is theft, then it automatically sends location of the vehicle to its user as the owner of the vehicle receives the information in theform of SMS through the GSM modem. This system is much simpler and cost effective than the others. The vehicle is automatically stopped if a password like SMS sent by the user.

Real-time GPS vehicle tracking system

In this paper implementation and designing of a real-time GPS tracker system via Arduino was applied. This method was applicable for salesman tracking, private driver and for vehicle safety. The author of the paper also tried to solve the problem of owners who have expensive cars to observe and track the vehicle and find out vehicle movement and its past activities of vehicle. Thesystem has GPS/GSM modules controlled by Arduino MEGA placed inside the vehicle. The vehicle position will be updated every time as the vehicle moves. Then User will send SMS on registered number and they will receives the coordinate location. At the same time the data will get stored on SD card continuously. The location will be accessible to users by system via websiteover the internet.

III.EXPERIMENTAL SETUP DESIGN AND COMPONENTS

What is Arduino?

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.
Arduino can be used to develop interactive objects, taking inputs froma variety of switchesor sensors, and controlling variety of lights, motors, and other physical outputs. Arduino projectscan be stand-alone, or they can communicate with software running on your computer (e.g. Flash,Processing, Max MSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.
The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

Why Arduino?
There are many other micro controllers and microcontroller platforms available for physicalcomputing. Parallax Basic Stamp, Net media's BX-24, Phidgets, MIT's Handy board, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interestedamateurs over other systems:

- **Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50
- **Cross-platform** - The Arduino software runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.
- **Simple, clear programming environment** - The Arduino programming environment is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, sostudents learning to program in that environment will be familiar with the look and feel ofArduino
- **Open source and extensible software**- The Arduino software is published as open sourcetools, available for extension by experienced programmers. The language can be expandedthrough C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- **Open source and extensible hardware** - The Arduino is based on Atmel's ATMEGA8 and ATMEGA168/ATMEGA2560 microcontrollers. The plans for the modules are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understandhow it works and save money

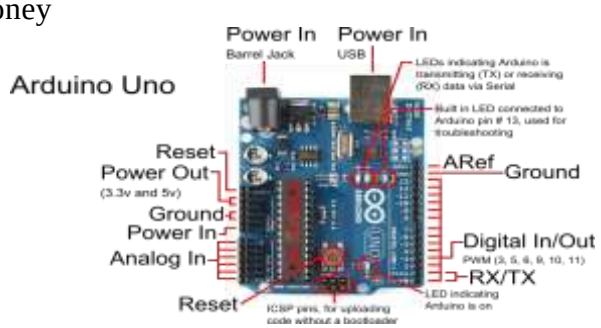

Fig 1 Arduino

ESP32-CAM Development Board: INTRODUCTION

The ESP32-CAM is a full-featured microcontroller that also has an integrated video cameraand micro SD card socket. It's inexpensive and easy to use, and is perfect for IoT devices requiringa camera with advanced functions like image tracking and recognition.

ESP32-CAM is a low-cost ESP32-based development board with onboard camera, small in size. It is an ideal solution for IoT application, prototypes constructions and DIY projects.

The board integrates Wi-Fi, traditional Bluetooth and low power BLE, with 2 high performance 32-bit LX6 CPUs. It adopts 7-stage pipeline architecture, on-chip sensor, Hall sensor, temperature sensor and so on, and its main frequency adjustment ranges from 80MHz to 240MHz.

Fully compliant with Wi-Fi 802.11b/g/n/e/i and Bluetooth 4.2 standards, it can be used as a mastermode to build an independent network controller, or as a slave to other host MCUs to add networking capabilities to existing devices

ESP32-CAM can be widely used in various IoT applications. It is suitable for home smart devices,industrial wireless control, wireless monitoring, QR wireless identification, wireless positioning system signals and other IoT applications. It is an ideal solution for IoT applications.

The ESP32-CAM module has fewer I/O pins than the previous ESP-32 module we looked at. Manyof the GPIO pins are used internally for the camera and the micro SD card port.

Another thing missing from the ESP32-CAM module is a USB port. In order to program this device, you'll need to make use of an FTDI adapter. This will be described further on in this article.

Here is the pinout of the ESP32-CAM Module

Fig 2 Schematic Diagram ESP32-CAM

Dimension Diagram

There are three pins and two pins for power: either 3.3V or 5V.GPIO 1 and GPIO 3 are the serial pins and need these pins to upload code to your board. Additionally, GPIO 0 also plays an important role, since it determines whether the ESP32 is in flashing mode or not. When GPIO 0 isconnected to, the ESP32 is in flashing mode.

The following pins are internally connected to the micro SD card reader:

- GPIO 14: CLK
- GPIO 15: CMD
- GPIO 2: Data 0
- GPIO 4: Data 1 (also connected to the on-board LED)
- GPIO 12: Data 2
- GPIO 13: Data 3

Working with the ESP32-Cam

Using the ESP32-CAM is similar to using the ESP32 modules we looked at previously, with one major difference. The ESP32-CAM board has no USB port, so you can't just connect it up to yourcomputer and start loading programs.

Instead you will need to add an external FTDI adapter. This is the same adapter you would use programming an Arduino Pro Mini, so if you've worked with the Pro Mini then you probably already have one of these.

Hooking up the FTDI Adapter

Here is the hookup diagram for connecting the FTDI adapter to the ESP32 -CAM module:

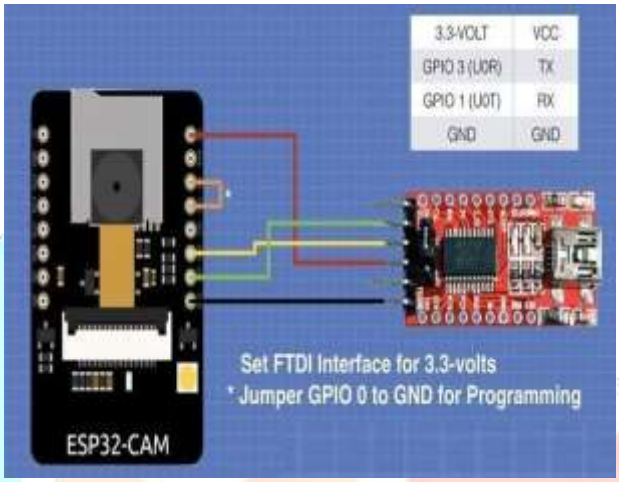

Fig 3: FTDI Adapter

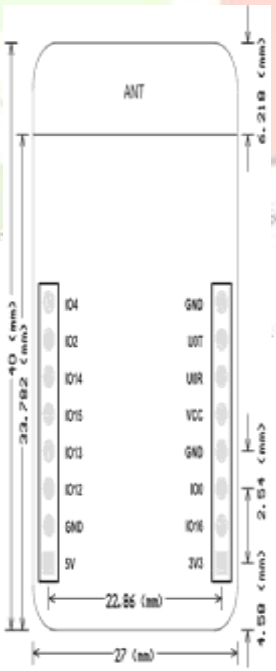

Fig 4 Dimension Diagram

METHODOLOGY

In this Project owner can start the vehicle using some commands to operate the engine on/ off. Any theft person want to start the vehicle then engine will start and send the sms to owner mobilecalled somebody started the vehicle. Then owner is sending the sms to vehicle using#S.NO*. ThenESP32 can will take photo and send on owner mobile Telegram app theft images. Then owner calltack the vehicle as well as stop the vehicle using sms.

BLOCK DIAGRAM

POWER SUPPLY

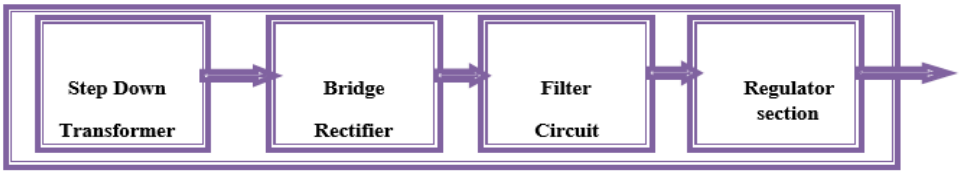

Fig 5: Power Supply

IV.RESULTS AND DISCUSSION

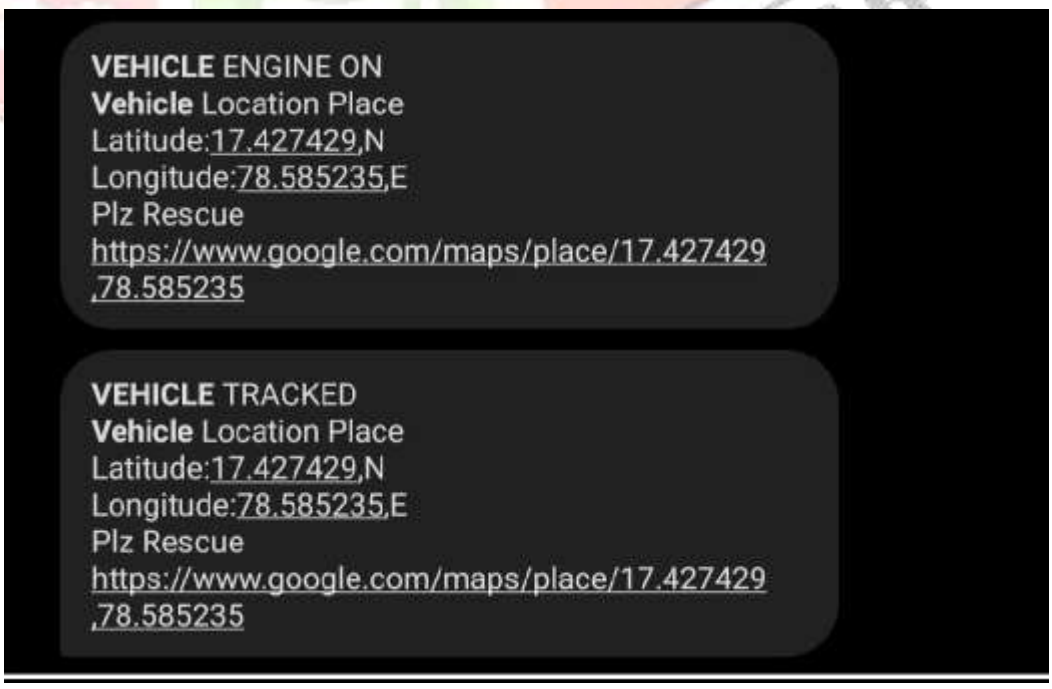

Fig 6: Telegram Results

- IoT based vehicle theft detection system. Inform the owner if intrusion detected
- Smart surveillance system for burglar image capturing
- Autonomous communication between the car and the car owner using Global positioning system (GPS) and Global system mobile communication (GSM) with the help of ESP32 Cam.
- Crimes can be reduced to a great extent as vehicles today are being stolen in large number

V CONCLUSION

The main objective of this thesis was to design and construct a cost-effective system to track position or movements of vehicles using a Network based positioning system. It can say the primary objective was achieved by 100%. The main objective of this undertaking was to develop a cost-effective solution for vehicle movement tracking. That primary objective was met with the development of this vehicle tracking software. This was achieved with the support of location based system (LBS) which uses GSM digital cellular network infrastructure. The customer organization is pretty satisfied with the final version of the vehicle tracking software.The almost all of their functional requirements were met by this vehicle tracking system. The other non-functional requirements such as usability requirements, reliability requirements, performancerequirements, supportability requirements and user interface designs were accomplished as well.

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