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Smart Vehicle Automation with Automobile Black box Using IOT

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ABSTRACT

Build a smart integrated IOT system for automobile to share the parameter of automobile on cloud (AWS). To make an integrated circuit which transfers analog data to the Wi-Fi module ESP8266 on cloud under a Wi-Fi network and then to analyse the data on cloud and further the data can be utilized and represents on a LCD screen. After completion of all process in software we can implement the whole process in vehicle (Two Wheeler). The prototype of an automobile black box system that can be installed used to record the movement parameter of a vehicle mainly used for accident analyses purposes and for safety measures.

Keywords: ESP8266, AT Mega 328P controller, GSM Module.

Introduction

In this paper, the proposed system will be dealing with Global Positioning System (GPS) interfaced with various sensor management system concluded as cloud-vehicle black box system Wireless black box is basically a device that will indicate all the parameters of a vehicle crash and will also store and display its parameters with respective timeline such as date, time, temperature, location, vibration etc. Whenever the accident held the message will sent from the system built inside the car to the registered mobile numbers such as emergency numbers of police stations, hospitals, family members, owner etc. We have used various types of sensors like temperature sensor (DTH11), which is used to measure temperature and humidity. Vibration sensor measures vibrations felt by the car during accident. Alcohol sensors are located on the steering wheel which will indicate whether the driver is drunk. Gyroscopic sensor is used to indicate tilt during the accident. All the parameters sensed by the sensors will send the signal to AT Mega 328P Controller. GSM module, ESP8266 module, GPS module are some of the devices used in our project which helped in accomplishing the output. The advantages of the proposed system is to extract the precise geo location data set with high accuracy and can also monitor the number of clients accessing/connected to the created server page through serial communication. The physical dimensions of the proposed system are in compact level.

1.1 Objective

The main objective of the project is to develop an automated WIFI enabled black box system integrated with sensor management system. In this proposed system we are designing a system which is based on IP (Internet Protocol) technology, which helps in detection of crash with respective real time sensor data and monitor its stats from any part the world. Wi-Fi IP protocol with cloud DNS is a technique used in the proposed system.

2. Details of Esp8266 Wi-Fi Module

ESP8266 is a Wi-Fi SOC (system on a chip) produced by Expressive of Systems. It is ahighly integrated chip designed to provide full internet connectivity in a small package. thischip set used in connectivity or establish a network locally. And also used to extract local ipaddress. ESP8266 can be used as an external Wi-Fi module, using the standard AT Commandset Firmware by connecting it to any microcontroller using the serial UART, or directly serveas a Wi-Fi-enabled micro controller, by programming a new firmware using the provided SDK.The GPIO pins allow Analog and Digital IO, plus PWM, SPI, I2C, etc. This board has beenaroundforalmostayearnow,andhasbeenusedmostlyinIoTcontexts,wherewewanttoaddconnectivityforexample toanIDE project.Awide adoptionhasbeenfacilitated. This is the first and simplest board using the ESP8266. It allows to attach serial lines,and only breaks out two GPIO pins for native usage. This is the second-generationboard,breakingoutmoreGPIOpins,andusingadifferentantenna,plusanexternal antenna connector. Several libraries have been developed to use ESP8266 as a moduleforIDE.

2.1 Block Diagram of Esp8266

TheESP8266usesa32bitprocessorwith16-bit instructions.ItisHarvardarchitecture which mostly means that instruction memory and data memory are completelyseparate.

The ESP8266 has on die program Read-Only Memory (ROM) which includes some library code and a first stage boot loader. All the rest of the code must be stored in external Serial flash memory (provides only serial access to the data - rather than addressing individual bytes, the user reads or writes large contiguous groups of bytes in the address space serially). Depending on your ESP8266, the amount of available flash memory can vary.

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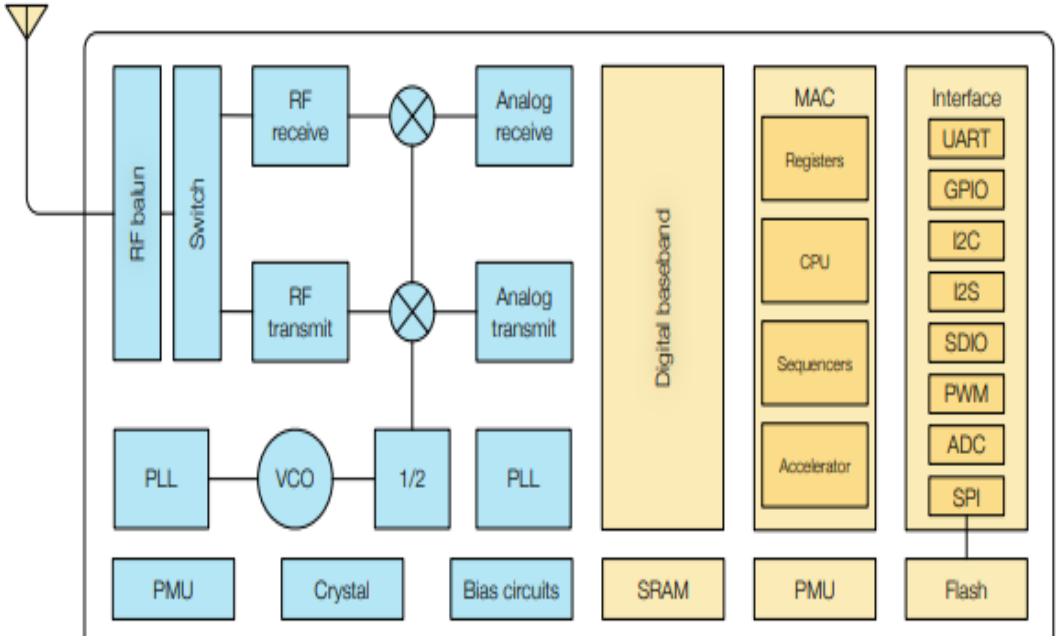

Figure 1 Block diagram of ESP8266

As any other microcontroller, ESP8266 has a set of GPIO pins (General Purpose Input (Output pins) that we can use to "control" external sensors. Our ESP8266 has 17 GPIO pins but only 11 can be used (among 17 pins, 6 are used for communication with the on-board flash memory chip). It also has an analog input (to convert a voltage level into a digital value that can be stored and processed in the ESP8266).It also has a WIFI communication to connect your ESP8266 to your WIFI network, connect to the internet, host a web server, let your Smartphone connect to it, etc. Another advantage of an ESP8266 is that is can be programmed as any other microcontroller and especially any Arduino.

3. U-blox NEO-6M GPS Module

Figure 2 U-blox NEO 6M GPS

The u-blox NEO-6M GPS engine on these modules is quite a good one, and it also has high sensitivity for indoor applications. Furthermore, there's one MS621FE- compatible rechargeable battery for backup and EEPROM for storing configuration settings. The module works well with a DC input in the 3.3- to 5-V range, it is built- with voltage regulator. The original circuit diagram of the module, borrowed from the web, is shown below:

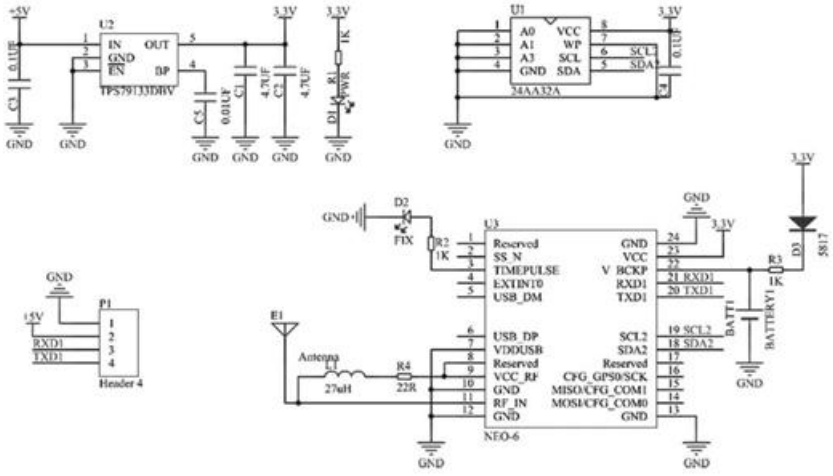

Figure 3 Schematic diagram of MS621FE

As indicated, the GPS modules are based on the u-blox NEO-6M GPS engine. The type number of the NEO-6M is NEO-6M-0-001, and its ROM/FLASH version is ROM 7.0.3 (PCN reference UBX-TN-11047-1). The NEO-6M module includes one configurable UART interface for serial communication, but the default UART (TTL) baud rate here is 9,600. Because the GPS signal is right-hand circular-polarized (RHCP), the style of the GPS antenna will be different from the common whip antennas used for linear polarized signals. The most popular antenna type is the patch antenna. Patch antennas are flat, generally have a ceramic and metal body, and are mounted on a metal base plate. They are often cast in a housing. For more information about u-blox reference designs, the position of the antenna mounting is very crucial for optimal performance of the GPS receiver. When using the patch antenna, it should be oriented parallel to the geographic horizon. The antenna must have full view of the sky, ensuring a direct line of sight with as many visible satellites as possible.

4. DHT Sensor

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal- acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti- interference ability and cost-effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmer in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20-meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to users' request.

When MCU sends a start signal, DHT11 changes from the low-power- consumption mode to the running-mode, waiting for MCU completing the start signal. Once it is completed, DHT11 sends a response signal of 40-bit data that include the relative humidity and temperature information to MCU. Users can choose to collect (read) some data. Without the start signal from MCU, DHT11 will not give the response signal to MCU. Once data is collected, DHT11 will change to the low power-consumption mode until it receives a start signal from MCU again..

5. Vibration sensor

This module features an adjustable potentiometer, a vibration sensor, and a LM393 comparator chip to give an adjustable digital output based on the amount of vibration. The potentiometer can be adjusted to both increase and decrease the sensitivity to the desired amount. The module outputs a logic level high (VCC) when it is triggered and a low (GND) when it isn't. Additionally, there is an onboard LED that turns on when the module is triggered.

6. GSM Module

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply . Using this modem, you can make audio calls, SMS, Read SMS; attend the incoming calls and internet through simple AT commands

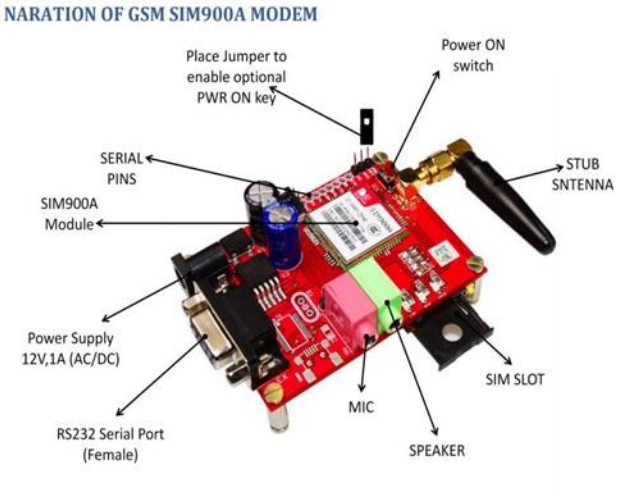

Figure 4 GSM sim900a Modem

7. Power Supply

All digital circuits require regulated DC voltage to operate. Regulated Power supply isa device, which converts, regulates, and transmits the required power to the circuit tobeoperated in given figureprocess.

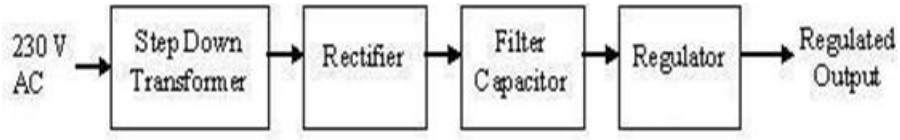

Figure 5 Basic block diagram of a fixed regulated power supply

8. Implementation of all components

Various sensor management system concluded as cloud-based vehicle black box system Wireless black box is basically a device that will indicate all the parameters of a vehicle crash and will also store and display its parameters with respective timeline such as date, time, temperature, location, vibration etc. Whenever the accident held the message will sent from the system built inside the car to the registered mobile numbers such as emergency numbers of police stations, hospitals, family members, owner etc. We have used various types of sensors like temperature sensor (DTH11), which is used to measure temperature and humidity. Vibration sensor measures vibrations felt by the car during accident. Alcohol sensors are located on the steering wheel which will indicate whether the driver is drunk. Gyroscopic sensor is used to indicate tilt during the accident. All the parameters sensed by the sensors will send the signal to AT Mega 328P Controller. GSM module, ESP8266 module, GPS module are some of the devices used in our project which helped in accomplishing the output..

8.1 Block diagram

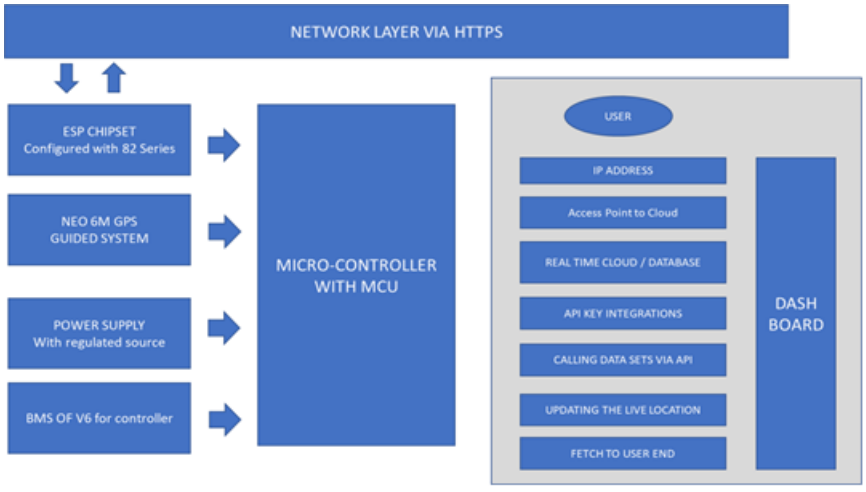

Figure 6 Block diagram of geo logical location pinging through IP address

The proposed system will be dealing with global positioning system and it is used to extract data sets like location altitude, speed, date and time with IDE with Node MCU 12E. A local web server can be created using Node MCU and the geo location details are updated in the server. The extracted datasets will be linked with respected string and uploaded in the server followed by sensors data. A direct access will be enabled in the form of link and it is to be checked the geo location on Google maps through the updated link in the server. By open this server logged page and can check the geo location from anywhere through activate port with the help of your modem/router.

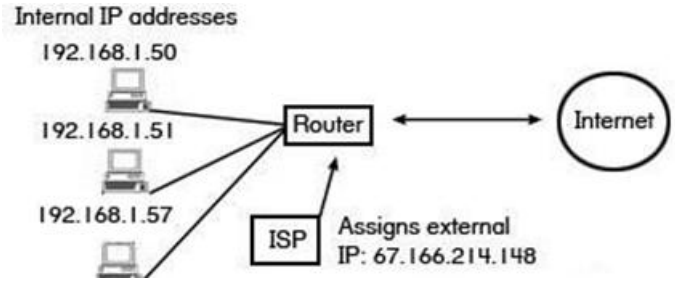

Figure 7 Internal IP addresses

The advantages of the proposed work is to extract the precise geo location data set with high accuracy and can also monitor the number of clients accessing/connected to the created server page through serial communication. The physical dimensions of the proposed system is in compact level.

9. Scope and Technical approach

The proposed work is to extract the precise geo location data set with high accuracy and can also monitor the number of clients accessing/connected to the created server page through serial communication. The physical dimensions of the proposed system is in compact level. Development of pinging geo location technology system is now reliable, longer life, cheaper with low maintenance, higher level of communication system and a baud rate of 115200, more focus on development in hardware and software IDE modules, it is precise to expect a 98% saving of accuracy in geo location.

10. Output

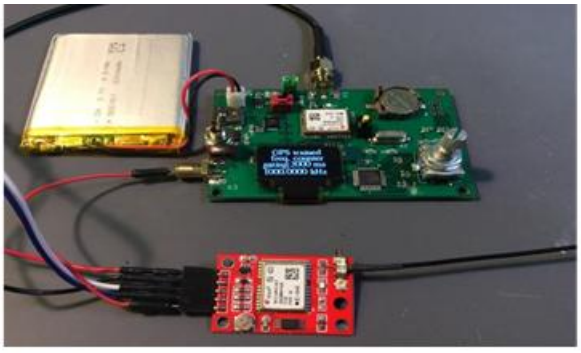

Figure 8 Hardware implementation with all components

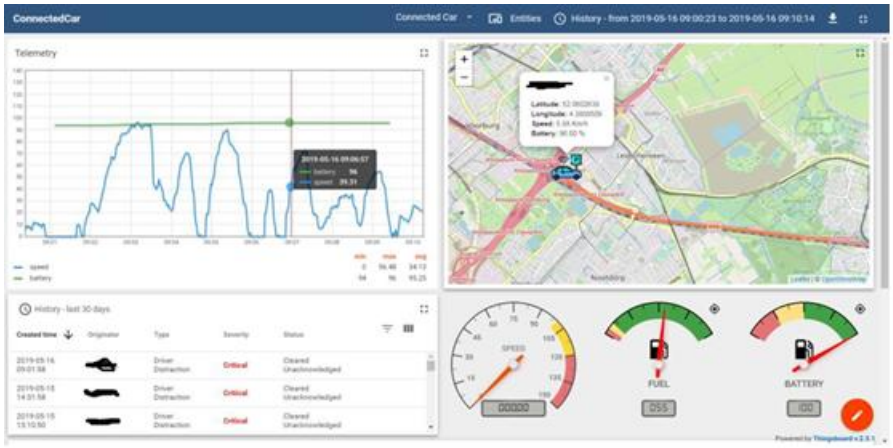

Figure 9 Output successful network establishment

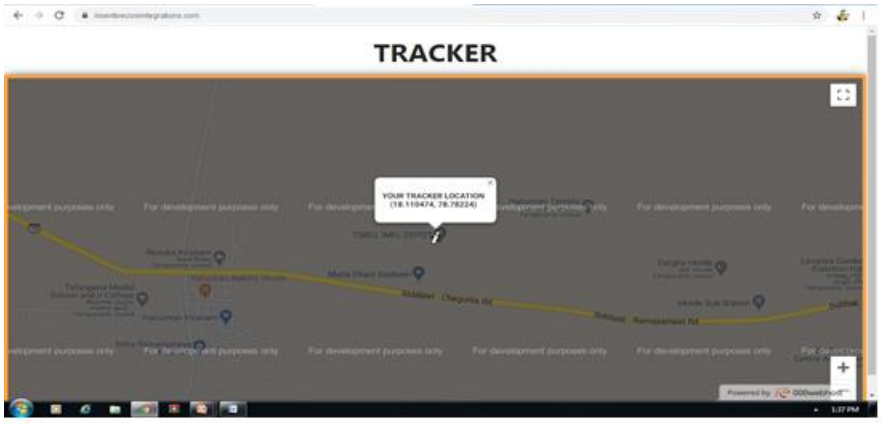

Figure 10 User interface with http secured line & domain

10. CONCLUSION

In this work, the proposed system will be dealing with Global Positioning System (GPS) interfaced with various sensor management system concluded as cloud-based vehicle black box system Wireless black box is basically a device that will indicate all the parameters of a vehicle crash and will also store and display its parameters with respective timeline such as date, time, temperature, location, vibration etc. Whenever the accident held the message will sent from the system built inside the car to the registered mobile numbers such as emergency numbers of police stations, hospitals, family members, owner etc. We have used various types of sensors like temperature sensor (DTH11), which is used to measure temperature and humidity. Vibration sensor measures vibrations felt by the car during accident this system is developed by using esp8266 chip with Node MCU development board and GPS module. This system produces accuracy location up to 96 % to 98%.

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