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Automobile Black Box System For Accident Analysis

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Abstract: ***The main goal of our project is to develop a prototype of the accident detection system using the black box. In the event of an accident, if an accident has occurred to the driver or passengers of the car, a loss of life may occur due to delays in medical assistance. This prototype is designed with a minimum number of circuits.This project aims to find the occurrence of any accident and to report the position of Incident with the previously coded number so that immediate assistance can be provided by the ambulance or patient. Nowadays automobiles technologies are rapidly increasing each and every year and also each and every second accident counts also increasing.so while using some technologies like black box in the automobile creates a new level of data service in vehicle. The automobile black box has functions similar to an airplane black box. It is highly useful to analyse the cause of vehicular accidents and prevent the loss of life and property arising from vehicle accident.This paper presents the prototype automobile black box system it has a group of sensor and also sends an alert message to pre stored mobile number in the way of way2sms in the case of an accident.The given senor is connected to the Arduino and it records the various driving data parameters in raspberry pi the system is having external sensor like camera and global positioning system to collect the data, video and location..***

Keywords: ABBAS, SOC,

I. INTRODUCTION

The main purpose of this paper is to develop a prototype of the Accident detection system using black box. In the event of accident, if any injury happened to the car driver or passengers so maybe there will be loss of lives due to delay in medical help. This prototype can be designed with minimum number of circuits. The VBBS can contribute to constructing safer vehicles, improving the treatment of crash victims, helping insurance companies with their vehicle crash investigations and enhancing road status in order to decrease the death rate. This project aim at finding the occurrence of any accident and reporting the location of accident to the previously coded number so that immediate help can be provided by ambulance or the relative members. GPS which is a navigational system using a network of satellites orbiting the earth.

Automobiles technologies are rapidly increasing each and every year and also each and every second accident counts also increasing.so while using some technologies like black box in the automobile creates a new level of data service in vehicle. The automobile black box has functions similar to an airplane black box.

This paper describes the design process of Car Black Box system IC. As by wire is introduced to the several part in vehicle, the demand of automotive semiconductors are increasing. Because it will be mandatory for every car to be equipped with Car Black Box, it is expected that many ICs for Car Black Box also will be integrated. So the topic of this paper is to develop the embedded controller for Car Black Box using SOC (System on Chip) technique. System on Chip (SOC) is the effective method to implement embedded system like car black box, which consists of processor, various sensors like temp , eye blink , steering position , over speed , alcohol sensors , SD card (to store the data) ,GPS and GSM(to send online (real time)information).

Hence this is an intelligent method to collect the accident or safety information using the widespread black box system. Conventionally, when information is needed after an accident or crime happened, investigators seek for possible clues non-systematically by hand. We propose a systematic method of gathering that information using an intelligent black box system which analyses and gathers information of neighbouring vehicles while driving. For this purpose, in addition to the functionality of storing the video sequence while driving.We also add the IOT functionality to receive information request message from the server and upload the matched information to the server.

II. EXISTING SYSTEM

Normally black box cost is high so no one prefers to install in the vehicle and normally black box is just to store the data but in existing system black box is done by using the sensors with gsm if any of the parameter reach above the threshold level it sends only the message.

In an existing system circuits looks bulky not in compact.Black Box has proved indispensable to improve the reliability of car safety. Unfortunately, in most real-life situations, Black Box fails to deliver their most essential feature: a faithful replay of events in real time. The flight recorder of the aircraft, Black Box continuously records the various run parameters, even on distributed systems, recording the execution for post-mortem analysis. We plan the flight recorder for real-time traffic accident information.

III. PROPOSED SYSTEM

To monitor the various sensors such as alcohol sensor, temperature sensor, light sensor, accelerometer, ultrasonic sensor, seat belt, IR sensor, GPS are connected to Arduino board. USB CAMERA is connected to raspberry pi.The output of the sensors is read from Arduino and communicated to single board computer. The data is stored on the SD card and also in the cloud the given system is proposed in IOT

Data: driving information such as speed, seat belt and brake status, steering performance. - Collision of data: time,

Speed and impact power in the event of an accelerometer accident. - Positioning data: the positions of the car have been verified in real time.

2)Accident analysis and reconstruction: Easily analyse the accident and manage many problems related to the car an accident such as a dispute over an accident, an insurance settlement

3) Wireless communication - Transmission of all data over the wireless network, such as CDMA and GSM / GPRS in the event of an accident at the main control centre. - support a fast service for the rescue and the treatment of the accidents

Black Box works on a single chip. It has several advantages with higher performance and reduced space requirements, lower power, greater reliability of the system, lower costs for the consumer.

CONTENT

EXTRA HARDWARE

You Will Need The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. RPi operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply. It also requires ‘mass-storage’, but a hard disk drive of the type found in a typical PC is not really in keeping with the miniature size of RPi. Instead we will use an SD Flash memory card normally used in digital cameras, configured in such a way to ‘look like’ a hard drive to RPi’s processor. RPi will ‘boot’ (load the Operating System into RAM) from this card in the same way as a PC ‘boots up’ into Windows from its hard disk.

The following are essential to get started:

• SD card containing Linux Operating system

• USB keyboard

• TV or monitor (with HDMI, DVI, Composite or SCART input)

• Power supply

• Video cable to suit the TV or monitor used recommended optional extras include:

• USB mouse

• Internet connection, Model A or B: USB WiFi adaptor

• Internet connection, Model B only: LAN (Ethernet) cable.

• Powered USB port.

CONNECTING HARDWARE

1. Plug the preloaded SD Card into the RPi.

2. Plug the USB keyboard and mouse into the RPi, perhaps via a USB hub. Connect the Hub to power, if necessary.

3. Plug a video cable into the screen (TV or monitor) and into the RPi.

4. Plug your extras into the RPi (USB Wi-Fi, Ethernet cable, external hard drive etc.). This is where you may really need a USB hub.

5. Ensure that your USB hub (if any) and screen are working.

6. Plug the power supply into the mains socket.

7. With your screen on, plug the power supply into the RPi microUSB socket.

8. The RPi should boot up and display messages on the screen.

OPERATING SYSTEM

As the RPi has no internal mass storage or built-in operating system it requires an SD card preloaded with a version of the Linux Operating System. • You can create your own preloaded card using any suitable SD card (4GBytes or above) you have to hand. We suggest you use a new blank card to avoid arguments over lost pictures. • Preloaded SD cards will be available from the RPi Shop.

DISPLAYS

There are two main connection options for the RPi display, HDMI (High Definition) and Composite (Standard Definition). • HD TVs and many LCD monitors can be connected using a full-size 'male' HDMI cable, and with an inexpensive adaptor if

DVI is used. HDMI versions 1.3 and 1.4 are supported and a version 1.4 cable is recommended. The RPi outputs audio and video via HMDI, but does not support HDMI input. • Older TVs can be connected using Composite video (a yellow-to-yellow RCA cable) or via SCART (using a Composite video to SCART adaptor). Both PAL and NTSC format TVs are supported. When using a composite video connection, audio is available from the 3.5mm jack socket, and can be sent to your TV, headphones or an amplifier. To send audio to your TV, you will need a cable which adapts from 3.5mm to double (red and white) RCA connectors. Note: There is no analogue VGA output available. This is the connection required by many computer monitors, apart from the latest ones. If you have a monitor with only a D-shaped plug containing 15 pins, then it is unsuitable.

ADDITIONAL PERIPHERALS

Internet Connectivity:

This may be via an Ethernet/LAN cable (standard RJ45 connector) or a USB WiFi adaptor. The RPi Model B Ethernet port is auto-sensing which means that it may be connected to a router or directly to another computer (without the need for a crossover cable).

USB hub:

In order to connect additional devices to the RPi, you may want to obtain a USB hub, which will allow multiple devices to be used. It is recommended that a powered hub is used - this will provide any additional power to the devices without affecting the RPi itself. A USB 2.0 model is recommended. USB 1.1 is fine for keyboards and mice, but may not be fast enough for other accessories.

Case:

Since the RPi is supplied without a case, it will be important to ensure that you do not use it in places where it will come into contact with conductive metal or liquids, unless suitably protected.

Expansion & Low-Level Peripherals:

If you plan on making use of the low-level interfaces available on the RPi, then ensure you have a suitable plug for the GPIO header pins. Also if you have a particular low-level project in mind, then ensure you design-in suitable protection circuits to keep your RPi safe.

RASPBERRY Pi ADVANCED SETUP

SETTING UP HARDWARE

You'll need a preloaded SD card, USB keyboard, TV/Monitor (with HDMI/ DVI/ Composite/SCART input), and power supply (USB charger or a USB port from a powered USB Hub or another computer). You'll likely also want a USB mouse, a case, and a USB hub (a necessity for Model A). A powered USB hub will reduce the demand on the RPi. To connect to the Internet, you'll need either an Ethernet/LAN cable (Model B) or a USB Wi-Fi adaptor (either model). When setting up, it is advisable to connect the power after everything else is ready.

The Serial Port is a simple and uncomplicated method to connect to the RPi. The communication depends on byte wise data transmission, is easy to setup and is generally available even before boot time. Connect the serial cable to the COM port in the RPi, and connect the other end to the COM port or USB Serial Adapter in the computer.

The following parameters are needed to connect to the RPi. All parameters except Port_Name and Speed are default values and may not need to be set. Port_Name: Linux automatically assigns different names for different types of serial connectors.

Choose your option:

• Standard Serial Port: ttyS0 ... ttySn

• USB Serial Port Adapter: ttyUSB0 ... ttyUSBn

• Speed: 115200

• Bits: 8

• Parity: None

• Stop Bits: 1

• Flow Control: None The Serial Port is generally usable by the users in the group dialout. To add oneself to the group dialout the the following command needs to be executed with root privileges:

```
$useradd -G {dialout} your_name
```

Super Easy Way using GNU Screen:

Enter the command below into a terminal window

```
screen Port_Name 115200
```

Super Easy Way using Minicom Run minicom with the following parameters:

```
minicom 115200 -o -D Port_Name -b
```

GUI method with GtkTerm:

Start GtkTerm,

select Configuration->Port and enter the values above in the labelled fields.

Windows Users:

Windows 7 or Vista users must download putty or a comparable terminal program. Users of XP and below can choose between using putty and HyperTerminal.

First Dialog:

If you get the prompt below, you are connected to the Raspberry Pi shell!

```
prompt> #
```

First command you might want try is "help":

```
prompt> # help
```

If you get some output, you are correctly connected to the Raspberry Pi! Congratulations!

SD CARD SYSTEM

Now we want to install a GNU/Linux distro on an SD card and make space for our stuff. You can use either an SD or SDHC card. In the latter case of course take care that your PC card reader also supports SDHC. Be aware that you are not dealing with an x86 processor, but instead a completely different architecture called ARM, so don't forget to install the ARM port for the one you are planning to use.

Formatting the SD card via the mkcard.txt script:

1. Download mkcard.txt .

2. $ chmod +x mkcard.txt

3. $ ./mkcard.txt /dev/sdx, where x is the letter of the card.

You can find this by inserting your card and then running dmesg | tail. You should see the messages about the device being mounted in the log. Mine mounts as sdc. Once run, your card should be formatted.

INTERNET OF THINGS

BACKGROUND

The Future Internet goal is to provide an infrastructure to have an immediate access to information about the physical world and its objects. Physical objects can be applicable to different application domains, such as e-health, warehouse management, etc. Eachapplication domain may have different types of physical devices. Each physical device can have its own specifications, which is required to use in order to interact with it. To achieve the future Internet goal, a layered vision is required that can facilitate data access. Internet of Things (IoT) is a vision that aims to integrate the virtual world of informationto the real world of devices through a layered architecture.

The term "Internet of Things" consists of two words, namely Internet and Things. Internet refers to the global network infrastructure with scalable, configurable capabilities based on interoperable and standard communication protocols. Things are physical objects or devices, or virtual objects, devices or information, which have identities, physical attributes and virtual personalities, and use intelligent interfaces. For instance, a virtual object can represent an abstract unit of sensor nodes that contains metadata to identify and discover its corresponding sensor nodes. Therefore, IoT refers to the things that can provide information from the physical environment through the Internet.

Middleware is as an interface between the hardware layer and the application layer, which is responsible for interacting with devices and information management. The role of a middleware is to present a unified programming model to interact with devices. A middleware is in charge of masking the heterogeneity and distribution problems that we face when interacting with devices.

MOTIVATION

IoT-based system is in charge of providing knowledge from an environment to an non-expert user. IoT-based system can be used in different environments, so it needs to be able to address many heterogeneous devices. Thus, a major concern within developing an IoT-based system is how to handle the interaction with the heterogeneous devices for non-expert users. This concern can be addressed by a middleware layer between devices and non-expert users. This layer is responsible to hide the diversity of devices from the user perspective, and provides access transparency to the devices for the end users.

IoT DEFINITION

In this section, we explain some of the IoT definitions. Also, we explain the layered architecture for IoT. The flow chart of the internet of things is as shown below in the figure :-Internet of Things (IoT) has increasingly gained attention in industry to interact with different types of devices. IoT can have influence on industry and society by integrating physical devices into information networks. IoT impacts can be on different perspectives, namely for private and business users. From the perspective of a private user, IoT has effect on both working and personal fields, such as smart homes and offices, e-health and assisted living. From the aspect of a business user the impacts would be in fields such as automation and industrial manufacturing, logistics, business process management, intelligent transportation of people and goods.

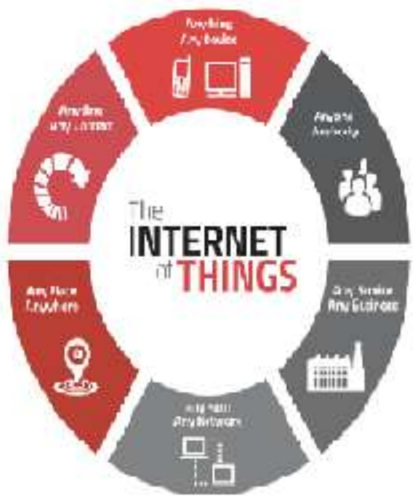
IoT integrates physical things into information networks. IoT covers the overall infrastructure, including software, hardware and services, which is used to support these information networks. The integrated physical things can exchange data about the physical properties and information that they sense in their environment. To identify devices, we can use identification technologies like for example RFID, which allow each device be uniquely identified.

International Telecommunication Union (ITU)defines IoT as “A global infrastructurefor the Information Society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies”.

IoT has a layered architecture designed to answer the demands of various industries, enterprises and society. As below figure shows a generic layered architecture for IoT that consist of five layers

Interface protocols

This component is in charge of providing technical interoperability. Interoperability in the context of Interface protocols means: the ability of two systems to interoperate by using the same communication protocols. According to ETSI (European Telecommunications Standards Institute) technical interoperability is defined as the association of hardware or software components, systems and platforms that enable machine-to-machine communication to take place. This kind of interoperability is often centered on (communication) protocols and the infrastructure needed for those protocols to operate.



The Interface Protocol component defines protocols for exchanging information among different networks that may work based on different communication protocols, in order to allow technical interoperability. This component is responsible for handling basic connectivity in the physical and data link, network, transport, and sometimes the application layer of the TCP/IP stack.

To cope with the heterogeneity of devices, we can use a wrapper for each device to translate the protocol supported by the device to a common protocol. This wrapper can be placed either on the device side or the middleware side. If we want to have direct interaction with devices, we should place the wrapper in the middleware side. Devices usually have limited capability of computational process, so this would be a reason to implement wrapper on the middleware side. In contrast, in case of indirect interaction with devices we can develop an intermediary wrapper between the middleware and the devices. The interface protocol component is responsible to allow the middleware to support both direct and indirect interaction.

Device Abstraction

This component is responsible for providing an abstract format to facilitate the interaction of the application components with devices. This abstraction provides syntactic and semantic interoperability, which are defined by ETSI as follows:

Syntactic interoperability is associated with data formats. The messages transferred by communication protocols must have a well-defined syntax and encoding format, which can be represented by using high-level transfer syntaxes such as, HTML and XML. Semantic interoperability is usually associated with the meaning of the content of message which is understandable for human. However, since DA does not communicate directly with human, semantic interoperability in the context of DA is in charge of providing this common understanding for applications.

Semantic interoperability relies on semantic models which tends to be domain specific. For example, one way to provide semantic interoperability in Service Oriented (SOA) based middleware is by using Devices Profile for Web Services (DPWS). In this context, each device type refers to a distinguished service type DA component provide two general functionalities: (1) to ask devices to perform some functionality and (2) to define and configure devices DPWS uses the XML format that is shown in Code 2.1

Central control, Context detection & Management (CCM)

Context characterizes the situation of an entity, which can be a place, a person or an object that is relevant to the user, applications and their interactions. The CCM functional component is responsible to support context-aware computation that is a computational style that take to account the context of the entities that interact with the system. A middleware for IoT-based systems must be context-aware to work in smart environments. Smart environments refer to a physical world that is richly and invisibly interwoven with sensors, actuators, displays, and computational elements, embedded seamlessly in the everyday objects of our lives, and connected through a continuous network. Context-awareness includes two functionalities:

1)Context detection, which consists of collecting data from resources, and selecting the information that can have an impact on the computation.

2)Context processing, to use the gathered information to perform a task or make a decision.

Application Abstraction

This functional component provides an interface for both high-level applications and end-users to interact with devices. For instance, this interface can be a RESTful interface or can be implemented with some query-based language.

nearby and temperatures that are sensed by this sensor during the past 10 seconds before executing the query:

Malatras. et. al. propose a SOA-based middleware to perform data management and data monitoring services. This middleware uses a RESTful interface to facilitate the interaction of high-level applications with sensors, which can communicate with Wireless Sensor Network (WSN) through the HTTP operations: (1) GET to issue a query on an existing resource, (2) DELETE to remove an existing resource, (3) POST to create a new resource,.(4) PUT to update an existing resource.

For instance, a client application gets the result of a domain task by sending a GET request through the URL: „http ://{hostname}/REST/ {version}/DomaintaskResult/id'. In this URI that reference to an „id" leads to a unique result.

SELECT nodeid, temp

FROM sensors

Gas sensor module

In current technology scenario, monitoring of gases produced is very important. From home appliances such as air conditioners to electric chimneys and safety systems at industries monitoring of gases is very crucial. Gas sensors are very important part of such systems. Small like a nose, gas sensors spontaneously react to the gas present, thus keeping the system updated about any alterations that occur in the concentration of molecules at gaseous state.

Gas sensors are available in wide specifications depending on the sensitivity levels, type of gas to be sensed, physical dimensions and numerous other factors. This Insight covers a methane gas sensor that can sense gases such as ammonia which might get produced from methane. When a gas interacts with this sensor, it is first ionized into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current. What is this sensing element? Is it kept in some chamber or is kept exposed? How does it get current and how it is taken out? Let's find out in this Insight!!!

The gas sensor module consists of a steel exoskeleton under which a sensing element is housed. This sensing element is subjected to current through connecting leads. This current is known as heating current through it, the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it.

Image shows externals of a standard gas sensor module: a steel mesh, copper clamping ring and connecting leads. The top part is a stainless steel mesh which takes care of the following:

Protecting the insides of the sensor.

Exhibits an anti-explosion network that keeps the sensor module intact at high temperatures and gas pressures.

In order to manage above listed functions efficiently, the steel mesh is made into two layers. The mesh is bound to rest of the body via a copper plated clamping ring.

The connecting leads of the sensor are thick so that sensor can be connected firmly to the circuit and sufficient amount of heat gets conducted to the inside part. They are casted from copper and have tin plating over them. Four of the six leads (A, B, C, D) are for signal fetching while two (1, 2) are used to provide sufficient heat to the sensing element.

The pins are placed on a Bakelite base which is a good insulator and provides firm gripping to the connecting leads of the sensor.The leads responsible for heating the sensing element are connected through Nickel-Chromium, well known conductive alloy. Leads responsible for output signals are connected using platinum wires which convey small changes in the current that passes through the sensing element. The platinum wires are connected to the body of the sensing element while Nickel-Chromium wires pass through its hollow structure.While other wires are attached to the outer body of the element, Nickel-Chromium wires are placed inside the element in a spring shaped. Image shows coiled part of the wire which is placed on the inside of the hollow ceramic.

VIBRATION SENSORS

The piezoelectric sensor is used for flex, touch, vibration and shock measurement. Its basic principal, at the risk of oversimplification, is as follows: whenever a structure moves, it experiences acceleration. A piezoelectric shock sensor, in turn, can generate a charge when physically accelerated. This combination of properties is then used to modify response or reduce noise and vibration that is given during the movement of the car. Why is that important? Because vibration and shock can shorten the life of any electronic and electromechanical system. Delicate leads and bond wires can be stressed, especially after exposure to long term vibration. Solder joints can break free and PCB traces can ever so slightly tear from impact and impulse shock, creating the hardest type of system failure to debug; an intermittent failure and hence thereby alerting the user of any abnormalities.

HOW IT WORKS:

The piezoelectric effect was discovered by Pierre and Jacques Curie in the latter part of the 19th century. They discovered that minerals such as tourmaline and quartz could transform mechanical energy into an electrical output. The voltage induced from pressure (Greek: piezo) is proportional to that applied pressure, and piezoelectric devices can be used to detect single-pressure events as well as repetitive events and reading taken during the car is in motion.

Still, the ability of certain crystals to exhibit electrical charges under mechanical loading was of no practical use until very-high-input impedance amplifiers enabled engineers to amplify the signals produced by these crystals to amplify it and help run the sensor.

Several materials can be used to make piezoelectric sensors, including tourmaline, gallium phosphate, salts, and quartz. Most electronic applications use quartz since its growth technology is far along, thanks to development of the reverse application of the piezoelectric effect the quartz oscillator.

Sensors based on the piezoelectric effect can operate from transverse, longitudinal, or shear forces, and are insensitive to electric fields and electromagnetic radiation. The response is also very linear over wide temperature ranges, making it an ideal sensor for rugged environments. For example, gallium phosphate and tourmaline sensors.

The physical design of the piezoelectric sensor depends on the type of sensor you wish to create. For example, the configuration of a pressure sensor, or a shock (impulse) sensor, would arrange a smaller, but well-known mass of the crystal in a transverse configuration, with the loading deformation along the longest tracks to a more massive base. This assures that the applied pressure will load the base from only one direction.

Op-amp circuits can be designed to operate in voltage mode or charge mode. Charge mode is used when the amplifier is remote to the sensor. Voltage mode is used when the amplifier is very close to the sensor and hence therby the voltage is increased. Another tip is to attenuate the input signal and use the op amp’s gain to bring into the desired range. Be aware that you may need snubbing protection on the inputs of the op amp, especially if the design could be subjected to harsh hits during an accident.

Also note that you may think that a pressure sensor would generate only a positive voltage, but, in reality, the signal from the sensor can ring and introduce negative voltage spikes (Figure 4). This means that you may need to squelch negative voltage levels on the op-amp inputs, especially if using only a single rail power supply on the op amp.

Many off the shelf piezoelectric sensors are readily available to use in your designs. A case in point is the Parallax 605-00004, which is a piezo vibra tab sensor capable of acting as a switch, or as a vibration sensor (Figure 5). A polymer film laminate uses crimped contacts and features a sensitivity of 50 mV/g.Another part worth considering is the Measurement Specialties 0-1002794-0 cantilever piezo film sensor. This is also a vibra tab sensor capable of hard mounting to a surface, floating in an axis of inertia, or mass loaded to prebias and calibrate. The output voltage swings can directly trip a FET or CMOS input, and a multiaxis response can be obtained by offsetting the masscenter.

In addition to sensing vibration and shock, a piezoelectric device can also be used to extract ambient energy. Take for example the MideV22BL, which is a hermetically sealed piezoelectric sensor capable of sensing from 26 to 100 Hz vibrations.It can be evaluated using the company’s VR001 data logger, which is a portable rechargeable data logger that can measure acceleration and vibration in three axes (Figure 7). As a USB peripheral, it can be configured and have its data transferred to a PC or other USB host device. It can also be used to help you develop your own designs based on the piezoelectric sensors you choose. A Mide training module is available on the Digi-Key website to help bring you up to speed quickly when starting a new design.

TILT:

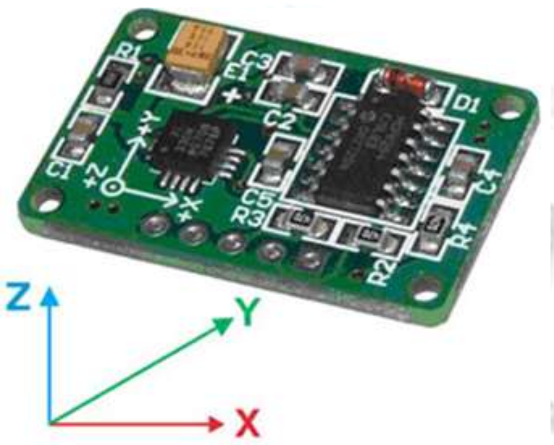
Micro-electromechanical systems (MEMS) is a technology that combines computers with tiny mechanical devices such as sensors, valves, gears, mirrors, and actuators embedded in semiconductor chips. MEMS or what he calls analogue computing will be "the foundational technology of the next decade." MEMS is also sometimes called smart matter.

MEMS are already used as accelerometers in automobile air-bags. They've replaced a less reliable device at lower cost and show promise of being able to inflate a bag not only on the basis of sensed deceleration but also on the basis of the size of the person they are protecting. Basically, a MEMS device contains micro-circuitry on a tiny silicon chip into which some mechanical device such as a mirror or a sensor has been manufactured. Potentially, such chips can be built in large quantities at low cost, making them cost-effective for many uses.

Among the presently available uses of MEMS or those under study are:

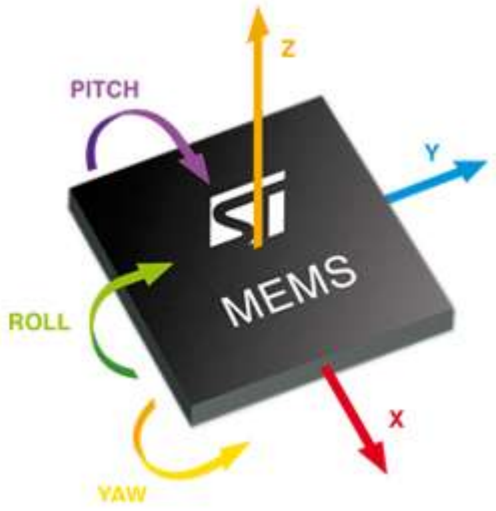
- Global position system sensors that can be included with courier parcels for constant tracking and that can also sense parcel treatment en route
- Sensors built into the fabric of an airplane wing so that it can sense and react to air flow by changing the wing surface resistance; effectively creating a myriad of tiny wing flaps
- Optical switching devices that can switch light signals over different paths at 20-nanosecond switching speeds
- Sensor-driven heating and cooling systems that dramatically improve energy savings
- Building supports with imbedded sensors that can alter the flexibility properties of material based on atmospheric stress sensing

Visual Diagram:



FUNCTIONAL DIAGRAM:

One of the newer sensors to come about in recent times is the accelerometer. Granted the idea and implementation of a sensor that measures acceleration has been around for a long time the newer technologies available to industry have made them super accurate.



The MEMS Accelerometer usually comes in the smallest surface mount package and can detect acceleration in up to 3 axis. This tutorial will cover capturing data for onle one axis. The PIC will be used to capture the data and make sense of it.

Light Dependent Resistor (LDR):

The light dependant resistor is an electronic component whose resistance decreases with increasing light intensity. It is also called as “Photo Resistor” or “Photo conductor”

The light dependant resistor uses high resistance semiconductor material.

When light falls on such a semiconductor the bound electrons [i.e., Valence electrons] get the light energy from the incident photos.

Due to this additional energy, these electrons become free and jump in to the conduction band. The electron –hole pairs are generated. Due to these charge carriers, the conductivity of the device increases, decreasing its resistivity.

It is relatively easy to understand the basics of how an LDR works without delving into complicated explanations. It is first necessary to understand that an electrical current consists of the movement of electrons within a material. Good conductors have a large number of free electrons that can drift in a given direction under the action of a potential difference. Insulators with a high resistance have very few free electrons, and therefore it is hard to make the them move and hence a current to flow.

An LDR or photoresistor is made any semiconductor material with a high resistance. It has a high resistance because there are very few electrons that are free and able to move - the vast majority of the electrons are locked into the crystal lattice and unable to move. Therefore in this state there is a high LDR resistance.

As light falls on the semiconductor, the light photons are absorbed by the semiconductor lattice and some of their energy is transferred to the electrons. This gives some of them sufficient energy to break free from the crystal lattice so that they can then conduct electricity. This results in a lowering of the resistance of the semiconductor and hence the overall LDR resistance.

The process is progressive, and as more light shines on the LDR semiconductor, so more electrons are released to conduct electricity and the resistance falls further.

LDRs are very useful components that can be used for a variety of light sensing applications. As the LDR resistance varies over such a wide range, they are particularly useful, and there are many LDR circuits available beyond any shown here. In order to utilise these components, it is necessary to know something of how an LDR works, which has been explained above.

Light dependent resistors, LDRs or photoresistors fall into one of two types or categories:

• Intrinsic photoresistors: Intrinsic photoresistors use un-doped semiconductor materials including silicon or germanium. Photons fall on the LDR excite electrons moving them from the valence band to the conduction band. As a result, these electrons are free to conduct electricity. The more light that falls on the device, the more electrons are liberated and the greater the level of conductivity, and this results in a lower level of resistance.

• Extrinsic photoresistors: Extrinsic photoresistors are manufactured from semiconductor of materials doped with impurities. These impurities or dopants create a new energy band above the existing valence band. As a result, electrons need less energy to transfer to the conduction band because of the smaller energy gap.

.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 from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, 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 interested amateurs 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, so students learning to program in that environment will be familiar with the look and feel of Arduino

Open source and extensible software- The Arduino software and is published as open source tools, available for extension by experienced programmers. The language can be expanded through 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.

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. The source code for the IDE is released under the GNU General Public License, version 2. Nevertheless, an official Bill of Materials of Arduino boards has never been released by Arduino staff.

Although the hardware and software designs are freely available under copyright licenses, the developers have requested the name Arduino to be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product.Several Arduino-compatible products commercially released have avoided the project name by using various names ending in.

Most Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and possibly stacked shields may be individually addressable via an I^2C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Arduino UNO is the optiboot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Boardand Boarduinoboards may provide male header pins on the underside of the board that can plug into solderless breadboards.

Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

PYTHON

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, and a syntax that allows programmers to express concepts in fewer lines of code,notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and has a large and comprehensive standard library.

Python interpreters are available for many operating systems. CPython, the reference implementation of Python, is open source software and has a community-based development model, as do nearly all of its variant implementations. Python is managed by the non-profit Python Software Foundation.

Python was conceived in the late 1980s and its implementation began in December 1989 by Guido van Rossum at Centrum Wiskunde & Informatica (CWI) in the Netherlands as a successor to the ABC language (itself inspired by SETL) capable of exception handling and interfacing with the Amoeba operating system.Van Rossum remains Python's principal author. His continuing central role in Python's development is reflected in the title given to him by the Python community: Benevolent Dictator For Life (BDFL).

Python 2.0 was released on 16 October 2000 and had many major new features, including a cycle-detecting garbage collector and support for Unicode. With this release, the development process became more transparent and community-backed.

Python 3.0 (initially called Python 3000 or py3k) was released on 3 December 2008 after a long testing period. It is a major revision of the language that is not completely backward-compatible with previous versions.However, many of its major features have been backported to the Python 2.6 and 2.7.x version series, and releases of Python 3 include the 2to3 utility, which automates the translation of Python 2 code to Python 3.

Python 2.7's end-of-life date (a.k.a. EOL, sunset date) was initially set at 2015, then postponed to 2020 out of concern that a large body of existing code could not easily be forward-ported to Python 3.

Python 3.6 had changes regarding UTF-8 (in Windows, PEP 528 and PEP 529) and Python 3.7.0b1 (PEP 540) adds a new "UTF-8 Mode" (and overrides POSIX locale).

In January 2017, Google announced work on a Python 2.7 to Go transcompiler to improve performance under concurrent workloads.

Features and philosophy

Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of its features support functional programming and aspect-oriented programming (including by metaprogramming and metaobjects (magic methods)).Many other paradigms are supported via extensions, including design by contract and logic programming.

Python uses dynamic typing, and a combination of reference counting and a cycle-detecting garbage collector for memory management. It also features dynamic name resolution (late binding), which binds method and variable names during program execution.

Python's design offers some support for functional programming in the Lisp tradition. It has filter(), map(), and reduce() functions; list comprehensions, dictionaries, and sets; and generator expressions.The standard library has two modules (itertools and functools) that implement functional tools borrowed from Haskell and Standard ML.

Rather than having all of its functionality built into its core, Python was designed to be highly extensible. This compact modularity has made it particularly popular as a means of adding programmable interfaces to existing applications. Van

Rossum's vision of a small core language with a large standard library and easily extensible interpreter stemmed from his frustrations with ABC, which espoused the opposite approach.

While offering choice in coding methodology, the Python philosophy rejects exuberant syntax (such as that of Perl) in favor of a simpler, less-cluttered grammar. As Alex Martelli put it: "To describe something as 'clever' is not considered a compliment in the Python culture."Python's philosophy rejects the Perl "there is more than one way to do it" approach to language design in favor of "there should be one—and preferably only one—obvious way to do it".

Python's developers strive to avoid premature optimization, and reject patches to non-critical parts of CPython that would offer marginal increases in speed at the cost of clarity.When speed is important, a Python programmer can move time-critical functions to extension modules written in languages such as C, or use PyPy, a just-in-time compiler. Cython is also available, which translates a Python script into C and makes direct C-level API calls into the Python interpreter.

A common neologism in the Python community is pythonic, which can have a wide range of meanings related to program style. To say that code is pythonic is to say that it uses Python idioms well, that it is natural or shows fluency in the language, that it conforms with Python's minimalist philosophy and emphasis on readability. In contrast, code that is difficult to understand or reads like a rough transcription from another programming language is called unpythonic.

Users and admirers of Python, especially those considered knowledgeable or experienced, are often referred to as Pythonists, Pythonistas, and Pythoneers.

Syntax and semantics

Main article: Python syntax and semantics

Python is meant to be an easily readable language. Its formatting is visually uncluttered, and it often uses English keywords where other languages use punctuation. Unlike many other languages, it does not use curly brackets to delimit blocks, and semicolons after statements are optional. It has fewer syntactic exceptions and special cases than C or Pascal.

Indentation

Main article: Python syntax and semantics § Indentation

Python uses whitespace indentation, rather than curly brackets or keywords, to delimit blocks. An increase in indentation comes after certain statements; a decrease in indentation signifies the end of the current block.This feature is also sometimes termed the off-side rule.

Statements and control flow

Python's statements include (among others):

The assignment statement (token '=', the equals sign). This operates differently than in traditional imperative programming languages, and this fundamental mechanism (including the nature of Python's version of variables) illuminates many other features of the language. Assignment in C, e.g., x = 2, translates to "typed variable name x receives a copy of numeric value 2". The (right-hand) value is copied into an allocated storage location for which the (left-hand) variable name is the symbolic address. The memory allocated to the variable is large enough (potentially quite large) for the declared type. In the simplest case of Python assignment, using the same example, x = 2, translates to "(generic) name x receives a reference to a separate, dynamically allocated object of numeric (int) type of value 2." This is termed binding the name to the object. Since the name's storage location doesn't contain the indicated value, it is improper to call it a variable. Names may be subsequently rebound at any time to objects of greatly varying types, including strings, procedures, complex objects with data and methods, etc. Successive assignments of a common value to multiple names, e.g., x = 2; y = 2; z = 2 result in allocating storage to (at most) three names and one numeric object, to which all three names are bound. Since a name is a generic reference holder it is unreasonable to associate a fixed data type with it. However at a given time a name will be bound to some object, which will have a type; thus there is dynamic typing.

The if statement, which conditionally executes a block of code, along with else and elif (a contraction of else-if).

The for statement, which iterates over an iterable object, capturing each element to a local variable for use by the attached block.

The while statement, which executes a block of code as long as its condition is true.

The try statement, which allows exceptions raised in its attached code block to be caught and handled by except clauses; it also ensures that clean-up code in a finally block will always be run regardless of how the block exits.

The class statement, which executes a block of code and attaches its local namespace to a class, for use in object-oriented programming.

The def statement, which defines a function or method.

The with statement (from Python 2.5), which encloses a code block within a context manager (for example, acquiring a lock before the block of code is run and releasing the lock afterwards, or opening a file and then closing it), allowing Resource Acquisition Is Initialization (RAII)-like behavior.

The pass statement, which serves as a NOP. It is syntactically needed to create an empty code block.

The assert statement, used during debugging to check for conditions that ought to apply.

The yield statement, which returns a value from a generator function. From Python 2.5, yield is also an operator. This form is used to implement coroutines.

The import statement, which is used to import modules whose functions or variables can be used in the current program. There are four ways of using import: import <module name> or from <module name> import * or import numpy as np or from numpy import pi as Pie.

The print statement was changed to the print() function in Python 3.

Python does not support tail call optimization or first-class continuations, and, according to Guido van Rossum, it never will.However, better support for coroutine-like functionality is provided in 2.5, by extending Python's generators.Before 2.5, generators were lazy iterators; information was passed unidirectionally out of the generator. From Python 2.5, it is possible to pass information back into a generator function, and from Python 3.3, the information can be passed through multiple stack levels.

Expressions

Some Python expressions are similar to languages such as C and Java, while some are not:

Addition, subtraction, and multiplication are the same, but the behavior of division differs. There are two types of divisions in Python. They are floor division and integer division.[Python also added the ** operator for exponentiation.

From Python 3.5, a new infix operator indented to be used by libraries such as NumPy for matrix multiplication was introduced, which uses the @ operator.

In Python, == compares by value, versus Java, which compares numerics by value and objects by reference. (Value comparisons in Java on objects can be performed with the equals() method.) Python's is operator may be used to compare object identities (comparison by reference). In Python, comparisons may be chained, for example a <= b <= c.

Python uses the words and, or, not for its boolean operators rather than the symbolic &&, ||, ! used in Java and C.

Pyladies.

Naming

Python's name is derived from the British comedy group Monty Python, whom Python creator Guido van Rossum enjoyed while developing the language. Monty Python references appear frequently in Python code and culture for example, The official Python documentation also contains various references to Monty Python routines.

The prefix Py- is used to show that something is related to Python. Examples of the use of this prefix in names of Python applications or libraries include Pygame, a binding of SDL to Python (commonly used to create games); Python for S60,an implementation for the Symbian S60 operating system; PyQt and PyGTK, which bind Qt and GTK to Python respectively; and PyPy, a Python implementation originally written in Python.

Uses

Main article: List of Python software

Since 2003, Python has consistently ranked in the top ten most popular programming languages in the TIOBE Programming Community Index. As of January 2018, it is the fourth most popular language.It was selected Programming Language of the Year in 2007 and 2010.It is the third most popular language whose grammatical syntax is not predominantly based on C.

An empirical study found that scripting languages, such as Python, are more productive than conventional languages, such as C and Java, for programming problems involving string manipulation and search in a dictionary, and determined that memory consumption was often "better than Java and not much worse than C or C++".

Large organizations that use Python include Wikipedia, Google, Yahoo!, CERN, NASA and some smaller entities like ILM and ITA.The social news networking site Reddit is written entirely in Python.

Python can serve as a scripting language for web applications, e.g., via mod_wsgi for the Apache web server.With Web Server Gateway Interface, a standard API has evolved to facilitate these applications. Web frameworks like Django, Pylons, Pyramid, TurboGears, web2py, Tornado, Flask, Bottle and Zope support developers in the design and maintenance of complex applications. Pyjs and IronPython can be used to develop the client-side of Ajax-based applications. SQLAlchemy can be used as data mapper to a relational database. Twisted is a framework to program communications between computers, and is used (for example) by Dropbox.

Libraries such as NumPy, SciPy and Matplotlib allow the effective use of Python in scientific computing,with specialized libraries such as Biopython and Astropy providing domain-specific functionality. SageMath is a mathematical software with a "notebook" programmable in Python: its library covers many aspects of mathematics, including algebra, combinatorics, numerical mathematics, number theory, and calculus. The Python language re-implemented in Java platform is used for numeric and statistical calculations with 2D/3D visualization by the DMelt project.

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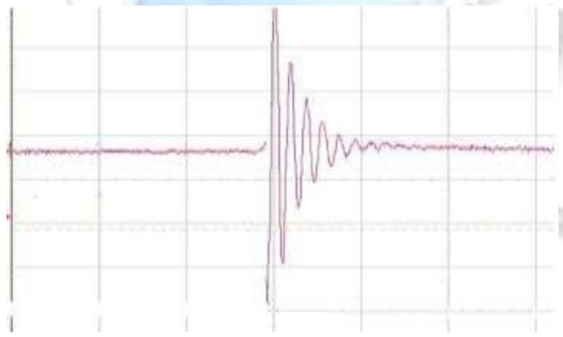
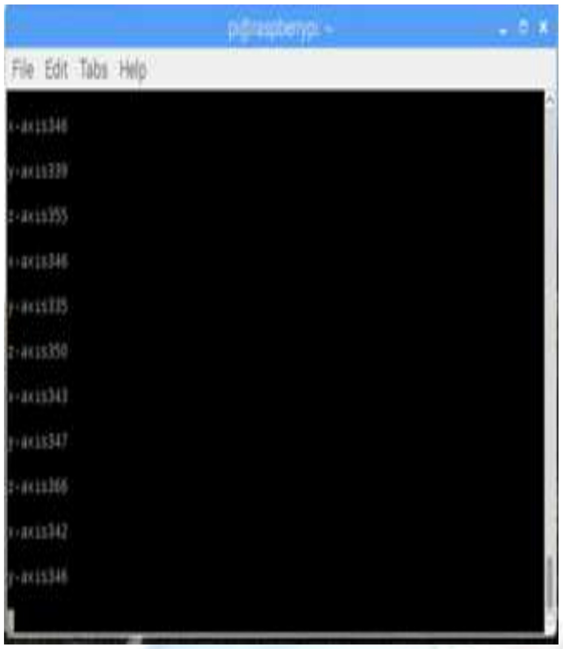
Python has been successfully embedded in many software products as a scripting language, including in finite element method software such as Abaqus, 3D parametric modeler like FreeCAD, 3D animation packages such as 3ds Max, Blender, Cinema 4D, Lightwave, Houdini, Maya, modo, MotionBuilder, Softimage, the visual effects compositor Nuke, 2D imaging programs like GIMP,Inkscape, Scribus and Paint Shop Pro and musical notation programs like scorewriter and capella. GNU Debugger uses Python as a pretty printer to show complex structures such as C++ containers. Esri promotes Python as the best choice for writing scripts in ArcGIS.It has also been used in several video games and has been adopted as first of the three available programming languages in Google App Engine, the other two being Java and Go.Python is also used in algorithmic trading and quantitative finance.Python can also be implemented in APIs of online brokerages that run on other languages by using wrappers.

Python has been used in artificial intelligence projects.As a scripting language with modular architecture, simple syntax and rich text processing tools, Python is often used for natural language processing.

Many operating systems include Python as a standard component. It ships with most Linux distributions, AmigaOS 4, FreeBSD, NetBSD, OpenBSD and macOS, and can be used from the command line (terminal). Many Linux distributions use installers written in Python: Ubuntu uses the Ubiquity installer, while Red Hat Linux and Fedora use the Anaconda installer. Gentoo Linux uses Python in its package management system, Portage.

SCREEN SHOTS





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x-axis346
y-axis339
z-axis355
x-axis346
y-axis335
z-axis350
x-axis343
y-axis347
z-axis366
x-axis342
y-axis346
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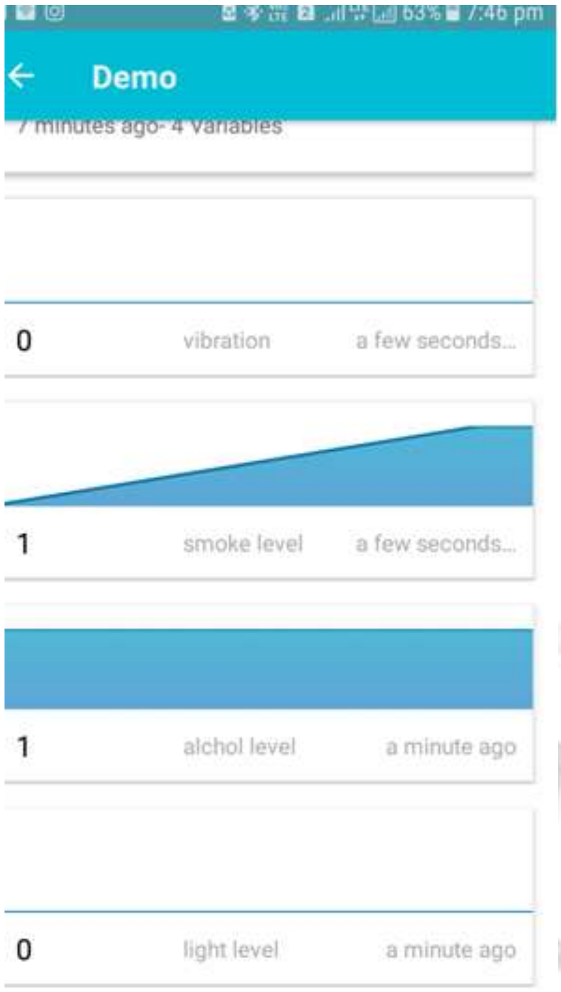
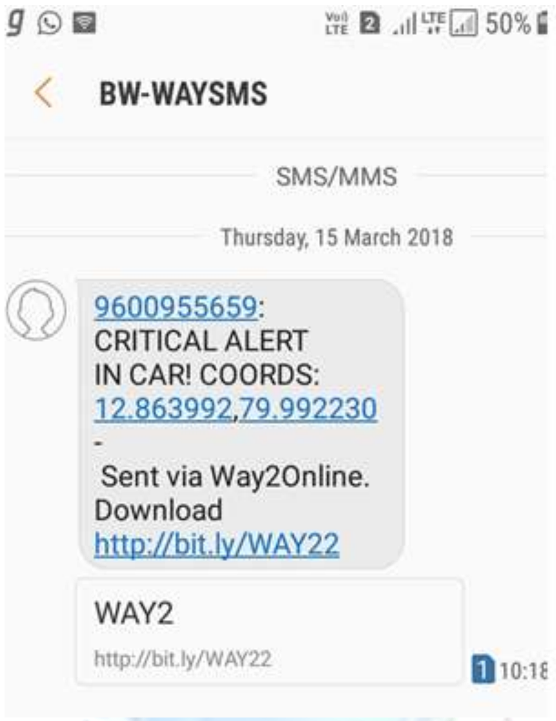

Demo

7 minutes ago- 4 Variables

0	vibration	a few seconds...
1	smoke level	a few seconds...
1	alchol level	a minute ago
0	light level	a minute ago



BW-WAYSMS

SMS/MMS

Thursday, 15 March 2018

9600955659:
CRITICAL ALERT
IN CAR! COORDS:
12.863992,79.992230
-
Sent via Way2Online.
Download
http://bit.ly/WAY22

WAY2
http://bit.ly/WAY22

10:18

IV. CONCLUSION

In this paper, we proposed an intelligent blackbox based safety information gathering system. We added additional functionalities to the ordinary car blackbox such as sensor to monitor, what is happening in the car. The alcohol sensor is used to find whether they consume alcohol or not. Tilt sensor and alcohol sensor is used to find the position of the car.It has a light ambient sensor which consists of a LDR and given it a threshold level.It also has smoke sensor which is used to detect any dangerous smoke level in the car. The vibration sensor is used to detect any sudden and dangerous vibrations such as accident impacts. This proposed system also has an MEMS sensor which is used to read the x, y, z coordinates of the axle of the car and hence if there is any abnormal level of inclination such as turning of the car upside down due to an accident, then it sends an alert message to the userwith the coordinates of the car's location.

All the sensors are handled by the Arduino board of the system, which interacts with the raspberry pi and stores the data locally in the SD in the raspberry pi and also it uploads the values to the cloud service and checks if there is any abnormality in the values of the sensor and if there is then if sends a alert message to the pre-stored mobile number. We have achieved in making the proposed system much compact than the existing system and also advancing and making it work more efficiently by integrating the proposed system by cloud computing and better alert system. In the future the proposed system can be more improved by adding real time location tracker and making the system more power efficient. The speed of the data accumulation can be improved.

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