AUTOMATIC ACCIDENT SPOTTING REMOTE TUNED BLACK-BOX

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Abstract:

In this paper, wireless black-box is designed to automatically spot accidents and alert the family and some emergency helpline numbers and hence prevent the loss of lives. There are a number of reasons like drunk driving, speed driving, driving without enough sleep etc. for the occurrence of an accident. But the number of death and disabilities are very high because of late assistance to the wounded lives. We in our paper have proposed a cost effective system to effectively render immediate help to the wounded lives. In addition to this two more features are added to the system for safety purpose. They are- alert messages followed by calls will be sent to number of the owner when the level of fuel decreases below a certain threshold level and also when the temperature of the engine raises above a certain degree. The set up consists of MEMS accelerometer LIS302DL, PIC microcontroller 16F877A, GPS tracking system, GSM modem.

Keywords: MEMS accelerometer, PIC microcontroller 16F877A, GPS tracking system, GSM modem, black-box.

Introduction:

The design is a equipment which contains all the data and which will not be destroyed in an accident and it is useful in investigation about the cause of the accident. It is called a black box. It is anonymous to the ones present in air planes. Since it is instrumental in many purposes so it should be fitted in a secret and safe place in the vehicle, ignorant to the driver's knowledge

The black-box co operatively consists of a MEMS accelerometer, PIC microcontroller 16F877A, GPS tracking system and GSM modem. The system is fitted with two SIM (Subscriber Identity Module) cards to communicate. Thus the wounded lives can receive immediate and necessary medical aid and loss of lives can be avoided.

Specification:

- The first module is the MEMS accelerometer module. When the vehicle meets with an accident, the

DC motor stops, the MEMS accelerometer detects it and then immediately informs the microcontroller through I2C protocol for further course of action.

- The second module is PIC microcontroller module. It is used to alert the GPS tracking system to immediately send the location of the accident spot..
- The third module is the GPS tracking system tracks down the location of the accident spot and then sends the information to the microcontroller with the help of UART protocol.
- The fourth module is the GSM module. It receives the data from the microcontroller through UART and then transmits it to the concerned person's number.
- The fifth module is the power supply module. The kit requires a power of constant 5V. So a transformer and voltage regulator is used to step down the power supply from 220V to 12V.

Hardware required:

1. MEMS accelerometer LIS302DL
2. PIC microcontroller 16F877A
3. GPS tracking system
4. GSM modem
5. Power supply.
6. DC motor.
7. Temperature sensor
8. Fuel detector.

Description:

1. MEMS accelerometer LIS302DL:

An accelerometer is a device for measuring acceleration and gravity induced reaction forces. Single and multi axis model are available to detect the magnitude and direction of acceleration as a vector quantity. They are used to sense inclination, vibration and shock.

Here the inclination sensing quality of the accelerometer is used to detect the accident.

The LIS302DL is an ultra compact low-power three axes linear accelerometer. It includes a sensing element and an IC interface able to provide the measured acceleration to the external world through I2C/SPI serial interface. The device may be configured to generate inertial wake-up/free-fall interrupt signals when a programmable acceleration threshold is crossed at least in one of the three axes.

Features:

- Three axes.
- SPI/I2C digital interface
- Innovative functional functionalities.
- Two highly flexible and programmable interrupt request outputs
- Programmable thresholds and timing of interrupt signals
- 2.16V to 3.6V supply voltage
- Temperature range -40^0C to $+85^0$C
- Embedded high pass filter and self-test.
- 10,000 g high stock survivability

2. PIC microcontroller 16F877A:

A PIC microcontroller is a processor with built in memory and RAM and can be used to control our projects or build projects around it. So it saves us from building a circuit that has separateexternal RAM, ROM and peripheral chips. It has many useful built in modules.

ADC

An analog-to-digital converter is an electronic integrated circuit, which convertscontinuous signals to discrete digital numbers. The Analog-to-Digital (A/D) Converter module has five inputs for the 28-pin devices and eight for the 40/44-pin devices. The conversion of an analog input signal results in a corresponding 10-bit digital number.

UART:

A universal asynchronous receiver/transmitter is a type of "asynchronous receiver/transmitter", a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with other communication standards such as EIA RS-232.

Fig: Circuit diagram of UART

I2C:

I²C is a multi-master serial computer bus invented by Philips that is used to attach low-speed peripherals to a motherboard, embedded system, or cell phone. The name stands for **Inter-Integrated Circuit** and is pronounced *I-squared-C* and also, incorrectly, *I-two-C*.

Features of PIC microcontroller:

- High-performance RISC CPU
- Only 35 single word instructions.
- All single cycle instructions except for program branches which are two cycle
- Operating speed: DC - 20 MHz clock input DC - 200 ns instruction cycle
- Up to 368 x 8 bytes of Data Memory (RAM)
- Interrupt capability (up to 14 sources)
- Eight level deep hardware stack

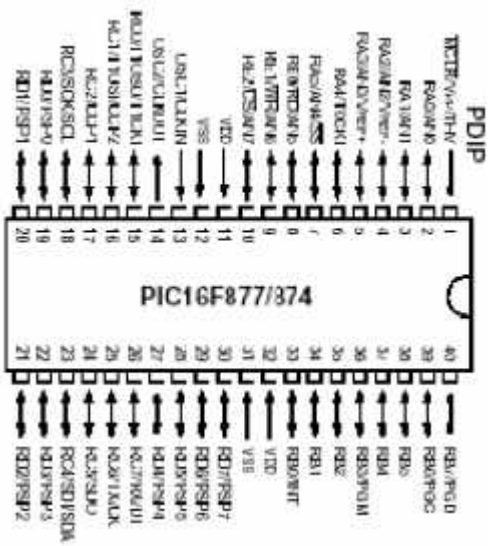

Fig: Pin diagram of PIC 16f877A

3. GPS tracking system:

The Global Positioning System (GPS) is a location system based on a constellation of about 24 satellites orbiting the earth at altitudes of approximately 11,000 miles. GPS was developed by the United States Department of Defense (DOD), for its tremendous application as a military locating utility. GPS has proven to be a useful tool in non-military mapping applications as well. GPS satellites are orbited high enough to avoid the problems associated with land based systems, yet can provide accurate positioning 24 hours a day, anywhere in the world.

4. GSM modem:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable

5. Power supply:

This circuit is a small +5V power supply, which is useful when experimenting with digital electronics. Those transformers are easily available, but usually their voltage regulation is very poor, which makes then not very usable for digital circuit experimenter unless a better regulation can be achieved in some way. The following circuit is the answer to the problem. This circuit can give +5V output at about 150 m A current, but it can be increased to 1 A when good cooling is added to 7805 regulator chip. The circuit has over overload and terminal protection.

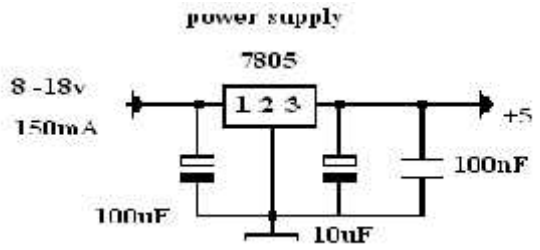

Fig: Circuit diagram of power supply

6. DC motor:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

7. Temperature Sensor:

A temperature sensor is a device that gathers data concerning the temperature from a source and converts it to a form that can be understood either by an observer or another device. These sensors come in many different forms and are used for a wide variety of purposes, from simple home use to extremely accurate and precise scientific use. They play a very important role almost everywhere that they are applied.

8. Fuel level detector:

It is aninstrument used to indicate the level of fuel contained in a tank. The unit consists of two parts:

- The sensing unit
- The indicator unit

The sensing unit usually uses a float connected to a potentiometer, typically printed ink design in a modern automobile. As the tank empties, the float drops and slides a moving contact along the resistor, increasing its resistance. In addition, when the resistance is at a certain point, it will also turn on a "low fuel" light on some vehicles.

The indicator unitis measuring and displaying the amount of electrical current flowing through the sending unit. It will indicate when the level of fuel decreases beyond a certain threshold.

9. Conclusion:

According to the modular design by using PIC microcontroller and MEMS accelerometer, GPS and GSM module the project is done successfully.The developed system successfully alerts for emergency medical aid in case of an accident. And it also alerts the owner when the temperature of the engine increases and the level of fuel decrease.

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