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An Enhanced Ambulance Rescue and Patient Observation System Using Green Wave Technology

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Abstract: Traffic congestion and tidal flow management were recognized as major problems in modern urban areas, which have caused much uncomfortable for the ambulance. Moreover road accidents in the city have been nonstop and to bar the loss of life due to the accidents is even more crucial. To implement this we introduce a scheme called AARS (Automatic ambulance rescue system). The main theme behind this scheme is to provide a smooth flow for the ambulance to reach the hospitals in time and thus minifying the expiration. The idea behind this scheme is to implement a ITS which would control mechanically the traffic lights in the path of the ambulance.

Keywords: ARM, GPS, GSM, RF, Sensors Module.

I. INTRODUCTION

When a vehicle met with an accident the message came to control room or a rescue team by using GPS and GSM Technology. GPS is a fleet of more than 24 communications satellites that transmit signals globally around the clock. With a GPS receiver, one can quickly and accurately determine the latitude, the longitude, and in most cases the altitude of a point on or above Earth's surface. GSM use a Subscriber Identity Module (SIM) smart card that contains user account information. Any GSM phone becomes immediately programmed after plugging in the SIM card, thus allowing GSM phones to be easily rented or borrowed. Here an accelerometer (MEMS) is used in a car alarm application; MEMSENSOR is a powerful yet simple software tool for engineers, researchers and students working in the field of Micro Electro Mechanical Systems Dangerous driving can be detected with an accelerometer. It can be used as a crash recorder of the vehicle movements before, during and after a crash. With signals from an accelerometer, a severe accident can be recognized. According to this project when a vehicle met with an accident immediately the vehicle number and persons contact number will be transferred to control room or a rescue team. So the rescue team can immediately trace the location from where the message came (fig 3). Then after conforming the location necessary action will be taken. In second application on an uncertain situation many of vehicles that have center locking system, Such as door locking system faces many problems due to automatic locking system. At that situation there is no way to open the lock. Our project will provide a suitable solution for this situation. Figure 1 to 4 shows use of system according the ambulance, signal, vehicle and hospital.

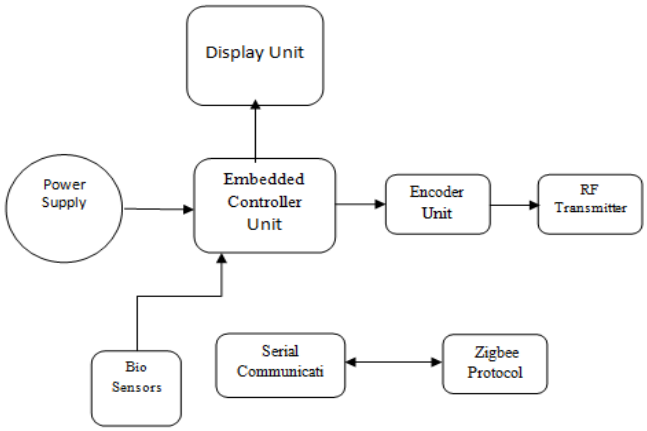

Fig 1: Notification to Ambulance.

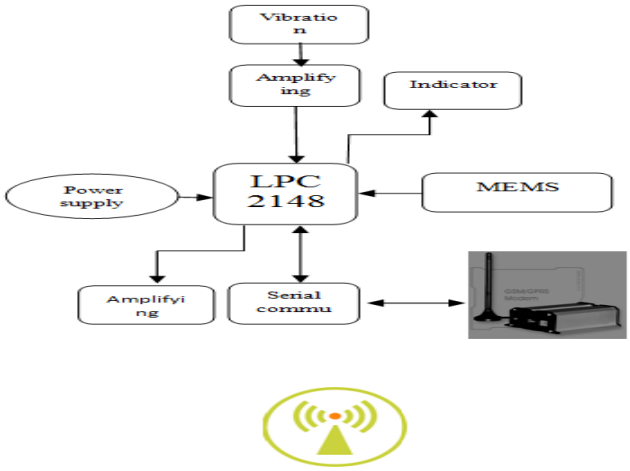

Fig 2: Communicating Vehicle Status.

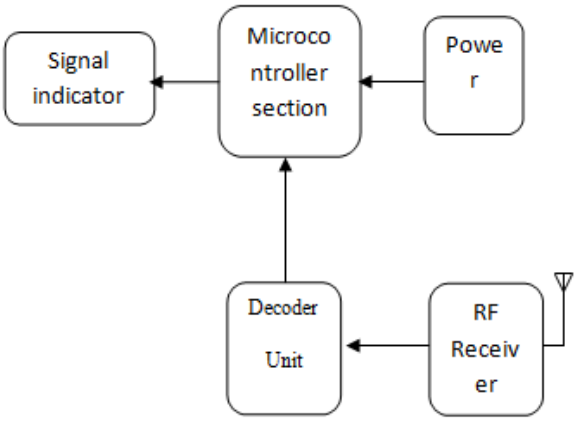

Fig 3: Signal Selection.

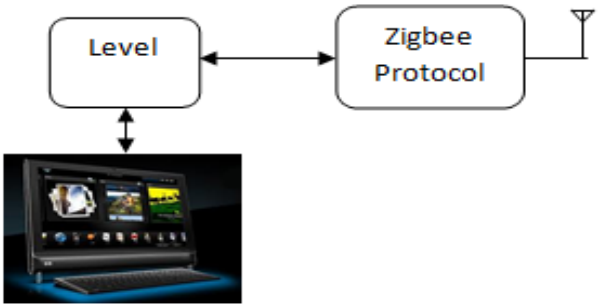

Fig 4: Notification to Hospital.

II. MEMS TECHNOLOGY

Micro-Electro-Mechanical-Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology. MEMS is an enabling technology allowing the development of smart products, augmenting the computational ability of microelectronics In most cases, the physics behind the behavior of MEMS devices can be expressed by mathematical expressions. MEM Solver works by creating a mathematical model of the system and generates analytical solutions to explain the behavior of the MEMS device. The user just has to enter the input parameters like length and width of the beam for example in a user friendly GUI, and the software will immediately calculate the relevant results and plot graphs that fully explain the MEMS device or part of it.

III.VIBRATION SENSOR

Vibration sensors detect the vibration of the ground soil in case of a debris flow. Prior to installing a vibration sensor, it is extremely important to determine what level of vibration is appropriate to activate the sensor in case of a debris flow. It is also important to keep in mind the risk of unintentional activation caused by earthquakes, as well as areas in which there is construction traffic and other vibration causes that may activate the sensor. Machinery damage and costly production delays caused by unforeseen machinery failure can be prevented.

- When pending problems are discovered early, the plant engineer has the opportunity to schedule maintenance and reduce downtime in a cost effective manner.
- Vibration analysis is used as a tool to determine machine condition and the specific cause and location of machinery problems.
- This expedites repairs and minimizes costs

IV. GPS MODULE

The Global Positioning System (GPS) comprises three segments:

- The space segment (all functional satellites)
- The control segment (all ground stations involved in the monitoring of the system master control station, Monitor stations, and ground control stations)
- The user segment (all civil and military GPS users).

GPS Was developed by the U.S. Department of Defense (DOD) and can be used both by civilians and military Personnel. The civil signal SPS (Standard Positioning Service) can be used freely by the general public, whilst the Military signal PPS (Precise Positioning Service) can only is used by authorized government agencies. The first Satellite was placed in orbit on 22nd February 1978, and there are currently 28 operational satellites orbiting the Earth at a height of 20,180 km on 6 different orbital planes. Their orbits are inclined at 55° to the equator, ensuring that at least 4 satellites are in radio communication with any point on the planet. During the development of the GPS system, particular emphasis was placed on the following three aspects:

- It had to provide users with the capability of determining position, speed and time, whether in motion at rest.
- It had to have a continuous, global, 3-dimensional positioning capability with a high degree of accuracy, Irrespective of the weather.
- It had to offer potential for civilian use

Civil use: System accuracy had been intentionally degraded up until May 2000 for political and tactical reasons by the U.S. Department of Defense (DOD), the satellite operators. It was shut down in May 2000, but it can be started up again, if necessary, either on a global or regional basis.

V. VEHICLE SECTION

A. RF transmitter and receiver

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation Radio Frequency: The 10 kHz to 300 GHz frequency range that can be used for wireless communication. Also used generally to refer to the radio signal generated by the system transmitter, or to energy present from other sources that may be picked up by a wireless receiver.

1. Transmitter

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The transmitter module is only 1/3 the size of a standard postage

stamp, and can easily be placed inside a small plastic enclosure.

TWS-434: The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls.

2. Receiver

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.

4. Transmitting and receiving

Full duplex or simultaneous two-way operation is not possible with these modules. If transmit and receive module are in close proximity and data is sent to a remote receive module while attempting to simultaneously receive data from a remote transmit module, the receiver will be overloaded by its close proximity transmitter. This will happen even if encoders and decoders are used with different address settings for each transmitter and receiver pair. If two way communications is required, only half duplex operation is allowed

VI. RELAY CIRCUIT

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Hence a CB amplifier is used to achieve the current rating of the relay. Transistors and ICs must be protected from the brief high voltage produced when a relay coil is switched off. The diagram shows how a signal diode (e.g. 1N4148) is connected 'backwards' across the relay coil to provide this protection. Current flowing through a relay coil creates a magnetic field which collapses suddenly when the current is switched off. The sudden collapse of the magnetic field induces a brief high voltage across the relay coil which is very likely to damage transistors and ICs.

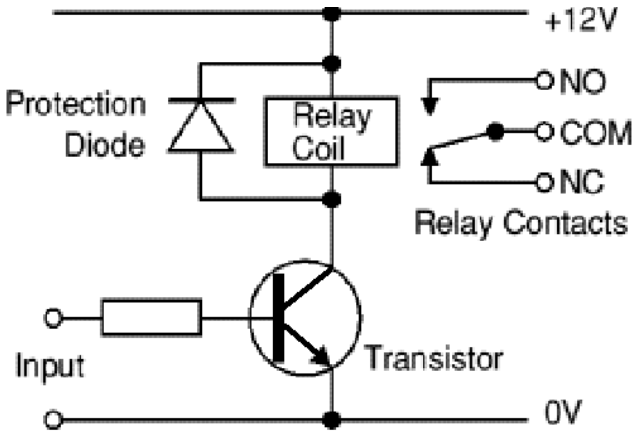

Fig 5: Realy circuit.

The protection diode allows the induced voltage to drive a brief current through the coil (and diode) so the magnetic field dies away quickly rather than instantly (fig 5). This prevents the induced voltage becoming high enough to cause damage to transistors and ICs.

VII. INTRODUCTION OF GPRS AND TRANSMISSION MODULE

The General Packet Radio Service (GPRS) is a connectivity solution based on Internet Protocols supporting a wide range of enterprise and consumer applications available now with almost every GSM network. GPRS is a method of enhancing 2G phones to enable them to send and receive data more rapidly. It promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users. GPRS supports a number of data services such as Short Message Service (SMS), Multimedia Messaging Service (MMS), Wireless Application Protocol (WAP) access, as well as Internet communications services. Additionally GPRS customers enjoy a number of advanced, feature-rich data services such as colour Internet browsing, e-mail on the move, video streaming, multimedia messages and location-based services. GPRS data transfer is typically charged per megabyte of traffic transferred, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user actually is using the capacity or is in an idle state. GPRS is a best-effort packet switched service, as opposed to circuit switching, where a certain quality of service (QoS) is guaranteed during the connection for non-mobile users. 2G cellular systems combined with GPRS are often described as "2.5G", that is, a technology between the second and third generations of mobile telephony

VIII. LM35 AND HEARTBEAT SENSOR

A. Temperature sensor

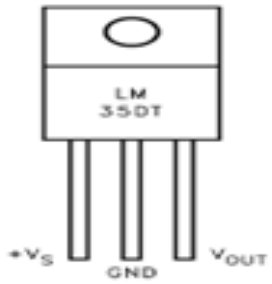

Fig 6: Temperature sensor.

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially

easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package. Figure 6 shows the temperature sensor diagram.

B. Heart beat sensors

The sensor consists of a light source and photo detector; light is shone through the tissues and variation in blood volume alters the amount of light falling on the detector. The source and detector can be mounted side by side to look at changes in reflected light or on either side of a finger or earlobe to detect changes in transmitted light. The particular arrangement here uses a wooden clothes peg to hold an infrared light emitting diode and a matched phototransistor. The infrared filter of the phototransistor reduces interference from fluorescent lights, which have a large AC component in their output. The skin may be illuminated with visible (red) or infrared LEDs using transmitted or reflected light for detection. The very small changes in reflectivity or in transmittance caused by the varying blood content of human tissue are almost invisible. Various noise sources may produce disturbance signals with amplitudes equal or even higher than the amplitude of the pulse signal. Valid pulse measurement therefore requires extensive preprocessing of the raw signal.

IX. ZIGBEE

A. Zigbee module

The XBee/XBee-PRO RF Modules are designed to operate within the ZigBee protocol and support the unique needs of low-cost, low-power wireless sensor networks(fig 7). The modules require minimal power and provide reliable delivery of data between remote devices. The modules operate within the ISM 2.4 GHz frequency band and are compatible with the following:

- XBee RS-232 Adapter
- XBee RS-232 PH (Power Harvester) Adapter
- XBee RS-485 Adapter
- XBee Analog I/O Adapter
- XBee Digital I/O Adapter
- XBee Sensor Adapter
- XBee USB Adapter
- XStick
- Connect Port X Gateways
- XBee Wall Router.

The XBee/XBee-PRO ZB firmware release can be installed on XBee modules. This firmware is compatible with the ZigBee 2007 specification, while the ZNet 2.5 firmware is based on Ember's proprietary "designed for ZigBee" mesh stack (EmberZNet 2.5). ZB and ZNet 2.5 firmware are similar in nature, but not over-the-air compatible. Devices running ZNet 2.5 firmware cannot talk to devices running the ZB firmware.

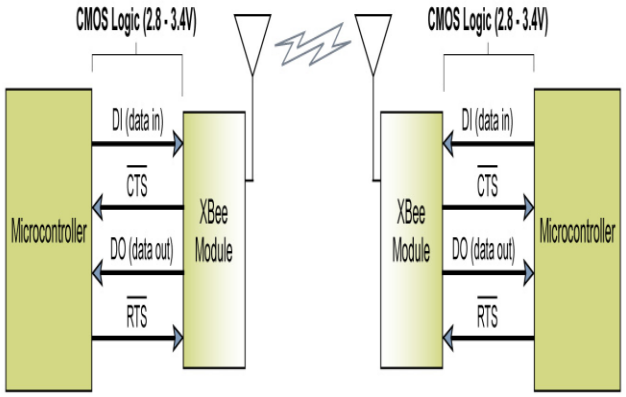

Fig 7: Design of Zigbee module.

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- XBee USB Adapter
- XStick
- Connect Port X Gateways
- XBee Wall Router.

X. CONCLUSION

The ambulance is controlled by the central unit which furnishes the most scant route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The server also determines the location of the accident spot through the sensor systems in the vehicle which encountered the accident and thus the server walks through the ambulance to the spot. This scheme is fully automated, thus it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

XI. REFERENCES

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