

Wave Height Measurement and Tsunami Detection

Mr. Ajinkya A.Karanjawane¹ Mr. Karan J. Pardeshi² Mrs.Kalpna J.Amrutkar³

^{1,2,3}Department of Electronics & Telecommunication Engineering

^{1,2,3}Sinhgad Technical Education Campus, Pune, India

Abstract— A Wave Height Measurement and Tsunami Detection system is used to detect wave height of ocean waters. Wave Height Measurement System contains a sensor to detect wave height and a communications facility to issue timely information to a remote users for monitoring purpose and for further evaluation towards the needs of the coastal areas. The A Wave Height Measurement and Tsunami Detection system is based on GPS, GSM and Accelerometer, which are interfaced with PIC controller. The Onsite Personnel Health Monitoring system is an individual system to remotely monitor the health status of the person working in the field. The Onsite Personal Health Monitoring System is based on Bio medical sensor, GPS, GSM. This kit will also indicate location of people present on particular place in the ocean. The server unit will convey message to dedicated mobile and also receive any type of message information from given system.

Key words: PIC, LCD, Accelerometer, GSM, GPS, Biomedical Sensors

I. INTRODUCTION

A Wave Height Measurement system is used to Measure wave height of ocean water and deliver at remote site through GSM transmission. Wave Height Measurement system contains a sensor to detect wave height and communication facility to issue timely information to the remote user for monitoring purpose. The Wave Height Measurement System is based on GPS, GSM, and Accelerometer, which are interface with microcontroller. The Onsite Personal Health Monitoring System is an individual system to remotely monitor the health status of the person working in the field. This kit will also indicate location of person present on particular place in the ocean. The Onsite Personal Health Monitoring System is based on Bio medical sensor, GPS, GSM.

II. BLOCK DIAGRAM

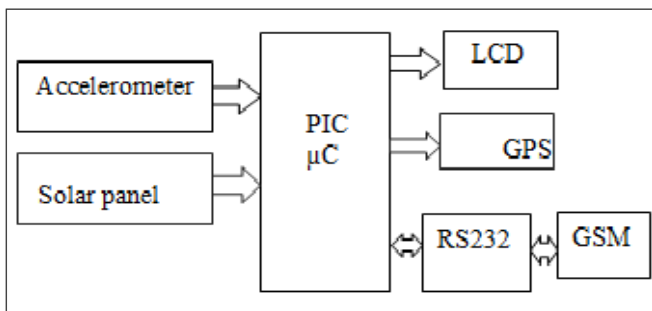


Fig 1.1: Wave height measurement system.

1) Description:

This unit has an accelerometer connected to the microcontroller's analog port. The accelerometer provides x, y, and z readings. Initially, the accelerometer is placed at a normal level.

As soon as the level increases, the x-axis reading starts to increase. As soon as the reading goes above the set point, the microcontroller will send an SMS to the people leaving near the shore, indicating an impending tsunami.

III. BLOCK DIAGRAM

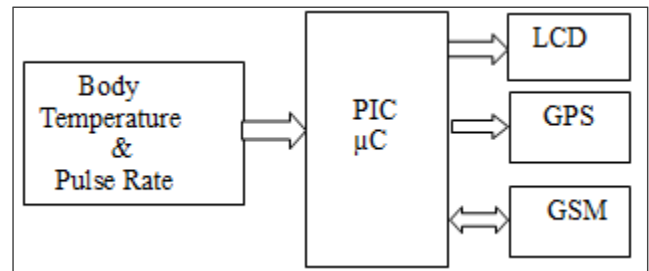


Fig. 1.2: Onsite Personal Health Monitoring System

DESCRIPTION:

This monitoring system is placed on the person in the field. It has mainly two parts:

A. Biomedical sensors:

A body temperature sensor as well as a pulse rate sensor stores the information in the microcontroller's memory. This data is used to monitor the health status remotely. Accordingly, a preventive measure or survival activity can be taken depending upon the emergency.

1) Temperature Sensor:

A temperature sensor is used to sense the temperature. We have used a temperature sensor called LM35. The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. ... The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy.

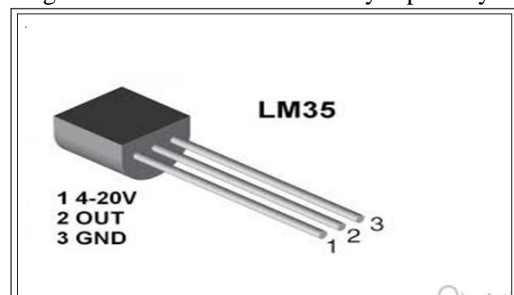


Fig. 1.3: 1LM35 Temperature Sensor

2) Pulse rate sensor:

The pulse rate sensor interfaced within the system will keep on monitoring the pulses of the VIP person in order to ensure that the person is safe. If the pulse rate is fast, that will indicate that either the VIP person is not safe or he/she has some health issues. So, on the basis of the output provided by the pulse rate sensor, we can track the health issues of the VIP person.

B. GPS & GSM unit

1) GSM MODEM: SIM900

GSM (Global System for Mobile communication) is a digital mobile telephony system. With the help of GSM module interfaced, we can send short text messages to the required authorities as per the application. GSM module is provided by SIM uses the mobile service provider and send SMS to the respective authorities as per programmed. This technology enable the system a wireless system with no specified range limits. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.



Fig. 1.4: GSM Modem

C. GPS Modem:

The Global Positioning System (GPS), originally Navstar GPS, is a space-based radionavigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

The GPS system does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS system provides critical positioning capabilities to military, civil, and commercial users around the world.



Fig. 1.5: GPS Modem

The GPS concept is based on time and the known position of GPS specialized satellites. The satellites carry very stable atomic clocks that are synchronized with one another and with the ground clocks. Any drift from true time maintained on the ground is corrected daily. In the same manner, the satellite locations are known with great

precision. GPS receivers have clocks as well, but they are less stable and less precise.

1) Microcontroller-

The main advantages is that it can be write-erase many times as possible because it has a FLASH memory technology. Microcontroller has a total number of 40 pins and there are 32 pins for input and output port. PIC18F is used Communication Protocol PIC18F is marked as advanced, as it uses well sophisticated protocols for communications. The modern protocols like USB, SPI, EUSART, I2C, etc are well supported in PIC18F. These technologies integrate with Nano Technology (as mentioned before) to produce PIC18F, as well equipped, low power consuming microcontroller

2) Accelerometer:

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic caused by moving or vibrating the accelerometer.

The three axis accelerometer are basically used to identify the movement across the three axis i.e. x-axis, y-axis, z-axis. Accelerometer is an electronic device which is interfaced using I2C protocol and provides reading after every 1msec.

By measuring the amount of static acceleration due to gravity, you can find out the angle the device is tilted at with respect to the earth. Accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which cause a voltage to be generated. Accelerometers are available that measure in one, two, or three dimensions. The most familiar type of accelerometer measures across two axes. However, three-axis accelerometers are increasingly common and inexpensive.

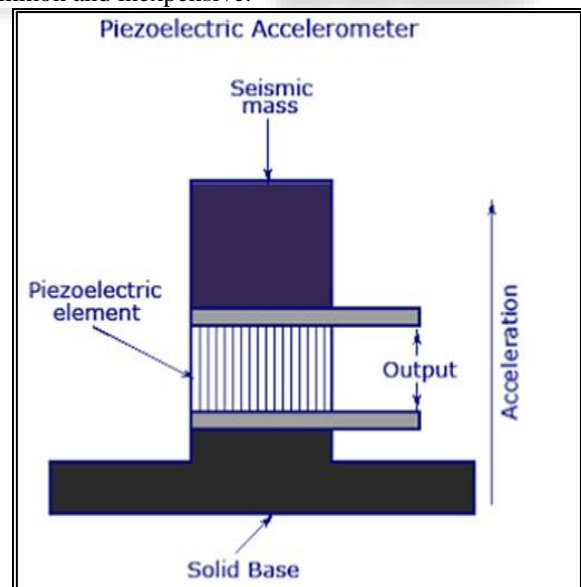


Fig. 4.1: Piezoelectric Accelerometer

3) LCD

16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

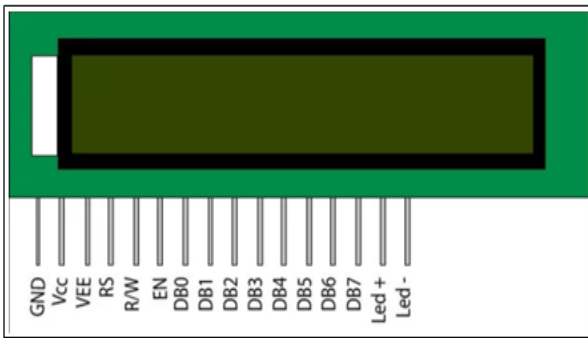


Fig. 1.4: LCD

- a) Advantage-
 - Quick response time
 - Fully automate system thus Reduces human efforts
 - Robust system.
 - Highly flexible.
- b) Applications:
 - Used for Tsunami Detection
 - Used in Early Warning System
 - Used in Navigation Applications.

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