Volume 2, Issue 12, December-2015, pp. 1153-1157 ISSN (O): 2349-7084

International Journal of Computer Engineering In Research Trends

Available online at: www.ijcert.org

TSUNAMI DETECTION SYSTEM

[1]Mrs.Grace John ,[2]Athira P I , [3]Sreedevi K

[1,2,3]*ECE Department, Vimal Jyothi Engineering College,Kannur*

Abstract:- — The Tsunami waves cause considerable destruction and kills people . The detection section of the proposed system consists of a microcontroller, a vibration sensor to detect the Tsunami occurrence and a tilt sensor to monitor the sea waves. The principle is as follows, on the onslaught of Tsunami or any other natural calamity of this type , there is an abnormal pressure changes in the sea floor producing vibrations. Here a piezoelectric vibration sensor is used which gives an output depending on variations, and a microcontroller is used to announce the oncoming of Tsunami event to a concerned person, through the mobile computing. Mobile is used to give warning calls or send warning messages.

Keywords: Peripheral Interface Controller

1. INTRODUCTION

A Tsunami is a very long-wavelength wave of water that is generated by earthquakes that causes displacement of the seafloor, but Tsunami can also be generated by volcanic eruptions, landslides and underwater explosions. Earthquakes of M > 6.5 are critical for tsunami generation. On the average, there are two tsunamis per year somewhere in the world. Approximately every 15 years a destructive, Pacific wide tsunami occurs. Tsunami velocity is dependent on the depth of water through which it travels Tsunamis travel approximately 700 kmph in 4000 m depth of sea water. The velocity drops to about 36 kmph at 10 m of water depth which cause damage near the shore. Tsunami often occurs suddenly without warning and they are extremely dangerous to the coastal communities. To protect ourselves from such disaster some automated warning systems should be made. The proposed Tsunami warning system is basically an Embedded Systems. An embedded System is a microcontroller based system that is incorporated into a device to monitor and control the functions of the components of the device. Embedded systems are designed to perform specific tasks. An Embedded system is designed to perform a specific function, in which the software rules the entire hardware. The end user cannot alter the software. Reliability, Responsiveness, specialized hardware, low cost, robustness are some of the important features of an embedded system. To make such embedded applications, microcontrollers are needed.

2. BLOCK DIAGRAM

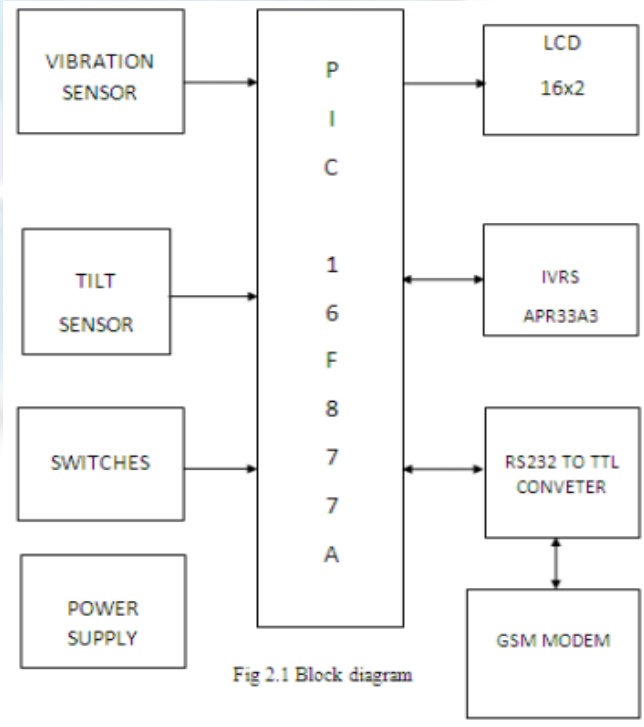

Fig 2.1 Block diagram

3. SYSTEM OVERVIEW

Block diagram contains ,Microcontroller PIC 16F877A, a 40 pin IC which is the brain of our project has 33input/output ports,8kb internal program memory,368 byte RAM and 256 byte EPROM . In this project mainly we are considering two sensors vibration sensor and tilt sensor. Vibration sensor ,a 2 pin IC which is small in size. It is an analog sensor which provide high frequency response. Next is the tilt sensor ,a 5 pin IC.Measures titling in often to a reference axis having 2 axis(Xaxis&Yaxis).For complete motion we are using 3 axis(X,Y,Z axis).It can be used as an warning system .Next is IVRS APR33A3 which is used for record and playback. Operating voltage is 3-6.5v , recording capability is 11 minutes and no external IC is used . Here we are using a 16x2 lines alpha numeric display unit displays all events which lead this as menu driven operation . It has a built in oscillator circuit.GSM modem used for sending and receiving MMS and SMS, which accepts SIM card and operate just like a mobile phone . In this we are using AT command .To interface this GSM modem with our microcontroller ,an interface circuit known as RS232 interface is needed . The interfacing IC is MAX232,which is a dual driver or reciever and typically converts RX,TX,CTS and RTS signals. It's typical threshold value is 1.3v.Power supply which is the main part of any project. Here we are using 5v supply. In this we are using a L7805 regulator IC which maintains a constant output level. Our system checks RPM using RPM sensor and inform concerned authority if over speed occurs also the system provides the facility to bus passengers by receiving station information received by wireless receiver. To achieve these things, we used an 8bit Microcontroller as its CPU. The PIC 16F877A is a lowpower, high-performance CMOS 8-bit microcomputer with 8K words of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Microchip's high density nonvolatile memory technology and is compatible with its RISC instruction. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the PIC 16F877A is a powerful microcomputer which provides a highly flexible and cost effective solution for many embedded control applications. This is a software controlled system, and it makes use of an 8 bit microcontroller PIC16F877A, is a 40 pin IC having 5 I/O ports (33 I/O pins). It has 14 interrupts, 8 A/D input channel, USART with 9 bit address detection, 8K x14 words Flash Program Memory, 368 x 8 bytes of Data Memory (RAM), and 256 x 8 bytes of EEPROM Data Memory

VIBRATION SENSOR

The Minisense 100 is a low-cost cantilever-type vibration sensor loaded by a mass to offer high sensitivity at low frequencies. The pins are designed for easy installation and are solder able. Horizontal and vertical mounting options are offered as well as a reduced height version. The active sensor area is shielded for improved RFI/EMI rejection. Rugged, flexible PVDF sensing element withstands high shock overload. Sensor has excellent linearity and dynamic range, and may be used for detecting either continuous vibration or impacts. The mass may be modified to obtain alternative frequency response and sensitivity selection (consult factory).

Fig 3.2 Vibration sensor

The MiniSense 100 acts as a cantilever-beam accelerometer. When the beam is mounted horizontally, acceleration in the vertical plane creates bending in the beam, due to the inertia of the mass at the tip of the beam. Strain in the beam creates a piezoelectric response, which may be detected as a charge or voltage output across the electrodes of the sensor. The sensor may be used to detect either continuous or impulsive vibration or impacts. For excitation frequencies below the resonant frequency of the sensor, the device produces a linear output governed by the "baseline" sensitivity quoted above. The sensitivity at resonance is significantly higher. Impacts containing high-frequency components will excite the resonance frequency, as shown in the plot above (response of the MiniSense 100 to a single half-sine impulse at 100 Hz, of amplitude 0.9 g). The ability of the sensor to detect low frequency motion is strongly influenced by the external electrical circuit, as described below (see "Electrical Description").

TILT SENSOR

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tiltsensing applications,

as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

Fig 3.3 Tilt Sensor

system. The ADXL335 has a measurement range of ±3 g mini-mum. It contains a polysilicon surfacemicromachined sensor and signal conditioning circuitry to implement an open-loop acceleration measurement architecture. The output signals are analog voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt-sensing applications as well as dynamic acceleration resulting from motion, shock, or vibration. The sensor is a polysilicon surface-micromachined structure built on top of a silicon wafer. Polysilicon springs suspend the structure over the surface of the wafer and provide a resistance against acceleration forces. Deflection of the structure is measured using a differential capacitor that consists of independent fixed plates and plates attached to the moving mass. The fixed plates are driven by 180° out-of-phase square waves. Acceleration deflects the moving mass and unbalances the differential capacitor resulting in a sensor output whose amplitude is proportional to acceleration. Phase-sensitive demodulation techniques are then used to determine the magnitude and direction of the acceleration. The demodulator output is amplified and brought off-chip through a 32 kΩ resistor. The user then sets the signal sbandwidth of the device by adding a capacitor. This filtering improves measurement resolution and helps prevent aliasing

RECORD AND PLAYBACK SWITCHES …

A tactile switch is an on/off electronic switch that is only on when the button is pressed or if there is a definitive change in pressure. Another way to consider it, as momentary make or break switch. As soon as a tactile switches button is released, the circuit is broken. A main area of tactile switches, are tact switches. Tact switches are tactile electromechanical switches for keyboards, keypads, instruments or interface control-panel applications. Tact switches react to user interaction with the button or switch when it makes contact with the control panel beneath. In most cases this is usually a printed circuit board (PCB)

LCD DISPLAY

DISPLAY LCD display unit helps user to manage operation very easily. It is a 16X2 lines alpha numeric display unit displays all events which lead this as menu driven operation. More details about it are given below.

Features of LCD display

- Easy interface with a 4/8-bit MPU.
- Built-in dot matrix LCD controller with font 5x7 or 5x10 dots.
- Display data RAM for 80 characters(80x8 bits).
- Character generator ROM which provide 160 characters.
- Both DD ram and CG ram can be read from MPU. Internal automatic reset circuit at power on.

VOICE AND PLAYBACK UNIT

- This unit is responsible for storing station information as voice codes. This is done with APR33A3 Recording voice IC The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-toanalog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

RS232 TO TTL CONVERTER

- For connecting GSM modem to our system, an interface circuit known as RS232 interface is needed. The interfacing IC is MAX232. MAX232 To allow compatibility among communication equipment made by various manufactures, an interfacing standard called RS232 was set by the Electronics Industries Association (EIA) in 1960. Since the RS232 standard is not suitable with today's microprocessors and microcontrollers, we

need a line driver (voltage converter) to convert the RS232 levels to TTL voltage levels that will be acceptable to 8051's TXD and RXD pins. One of such converter is MAX232 from Maxim Corp. On advantage of MAX232 chip is that it uses a +5V power source which is same as the source voltage for 8051. MAX232 converts TTL logic levels to RS232 logic levels and vice versa. In RS232, 1 is represented by -3V to +25V, while 0 bit is +3V to +25V, making -3 to +3 undefined. For this reason, to connect any Rs232 to a microcontroller system we must use voltage converters such as MAX232.

Fig.3.3 Max232

GSM MODEM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

POWERSUPPLY

The power supply is the most indispensable part of any project. IC regulators are versatile and relatively inexpensive and are available with features such as current/voltage boosting, internal short circuit current limiting, thermal shutdown and floating operation for high voltage applications. The regulated circuit is used to maintain constant output level. The integrated circuit regulator, sometimes called the three terminal regulators contains the circuitry for reference source error amplitude control device and overload protection all in a single IC chip. The regulator IC here used isL7805. It provides regulated 5V to the controller. Its maximum input voltage is 35V and minimum voltage is 8V. Output is constant 5V

ADVANTAGES AND DISADVANTAGES

Advantages

It can detect earth quake based natural calamities in faster way so that it can prevent loss of life and properties. This detection system is fully automatic. In this embedded system, fast alarm generation is implemented so that rehabilitation processes can start as fast as possible. This can monitor tidal level .

Disadvantages

Mobile network issue makes the system idle

FUTURESCOPE

Disadvantages can be avoided by making a dedicated satellite network provided only for our system so that it can generate call to authorized person any time. In future Tsunami occurrence can be decided and alarm can be raised only after checking many criteria. Three criteria to be checked out are as follows:

- Pressure inside the sea bed.
- Biological changes in the marine living organisms.
- Sea shore level.

If all these three criteria get detected then it can be concluded that there is some occurrence of Natural disaster (Tsunami).

4. CONCLUSION

Overall, the result indicates the ability for an evolution of a system which can detect Tsunami in advance based on the pressure changes under the sea. If, it is being practically implemented with the future enhancement any natural disaster can be detected in advance without producing false alarms. Existing system has all the facilities to detect Tsunami. Obviously it will detect Tsunami before many hours which are going to occur by raising an alarm. But, the problem with the existing system is, there is a chance to produce false alarms often which threatens our government and public.

REFERENCES:

[1] Kenneth Jamaal,"8051 Microcontroller ", West Publishing Company, 1991.

[2] R.S.Sedha, B.L.Theraja, "Principles of Electronics Devices and Circuits", International Book distributing CO, India, 1998.

[3] Steven Roman, Ron Petrusha, Paul Lomax, "VB.Net Language In a nutshell", O'Reilly, 2002.

[4] F.I.Gonneuman, Jalez, H.B.milburn, E.N.Bernard, Journalfrom "Oceanic and Atmospheric

Administration", WA98115, 2003.
[5] Wayne, A.Morrissey, Journal from "Science and Technology Information Resources, Science and Industry Division", 2005.
[6] Macrander , "PACT-a bottom pressure based .Compact Deep ocean Tsunameter with Acoustic surface Coupling." 2009 IEEE.
[7] YasuakiTeshirogi, Jun Sawamoto, NorihisaSegawa, EijiSugino, "A proposal of Tsunami warning system Using Area Mail Disaster Information Service on mobile Phones."2009 International Conference on Advanced Information networking and application workshops.
[8] USAID|ASIA –"How do seismometers contribute to a Tsunami Warning System".

