Wireless Surface Acoustic Wave Pressure for Seismic Monitoring Systems

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***Abstract*— This proposal generally reduces manpower, saves time and operates efficiently without human interface. In this system we monitor the pressure of water. In this proposed system it consists of two sections one is the underwater section and the other is the surface section. The pressure in the water is measured with the help of wave pressure sensor. The controller will transmits the data from the sea-shore section to the surface section in the wireless communication mode called ZigBee. If there any abnormality (earthquake/tsunami) occurs the controller automatically send an alert message via smart phone, laptop in real time. We are using three options for sending message they are as follows GSM transceiver, satellite transceiver and wideband transceiver. All these are used because if any one fails to transfer information the other two will pass the message. LCD is used to display the status of the system. From the survey done on 2014 earthquake is measured using moment magnitude scale, and a prototype model is done.**

I. INTRODUCTION

Wireless communication is becoming popular among all and it is useful in many ways, so we are going for wireless surface wave pressure monitoring instead of using it in underwater. Underwater acoustic communication is a technique of sending and receiving message .There are several ways have found for communication purpose but most commonly used is hydrophones. Under water communication is difficult due to factors like multi-path propagation, time variations of the channel etc., In underwater communication there are low data rates .underwater communication uses acoustic waves instead of radio waves. The ocean bottom seismometer with hydrophone is used to record and measure the pressure signals generated by tsunamis and the data that is collected from seafloor sites. The recorded seismic signals are of low distortion and low noise [1].Latest scientific results from monitored data are produced from cabled observations. Technical and theoretical developments for offshore earthquake monitoring must be considered for profound perception of geophysical processes [2].

In ocean observing systems, two techniques are implemented they are sea floor mapping and data-handling techniques. These results are obtained from commercial off-the shelf [3].The study reports on variability of the Total Electron Content (TEC) are measured in various countries. This paper concentrated on north Sumatra earthquake which recorded 8.6 in Richter scale in the year 2005[4].W-TREMORS, wireless sensing system for high-frequency and high reliability data acquisition to monitor seismic events result shows a good performance [5]. The variability of Total Electron Content during north Sumatra earthquake taken place in the year 2004.Global Positioning System (GPS) data is taken from Malaysian Mapping and Geodesy department. This result shows good agreement for earthquake readers [6].A new cross layer channel-aware routing protocol for wireless sensor networks for multi-hop delivery of data. It obtains remarkable performance improvements [7]

In this paper we are monitoring the pressure of sea shore waves to give a reliable earthquake warning in real time. Related to this survey is done. Simulation result and prototype model has been discussed in the sections 3 and 4.

II. METHODS AND METHODOLOGY

In this paper we propose two sections. They are as follows, A. Underwater section

B. Surface section

In the first underwater section, surface wave pressure sensor senses the pressure in water and that is given to controller which will transmit the data from the sea-shore to wireless communication mode called ZigBee. In the second Surface section, the data received from ZigBee is updated in PC. If there any disaster (earthquake/tsunami) occurs the controller will automatically send an alert SMS via GSM transceiver, wideband transceiver and satellite transceiver.

A. First Section: Underwater Section

The wave pressure sensor MS7201-A2 is placed in the sea shore .As the sensor stability is increased because a drilled glass is bounded on the backside of pressure sensor. The output of the sensor is given to PIC16F877A Microcontroller. Where PIC input is of only 0-5v so a signal conditioning circuit is fixed for converting 5v.Power supply is given to PIC Microcontroller for regular power supply. The data is collected frequently by PIC Microcontroller. When the vibration or pressure increases the data that is given to microcontroller and this information is given to ZigBee .ZigBee is used for transmitting and receiving data. In underwater section the work of the ZigBee is to transmit data and the other end i.e., in surface section receives the data through ZigBee. LCD HD44780 displays the values for every second

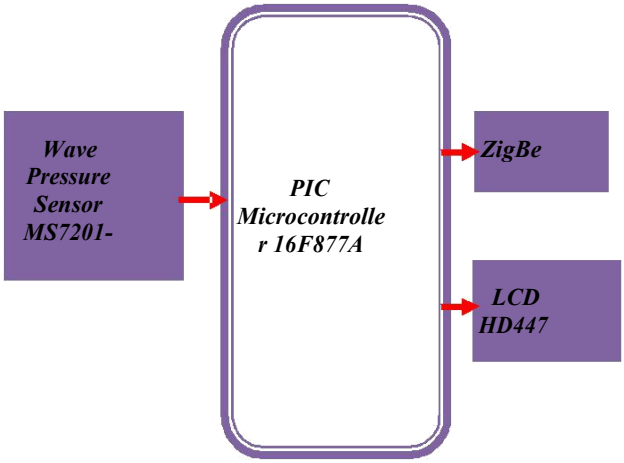

Figure 1. Block diagram for Underwater Section

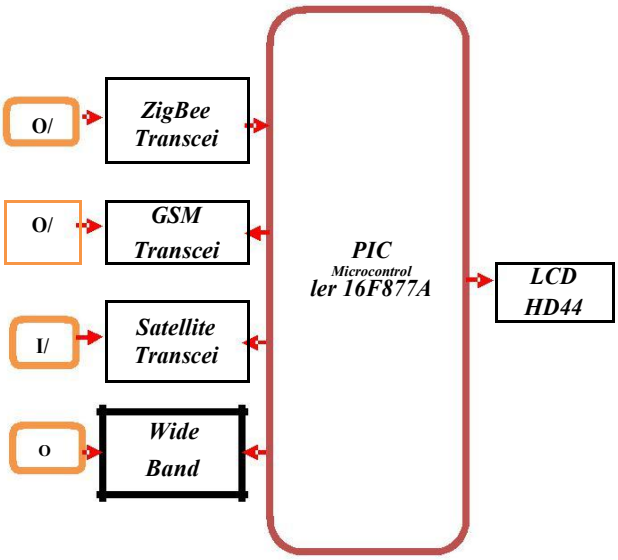

Figure 2. Block diagram for Surface Section

B. Second Section: Surface Section

The transmitted data from the ZigBee i.e., from underwater section is received in the surface section ZigBee. Then the received data is given to PIC Microcontroller .The program is written and fed to the microcontroller .When the moment magnitude value is greater than 2.0 it should send the message via, GSM transceiver, satellite transceiver, wideband transceiver. We have used three modes of communication they are satellite transceiver, GSM transceiver and wideband transceiver because if satellite transceiver fails to transmit data then that process is carried out by GSM transceiver and wideband transceiver. Again if GSM transceiver and satellite transceiver fails to transmit then that work will be done by wideband transceiver.LCD is connected to PIC to display what is the condition at present that is according to moment magnitude scale when the value is less than 2.0 normal pressure will be displayed and if it is greater than 2.0 then it is absorbed as earthquake and it will display as abnormal pressure in LCD screen and in the next few seconds message is sent, by three modes of communication.

III. LOGIC DIAGRAM AND SIMULATION RESULT

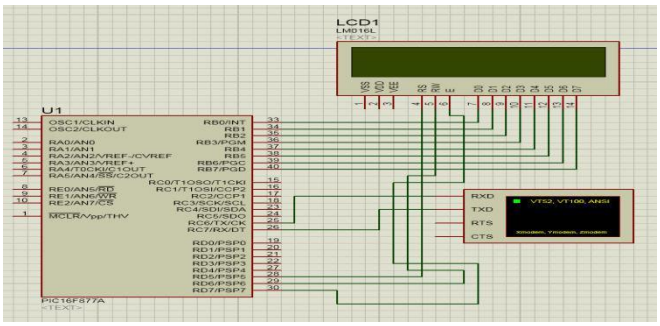

Figure 3. Logic diagram for Surface Section

Logic diagram is drawn in proteus 8 demonstration software, wave pressure sensor is connected to port A (pin no.2 RA0/AN0) of PIC Microcontroller for Analog to Digital Conversion (ADC).Microprocessor port B (pin no.33-40 RB0-RB07) is connected to LCD (pin no.7-14 D0-D7), port D pin no.28-30 RD5-RD7 is connected to LCD of pin no. 4-6 instruction and data input, read/write, Enable signal. Microcontroller port C pin no.26 (RC7) is connected to transmitting section of ZigBee and pin no.25 (RC6) is connected to receiving section of ZigBee. ZigBee act as communication medium as shown in fig.4In fig.4 it is just as fig3.except pressure sensor others are same (PIC Microcontroller ZigBee and LCD). In addition to this pin. RO6, RO7 are connected to

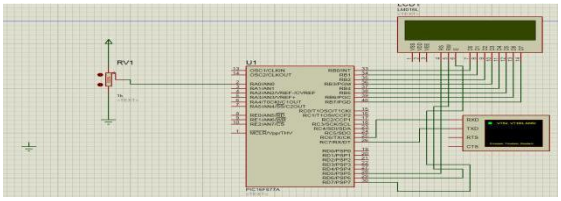

Figure 4. Logic diagram for Underwater Section

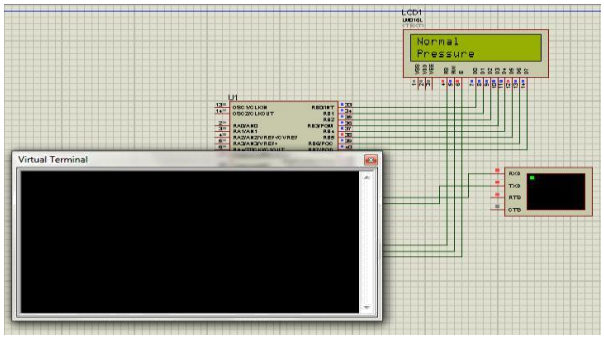

Figure 5. Normal pressure

GSM. The circuit diagram is drawn for prototype model i.e., out of three modes we have considered only GSM and shown output.

Fig.5, the virtual terminal window is displayed when we run the simulation. The LCD will be displaying normal pressure when the range is below 4oo Pascal. Similarly when the resistor value is above 400 Pascal then in the LCD displays a alphabet A. A represents absolute pressure as shown in fig.6.when the value is high then it is considered as earthquake and message will sent. As shown in the virtual terminal window i.e., Fig. 7.

The simulated output is shown in fig.7, when we increase the wave pressure sensor RV1 value and run the simulation. In LCD it will be displayed as absolute pressure. When we decrease the wave pressure sensor RV1 value and run the simulation. In LCD it will display the status of the system.

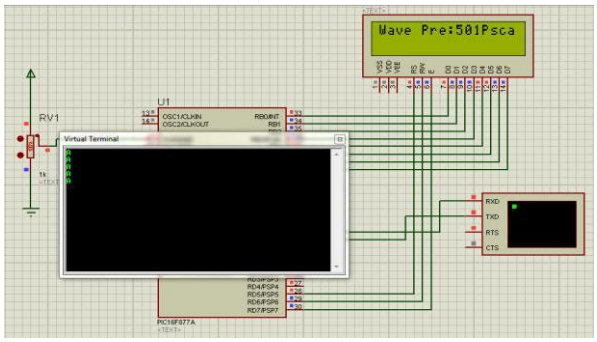

Figure 6. Absolute pressure

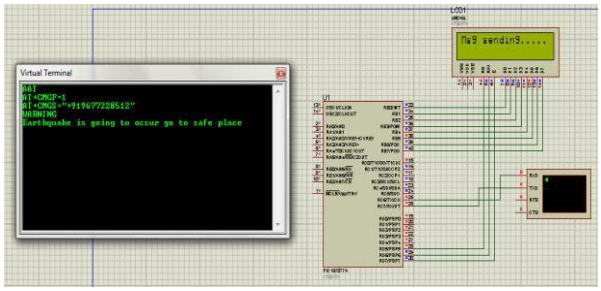

Figure 7. Simulated Output shows that message is sent

A. Earthquake Zones

Fig.8 shows the earthquake zones in the year 2014.These zones are marked from the smallest magnitude (2.0) to the largest magnitude (8.9) to monitor all the places and it is done. Survey is done for checking out how many places all over the world are affected frequently and we can implement this process and help people from severe damage, by sending this information in real time.Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

Figure 8. Earthquake zones

TABLE I. FREQUENTLY AFFECTED PLACES

Rank	Location	Varying Magnitude Range
1	Chile	3.0-8.2
2	Japan	4.0-7.1
3	Papua New Guinea	3.2-7.1
4	Fiji	2.0-6.9
5	Alaska, United States	5.1-7.9

B. Hardware Description And Output

From the below fig. the prototype model comes under first section: underwater section. Regular Power supply is

given to PIC microcontroller for running IC without any interruption. The wave pressure sensor input is of 0-12v.

Figure 9. Prototype Model Output For Normal Pressure When Value Is Less Than 400

Regulator is used in the circuit board in order to reduce the pressure voltage and output is 5v this is given as input to the PIC microcontroller. This conversion takes place because microcontroller accepts only 5v. If it exceeds 5v microcontroller will get damaged. PIC microcontroller connects ZigBee and LCD. In this section LCD is used for displaying values and ZigBee is used for transmitting value. In second section: surface section, for this use of power supply and PIC microcontroller is same. Microcontroller connects ZigBee, GSM and LCD. ZigBee is used for receiving data from underwater section and LCD displays the status of pressure.GSM is used to send warning message to mobile phones.

When the pressure sensor value is less than 400 Pascal. Then in second section LCD it will be displayed as normal pressure. Message will not be sent. As usual LCD displays the value as shown in fig.10.

Figure 10. Prototype Model Output For Abnormal Pressure When Value Is Greater Than 400

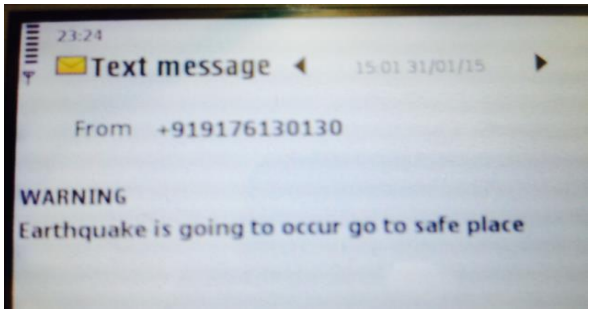

Figure 11. Hardware Output

When the wave pressure sensor value is greater than 400 Pascal. Then in second section LCD it will be displayed as abnormal pressure. Warning message is sent via GSM. LCD indicates that message is sending and when message is delivered it will be displayed as message sent as shown in fig 10.fig.11 shows the warning message(Earthquake is going to occur go to safe place) that has been sent from GSM to mobile.

IV. CONCLUSION

A wireless surface acoustic sensor networks for seismic monitoring has proposed in this paper. It has described in detail in two sections i.e., underwater section and surface section. The data is collected from sea shore waves, when any type of disorders is going occur then the message are sent to everyone via mobile, PC. Even the data that we get will be useful for Fishermans, people resting in beach, ships etc.,

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