

Earthquake Protection Bed

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Abstract:

An earthquake protection bed is a structure for housing a bed, for protection of a sleeper against serious injury or death from falling debris or collapse or damage of the surrounding residence in an earthquake. And the earthquake protection bed is having the superior endurance property is constructed of approximately box-shaped metallic panels and contains necessities in the event of an earthquake, such as tools for escaping ,oxygen, medicine and food in tool boxes installed under the bed.

This earthquake protection bed include box-shaped metallic panels. Each panel is shaped with a plurality of frames and a pair of metal plates fixed on both sides of the frames and this bed is supported by telescoping tubes with compression springs to absorb the energy of the falling debris thereby minimizing the damage to the bed structure and to provide safety to the occupant in the bed. Now the position of the person can be shared by using the GPS^[4](Global Positioning System) so that it can help to identified the person in the surroundings. The triangular structure is shaped to take the pressure easily so that the bed should not damaged heavily.

1. INTRODUCTION

In every year ,due to earthquakes number of people are dying and many more are effected physically like broken body parts. Earthquake will cause due to the sudden release of energy from the earths crest.The death rate of the people year by year due to earthquake is shown below.

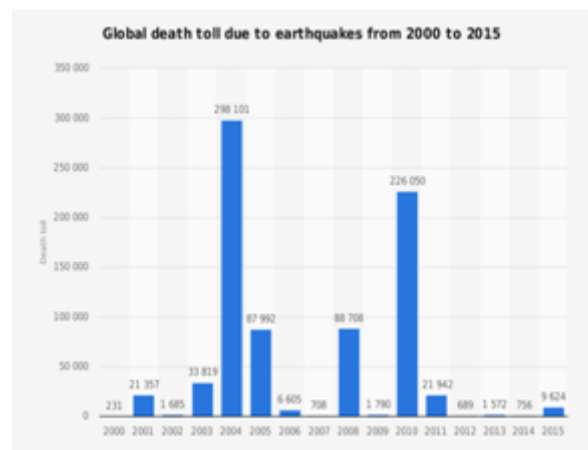


Figure.1 Graph representation of global death toll due to earthquake from 2000 to 2015

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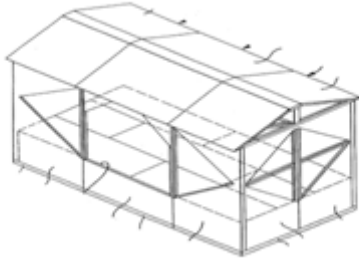


Figure.2 Structure of the bed

An earthquake can range in size from those that are so weak that they cannot be felt to those violent enough to toss people around, damage huge buildings and destroy cities. If this happens in the seabed then it will cause tsunamis and can also trigger landslides and volcanic activity. So necessary precautions need to be taken to face the earthquake, an earthquake protection bed is the one which will protect the sleeper against causing serious damage or even death of that person by forming a protective shield which can protect the person [1].

In this bed, the necessary tools like food, oxygen and medicine etc can be provided and a GPS is placed inside that box so that the position of that person can be identified. It also has a GSM which will help to send a message to the family members of the sleeper. These GSM and GPS modules are connected to the Arduino. To identify the earthquake we use an earthquake sensor but for the prototype we are using a vibration sensor [2]-[5].

The earthquake protection bed can be made in such a way that it will protect the sleeper by not getting any severe injuries. To obtain that we are using a structure shown in the figure below so that the impact can be shared by all the three axes and shock absorbers are used to absorb the pressure and safeguard the person inside the bed and to display the process of the earthquake protection bed we use an LCD display. The temperature is measured by using a temperature sensor and to rotate the door we use servomotors [6]-[8].

2. WORKING

The working purpose of this project is as follows, if an earthquake occurs near the surroundings then the vibration sensor will detect that and send a signal to the Arduino which will later send signals to the servomotors so that the person can get inside the bed and doors can be closed. Then the Arduino again sends another two signals to the GPS and GSM where the GPS is used to find the location of the person and the GSM is used to send a message to the family members to inform that the person is in danger and this earthquake protection contains the necessary tools most importantly oxygen so that the person in that box can breathe and food, medicine to cure. So this is the working process of the earthquake protection bed and the status of the project can be displayed by using an LCD. The temperature is measured by using a temperature sensor.

3. BLOCK DIAGRAM



Figure.3 Block diagram

Explanation of Block diagram:

The block diagram consists of an Arduino Uno board which contains 14 digital input/output pins operating at 5V voltage and out of these 14 pins some are used as serial pins TX(1) and RX(0). Pins 2 and 3 are used for external interrupts and pin 13 for an LED. The GPS module is attached to the Arduino board to TX and RX pins and the GSM module also requires TX and RX pins to connect to the Arduino board but as if GPS is already connected to it therefore we use the digital input/output pins as TX and RX pins so that both GPS

and GSM will share data to arduino and vice versa. The earthquake sensor will detect the earthquake and send signal to arduino and thereby it will send signals to servomotors ,GPS and GSM and the LCD is used for displaying the status of the project.

4. THE COMPONENTS REQUIRED FOR EARTHQUAKE PROTECTION BED

- A.Power Supply Board
- B.Arduino UNO
- C.LCD display
- D.GPS
- E.GSM
- F.Temperature sensor
- G.DC motor

Let's have brief explanation and usage of individual component in their respective field:

A. POWER SUPPLY UNIT (PSU)

The amount of power required for Arduino to work ranges for about 3.3V-12V because all the electronic circuits can accept only low power, if it is above the permissible level the circuit may damage. That is the reason why we use a PSU to convert high power to low power. In the PSU we have a bridge circuit which is used to convert alternate current to pulsated direct current. From that a capacitor accepts this pulsated DC and transforms it into complete direct current. After this transformation a regulator 7805 is have its presence for regulating the current as per requirement, after this capacitor will store the current obtained and lead to the Arduino board.

B. ARDUINO UNO

The Arduino UNO is the most used and documented board in the Arduino family. Arduino UNO is the first Arduino as it is cheap and very easy to setup when compared to the other arduinos and it is the toughest board you can play with. It contains a ATmega 328p microcontroller and the some of the features of the arduino is:

1. It has a reset button to reset the program on chip.

2. A Led on the arduino board is mapped to pin 13 for testing and debugging purpose.
3. A power led to indicate power.



Figure.4 Arduino UNO

C.16*2 LCD DISPLAY

The 16*2 LCD display is named as such for the reason it can accept up to 16 characters and can be displayed in 2 line. It have a built in microprocessor 8-bit MPU with a 5*7 dot characters along with a cursor. All this can be viewed with an area of 64.0mm (L)*14mm (W)*11.5mm (H). The input power of 3.3v is used for running it

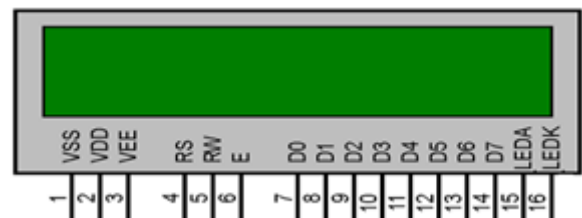


Figure.5 LCD

D.GPS MODULE

The GPS is a global positioning system which is a satellite based navigation system which will work based on radio signals transmissions and receivers. These signals will provide the user the required information. By using GPS we can acquire the location, velocity and time in any weather conditions anywhere in the world for free in any time. Basically GPS technology was originally developed for military .Because of its popular navigation capabilities and inexpensive equipment the government made this GPS system available for civilian use.



Figure.6 GPS

E. GSM MODULE

Main purpose of GSM module is if Wi-Fi network is absent then this GSM module is useful so that when can get message to user. This module consists of 2 rows of 8 pins and mainly 4, 5 i.e. RX and TX pins which are used for communication and program module respectively. This GSM module is also share the data to the members who are registered so that the data cannot be stolen and it can be accessed from anywhere.



Figure.7 GSM

F. TEMPERATURE SENSOR

This is resistance temperature detector (RTD) which measures the temperature and even alert the user if it is above the proximity level. It consists of three pins they are GND, Vout, Vin. Mostly we used LM35 with acronym as linear monolithic.

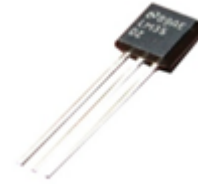


Figure.8 Temperature Sensor

G. DC MOTOR

A Submersible well pump is designed to operate beneath the earth surface and this tube has a hermetically sealed motor that is closed coupled to the body of the water pump .Sealing the motor prevents the water from getting inside and causing short circuit. The operating voltage required for the motor is 2.5 to 12v which drives the current for about 130 to 220mA. It flows with the rate of 20-120L/H .the driving mode of the pump is DC with work life of 500hours.



Figure.9 Servomotor

4. PROJECT SETUP



Figure.10 Project setup

6. RESULT

The earthquake protection bed works if the richter scale readings ranges from 5 and above then the earthquake detection sensor will send the signal to arduino thereby the arduino will send signals to

servomotor, gps and gsm so that the sleeper can be protected inside the bed and the information of that person will be shared to the accessed members.

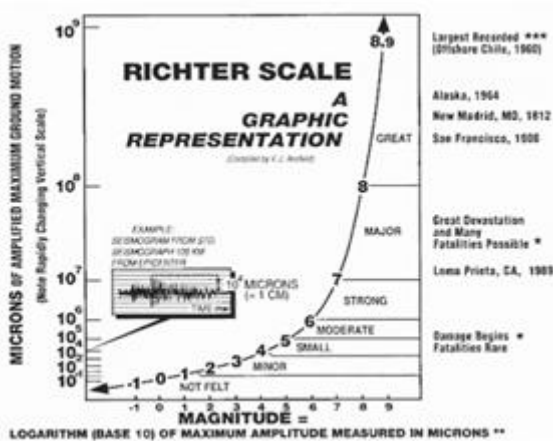


Figure.11 Richter scale for different levels

The readings detected by the earthquake detection sensor is shown below

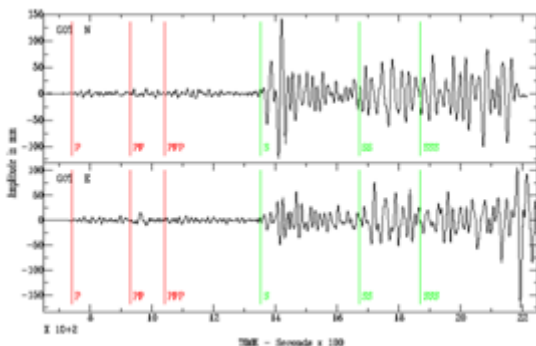


Figure.12 Readings obtained from richter scale

7. CONCLUSION

Thus we have designed a earthquake protection bed which will safeguard a sleeper from injuries from falling debris which will cause during an earthquake and also provide necessary tools like oxygen ,medicine and food for the sleeper. It will also provide the location of the by using GPS.

8. REFERENCE

[1] James Patrick Hamill, “EARTHQUAKE PROTECTION BED” ,journal of US patents.

[2] R.Bajaj , S.L.Ranaweera and D.P.Agarwal , “GPS: LOCATION TRACKING TECHNOLOGY” , journal of IEEE pages.

[3] M.Rahnema , “Overview of the GSM system and protocol architecture” journal of IEEE .

[4] Leo louis , “WORKING PRINCIPLE OF ARDUINO AND USING IT AS A TOOL FOR STUDY AND RESEARCH” , journal of AIRCC.

[5] Bahareh yaghootkar , Soheil Azimi and Behraad Bahreyni , “A High-performance Piezoelectric Vibration Sensor” , journal from IEEE Sensors journal.

[6] H.Kawamoto , “The history of liquid-crystal displays” , journal of proceedings of the IEEE,Vol:90 issue:4 .

[7] G.C.M.Meijer , Guijie Wang and F.Fruett , “Temperature sensors “ , journal of IEEE Sensirs journal , Vol:1 issue:3.

[8] H.R.Weed , “Servo motor characteristics by impulse testing” ,journal of IEEE.