e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021 Impact Factor- 5.354 www.irjmets.com

DESIGN & IMPLEMENTATION OF EARTHQUAKE PROTECTION AND BUILDING COLLAPSING RESISTING BED

Mohd.Sajid D. Makandar*[1], Museb J. Jamadar*[2], Onkar M. Bhokare*[3], Namarata S. Wadavane*[4], Nikhil L. Surve*[5], Aditya S. Ravan*[6], Prof. R.S. Gaikwad*[7]

*[1,2,3,4,5,6]Electrical Engineering, Sbgi, Miraj, Sangli, India.

*[6]Prof., Electrical Engineering, Sbgi, Miraj, Sangli, India.

ABSTRACT

An earthquake-protection bed having a superior tolerance property is constructed of box-shaped metallic panels and contains necessities in the event of an earthquake, such as tools for escaping and food in tool boxes installed under the bed. This earthquake- protection bed includes 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. A plurality of tool boxes is installed on the bottom of metallic panel. The range of tool boxes is formed by dividing plates. A plurality of lids covers the tool boxes, and an opening is shaped on any one of the metal panels. Bedding is provided on the lids.

Keywords: Vibration Sensor, Motor Drive, Battery, Arduino, LCD.

I. INTRODUCTION

An earthquake is a sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface slowly move over, under, and past each other [1]. The structural engineering point of view, the main purpose of design is to devise a technically and economically efficient system to protect the life of the human due to cause of earthquake. For more precise estimate of great earthquake risk to support the action of risk mitigation and post-earthquake emergency rescue, the more accurate data of the physical (such as the building distribution) or social (such as the population, economic status and the abilities to risk reduction) with the grid size less than 1km or in town-level, and more factors (such as the land use types, the geographic features etc.) affecting the earthquake risk should be considered. Besides, the earthquake risk is contributed not only by the ground seismic motion, but also the distribution of active faults and surface rupture of earthquake as well as the secondary disasters. The impact will also be not only the physical building damage, life and direct economic losses, but also the social influences. So, it is important to develop the synthetic risk assessment methodology and corresponding risk assessment system for great earthquake [8]. This invention relates to an earthquake-proof bed of superior compressive and earthquake-proof structure and, in particular, to an earthquake-proof bed suitable for securing An earthquake is a sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface slowly move over, under, and past each other [1]. The structural engineering point of view, the main purpose of design is to devise a technically and economically efficient system to protect the life of the human due to cause of earthquake. For more precise estimate of great earthquake risk to support the action of risk mitigation and post-earthquake emergency rescue, the more accurate data of the physical (such as the building distribution) or social (such as the population, economic status and the abilities to risk reduction) with the grid size less than 1km or in town-level, and more factors (such as the land use types, the geographic features etc.) affecting the earthquake risk should be considered. Besides, the earthquake risk is contributed not only by the ground seismic motion, but also the distribution of active faults and surface rupture of earthquake as well as the secondary disasters. The impact will also be not only the physical building damage, life and direct economic losses, but also the social influences. So, it is important to develop the synthetic risk assessment methodology and corresponding risk assessment system for great earthquake [8]. This invention relates to an earthquake-proof bed of superior compressive and earthquake-proof structure and, in particular, to an earthquake-proof bed suitable for securing

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021 Impact Factor- 5.354 www.irjmets.com

II. METHODOLOGY

We have designed our project operation on an Arduino Uno R3 microcontroller in Tinkercad Simulator Software as shown in below figure. In microcontroller 20 input-output pin are present technically we called them digital pins. We are used all that pins as an input and output. In input section we used a slide button as a sensor ant it is connected to pin of A0. At output section we are connected two applications. Basically we implemented three applications but in circuit we parallel two applications. At output section pin 2-5 and 11-12 are used for LCD display. And another one is pin 6-7 and 9-10 are connected with motor driver ICs input. As we told above the output section output port is connected to motor drivers. When high bit output is applied to motor driver then motor driver get provide path required supply to motors(electromechanical actuator) through itself and motors(electromechanical actuator) will run. In real time implementation we used operational sensor for sense the vibration at damper which is previously implemented in civil constriction. When sensor senses any major vibration at damper side then it will send high pulse to microcontroller.

Literature Review: Literature Review on the building construction, earthquake resistance Bed structure, and M/C based control unit. Design: In this process we will design our proposed work in designing simulink. Assembly and Installation: In this part we have design hardware of this project. In this section we atomized using sensor which we installed. Testing & Modification: In this section we test our system trolley providing lots of force. If any required modification is required then we will done after testing.

III. MODELING AND ANALYSIS

BLOCK DIAGRAM:

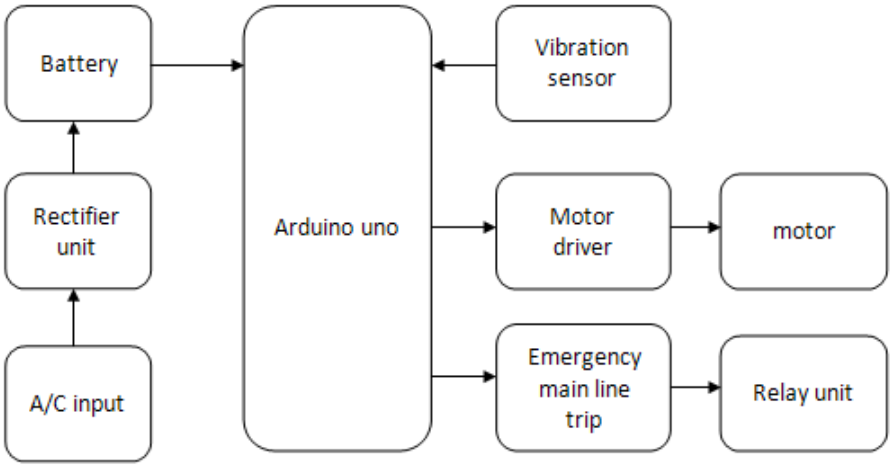

Fig.1 Block diagram

Battery. This section is plays key role in our system. When after disaster buildings power cut automatically this battery unit provided self-supply to the earthquake protection bed to shut door. And also providing power to whole system. Vibration sensor. This units' job is to sense vibration of the building and output is provided to M/C for further process. Arduino Uno microcontroller. This is heart of our system all operation will be controlled and commanded by M/C. output of vibration sensor is processed here. When high input gets M/C then it will run hazardous program which will we implemented and give command to motor driver to operate and shut the doors of bed. Motor driver. In this unit taking order from M/C and run the motor for shutting doors of bed. Speakers, This device for ringing as danger. Charging unit to charge battery.

SIMULATION WORK:

We are presenting a simulation work done by our group regarding our project. I progressive process we have designed our project operation on an Arduino Uno R3 microcontroller in Tinkercad Simulator Software as shown in below figure. In microcontroller 20input-output pin are present technically we called them digital pins. We are used all that pins as an input and output. In input section we used a slide button as a sensor ant it is connected to pin of A0. At output section we are connected two applications. Basically we implemented three applications but in circuit we parallel two applications. At output section pin 2-5 and 11-12 are used for LCD display. And another one is pin 6-7 and 9-10 are connected with motor driver ICs input.As we told above the output section output port is connected to motor drivers. When high bit output is applied to motor driver then

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021 Impact Factor- 5.354 www.irjmets.com

motor driver get provide path required supply to motors(electromechanical actuator) through itself and motors(electromechanical actuator) will run.In real time implementation we used operational sensor for sense the vibration at damper which is previously implemented in civil constriction. When sensor sense any major vibration at damper side then it will send high pulse to microcontroller.

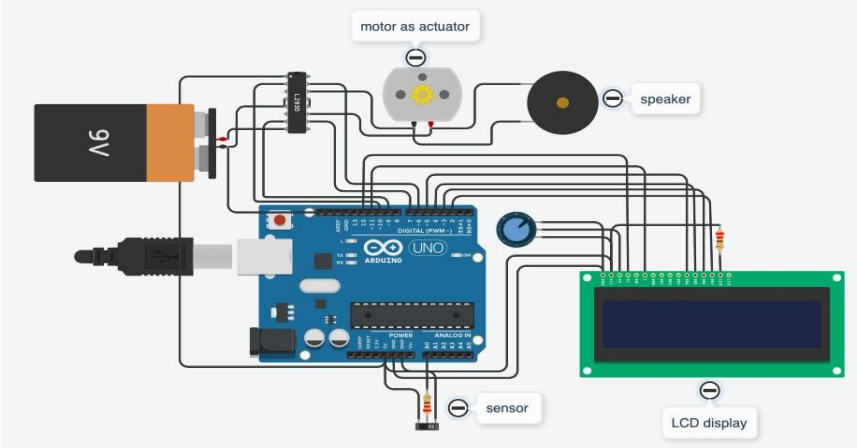

Fig.2 Operational diagram of earthquake protection bed

COMPONENT DETAILS:

1. Battery:

Battery is made up of a combination of materials like zinc (anode), manganese (cathode) and potassium. These materials are all earth elements the battery is a device that simply stores energy in the form of chemical energy and supplies in the form of electrical energy for your need when & where you require in the convenient way.

Fig.3 Battery

2. Arduino Uno R3:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with ac to dc adapter or battery to get started.

Fig.4 ATmega328

3. Motor Driver Circuit:

The L293D is designed to provide bidirectional drive currents of up to 600mA at voltages from 4.5 V to 36 V. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H reversible drive suitable for solenoid or motor applications.

Fig.5 Motor Driver Circuit

4. Electromechanical Actuator:

Custom manufacturer of nylon and steel electromechanical valve actuators. Pivot solenoid and dual solenoid electromagnetic valve actuators are offered. Available in 12 to 24 VDC supply voltage. Some actuators are suitable for beverage dispensers and seat belt pretensions.

Fig.6 Electromechanical Actuator

5. 16x2 LCD Display:

Operating Voltage is 4.7V to 5.3V. Current consumption is 1mA without backlight. Alphanumeric LCD display module, meaning can display alphabets and numbers. Consists of two rows and each row can print 16 characters. Each character is built by a 5×8-pixel box. Can work on both 8-bit and 4-bit mode. It can also display any custom generated characters. Available in Green and Blue Back

Fig.7 16x2 LCD Display

6. Voltage Regulator LM7805:

IC7805 is a 5VVoltageRegulatorthat restricts the output voltage to 5Voutput for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry. It is inexpensive, easily available and very much commonly used. With few capacitors and this IC, you can build pretty solid and reliable voltage regulator in no time

Fig.8 Voltage Regulator LM7805

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021 Impact Factor- 5.354 www.irjmets.com

7. Diode 1N4007:

1N4007 is a rectifier diode, designed specifically for circuits that need to convert alternating current to direct current. It can pass currents of up to 1 A, and have peak inverse voltage (PIV) rating of 1,000 V. Note: This product has a minimum quantity restriction (10nos) for order.

Fig.9 Diode 1N4007

IV. RESULTS AND DISCUSSION

We have designed our project operation on an Arduino Uno R3 microcontroller in Tinkercad Simulator Software as shown in below figure. In microcontroller 20input-output pin are present technically we called them digital pins. We are used all that pins as an input and output. In input section we used a slide button as a sensor ant it is connected to pin of A0. At output section we are connected two applications. Basically we implemented three applications but in circuit we parallel two applications. At output section pin 2-5 and 11-12 are used for LCD display. And another one is pin 6-7 and 9-10 are connected with motor driver ICs input. As we told above the output section output port is connected to motor drivers. When high bit output is applied to motor driver then motor driver get provide path required supply to motors(electromechanical actuator) through itself and motors(electromechanical actuator) will run. In real time implementation we used operational sensor for sense the vibration at damper which is previously implemented in civil constriction. When sensor senses any major vibration at damper side then it will send high pulse to microcontroller.

Case 1: Electromechanical Actuator turn Operation:

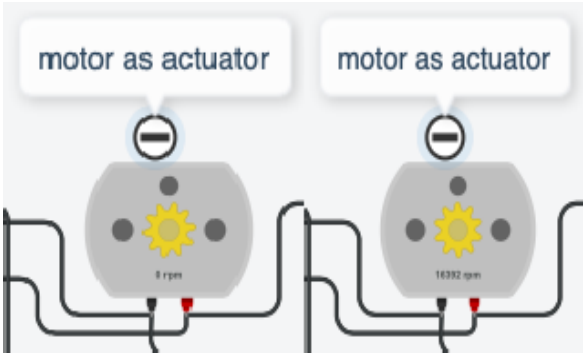

Fig.10 Forward Operation

In actuator operation when microcontroller get high pulse from sensor then it run a program for activate motor driver IC. At output section microcontroller give pin 6 and 7 respectively HIGH and LOW pulses. Which means microcontroller give order to motor driver to allow high voltage to actuator. Operation diagram shown in below in diagram (A) it show 0 RPM which means our vibration sensor not sensing any vibration. Now at diagram (B) it shows some RPM (16000+) that means sensor sense vibration. Motor (electromechanical actuator) operation and connection details are shown below fig.10.

Case 2: LCD Display Operation:

In LCDs Display operation when microcontroller get high pulse from sensor then it runs a program for activate LCD display for display warning massage. Pin no 2-5 and 11-12 are connected with display. When microcontroller sense high pulse from sensor then is will send digital signals to display to display a massage which means microcontroller give order to motor driver to allow high voltage to actuator. Operation diagram shown in below in diagram (A) it show Blank LCD screen which means our vibration sensor not sensing any vibration. Now at diagram (B) it shows some massage (building under danger) that means sensor sense vibration operation details are shown below fig.11.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021 Impact Factor- 5.354 www.irjmets.com

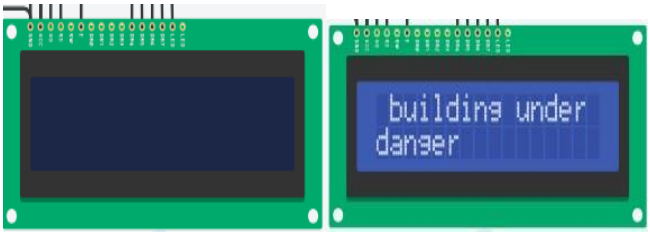

Fig.11 LCD Display Operation

Case 3: Piezo Speaker Operation:

In simulation we used piezo speaker for making beep sound. Shows are in main circuit diagram also. When LCD displaying warning on screen then simultaneously piezo speaker also turn ON. Now assembly moves in Left direction operation take place exactly opposite of previous case. Operation diagram shown in below in diagram (A) it show inactive speaker which means our vibration sensor not sensing any vibration. Now at diagram (B) it shows some activation action that means sensor sense vibration. See in both active and inactive in below fig 12&13.

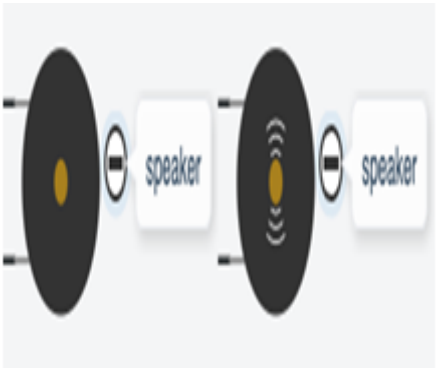

Fig.12 Piezospeaker Operation **Fig.13** Output Waveform and Voltages of motor Turn ON

V. CONCLUSION

This project is economical with smooth operation, quick response and user friendly. This project we will save humans lives from natural and man-made disasters using vibration sensors and metal earthquake protection bed we added damper spring and vibration sensor which increses the accuracy of detecting the earthquake and protecting the human life by closing doors of bed.

VI. REFERENCES

[1] ACI 318-08, ‘‘Building Code Requirements for Structural Concrete and Commentary’’, American Concrete Institute, Farmington Hills,(2008) USA
[2] Ambrose,J., andVergun,D. ‘‘Design for Earthquakes’’, John Wiley & Son, Inc., (1999) USA
[3] Arnold,C., and Reitherman,R., ‘‘Building Configuration and Seismic Design’’, John Wiley & Sons, Inc. (1982), NY,USA
[4] ASCE 41-06, ‘‘Seismic Rehabilitation of Existing Buildings’’, American Society of Civil Engineers,(2007), USA
[5] Charney,F.A., ‘‘NONLIN Program – educational program for learning the conceptsof Structural Dynamics and Earthquake Engineering, FEMA Training Center, and Advanced’’(1998),USA
[6] Chopra,A.K., “Dynamics of Structures A Primer, Earthquake EngineeringResearch Institute”, (1982), Oakland,California,USA
[7] Chopra,A.K., “Dynamics of Structures – Theory and Application toEarthquake Engineering”, Fourth Edition, Prentice Hall Inc, (2012), USA
[8] CSI, “Structural Analysis Program (SAP) 2000, Version 14, Computers andStructures Inc”., (2010),USA
[9] Das,B.M., “Principles of Foundation Engineering”, 7th Ed., Cengage Learning,Stamford, CT,USA
[10] “Structural Concept USA,http://www.app1.fema.gov/emi/nonlin.htm