Advanced Design of Wireless Communication Network for Building Monitoring

[1*]B.S.Sathish, [2]Ganesan P, [1]L.Bharathi, [1]V.Suryanarayana, [1]A.Ranganayakulu,
[1]Department of ECE, [1]Department of CSE, Ramachandra College of Engineering, Eluru-534007, Andhra Pradesh, India
[1*]subramanyamsathish@yahoo.co.in, [1]bharathioptical@gmail.com, [1]s_vadhri@yahoo.co.in,
[1]ranganayak2005@gmail.com,
[2]Department of ECE, VJIT, Aziz Nagar, Hyderabad – 500075, India
[2]gganeshnathan@gmail.com

Abstract— A wireless sensor system be projected to examine construction headed for appraise shaking smash up, the sensor preterit exploit routine built-up capacitive micro electro mechanical structure strain and 3D acceleration feeler and a low power state formally claim precise microcircuit designed for exciting battery life span up and about to 12 years. The strain sensors escalate at the base of the structure to subsist the arrangement unite plastic midpoint opening of the construction while an earthquake happens. They live sporadically or on stipulate preliminary the base station. The accelerometers square measure mounted at each floor of the formation to live the unstable response of the building throughout associate degree earthquake.

***Keywords* — 3-D acceleration sensors, Electro Mechanical Systems, Wireless Sensor Network, Local Acceleration, Strain Sensors.**

I. INTRODUCTION

Constructions add accrue damage throughout their functioning life. The interest in sensing technology for varied uses has been growing; new styles of sensors are developed by small MEMS technology. Environmental data, like brightness, temperature, sound, vibration, and a picture of a certain place in a building, is evaluated by the network [1]. Now a day there is a demand of home building monitoring product has been increased rapidly. On early days the traditional home automation or building monitoring systems use wired connection for automation purpose. But implementation of these systems requires cable installation at the same time when house building [2]. Wireless communication is that the transfer of knowledge between 2 or a lot of points that don't seem to be connected by associate electrical conductor. It include different kind of fixed, mobile, and transferable function, together with two mode radios, cellular telephones, PDA, and erstwhile model of purpose of radio wireless technology comprise GPS module, wireless mice, keyboard and headsets, head phones, receivers, take account of the utilize of sound [3]. The term wireless has been used double in communications history, with slightly totally different which means, it was at first used from concerning 1890 for the primary radio transmission and LTE, LTE Advanced, Wi-Fi, Bluetooth are several of the primarily familiar recent wireless technologies. Wireless procedure allows services, such as extensive sort connections, that are unattainable or not practical to execute with apply of wires.

The expressionism usually utilized in the telecommunications trade to sit down with telecommunications, which use some form of energy to transfer data while not the utilization of wires. Information is transferred in this manner over both short and long distances as exposed in figure 1.

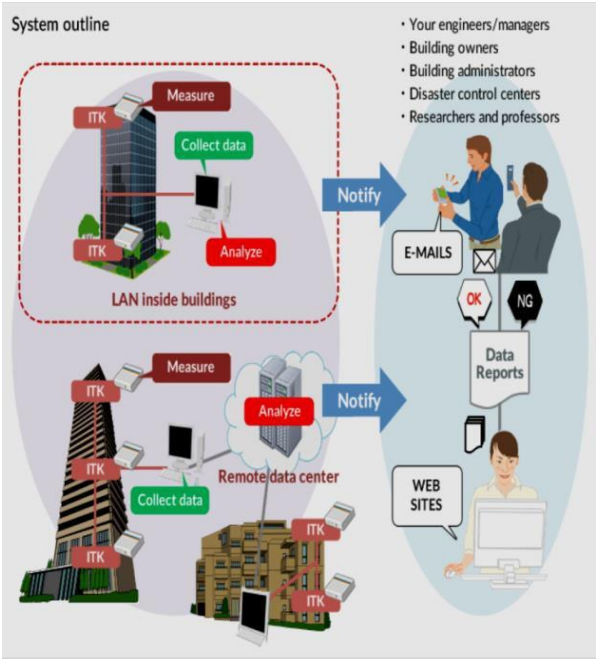

Fig. 1. Outline of Monitoring System

II. RELATED WORK

A. *Over View of Proposed System*

In this paper, the subsequent function such as continuously monitor the office block can progressively gather break throughout their effective duration, suitable to seismic measures, unpredicted foundation defrayal, etc. Intermittent inspection of the construction for such spoil is thus a key pace in sensibly manipulative the adequate level of safety and service ability. However, in order to install of a permanently installed sensing system in buildings to be cheaply as made known into fig 2 [4].

978-1-5386-9533-3/19/$31.00 ©2019 IEEE

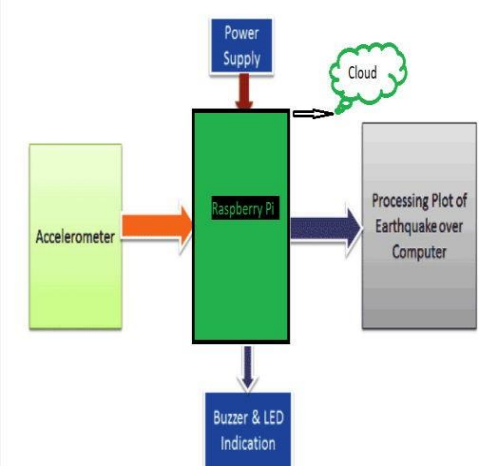

Fig. 2. System Overview

B. Raspberry Pi

The Raspberry Pi may be a series of tiny single-board computers developed within the U.K by the R-Pi base to push teaching of basic applied science in faculties and in emergent countries [5]. The innovative systems become approach more common than anticipated, mercantilism outside its target marketplace for uses like artificial intelligence. It doesn't embrace peripherals and cases however, some accessories area unit encircled in several official and unofficial bundles [6]. The organization behind the R-Pi consists of 2 arms. The first two models were developed by the R-Pi Foundation as exposed in figure 3.

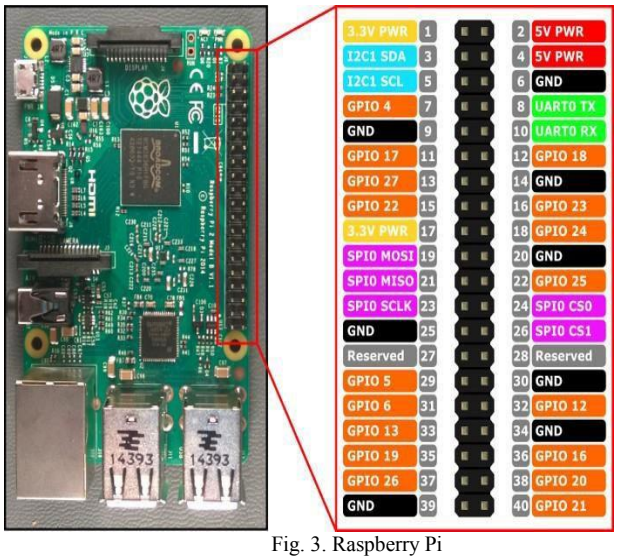

Fig. 3. Raspberry Pi

C. MAX 232

The MAX232 is a dual driver so as to consist of a capacitive voltage generator to supply RS232 voltage levels starting a single 5v [8]. All receiver converts RS-232 to 5v TTL-CMOS stage. Every driver transfer TLL/CMOS input stage into EIA-232 stage. The P30 (RX) and P31 (TX) pin of controller is connected to the scoop 232 driver and therefore the transmission and reception pin of dig 232 is connected to the GSM or PC [9]. In this route the controller transmitter pin is linked in the MAX232 T2 I/P pin which converts input 5v TTL/CMOS point to RS232 stage. Then T2OUT pin is connected to reviver pin of nine pin D sort serial instrumentality that is directly connected to computer as given away in figure 4.

Fig. 4. MAX 232

D. GSM Modem

A GSM is a wireless modems that installation with a GSM wireless complex. A modem performs like a dial-up net. The foremost variation among them is that dial-up modems sends and accept data during a fixed telephone streak though a wireless modem sends and receives data through radio waves as publicized in figure 5 [7].

Fig. 5. GSM Modem

E. Acceleration Sensor

Accelerometer is an apparatus that evaluate increase of rate which is the rate of revolutionize of velocity [11]. They determine in meters per second squared. Accelerometers are helpful for sensing shaking in structure as revealed in figure 6 [10].

Fig. 6. Acceleration Sensor

III. RESULTS AND DISCUSSION

The programming language used in lab view is a dataflow programming language. Since this might be the case for multiple nodes simultaneously as hidden in figure 7, 8, 9, 10 and figure 11 shows the experimental set up.

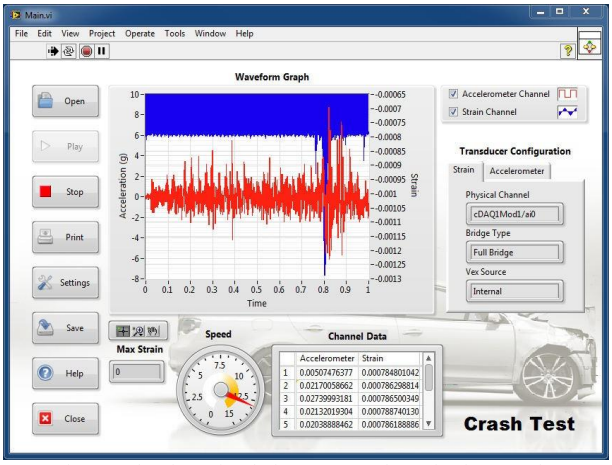

Fig. 7. Lab-View Simulation Output of Monitoring Panel1

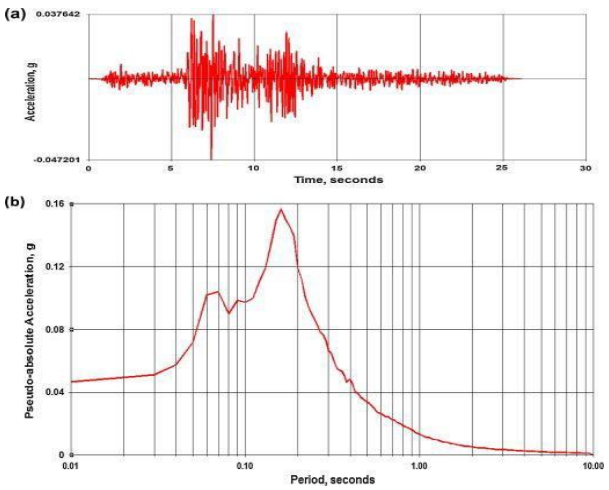

Fig. 8. Lab-View simulation output of Monitoring Panel2

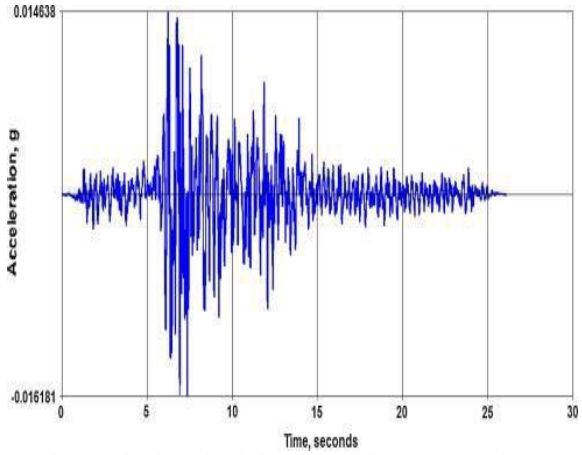

Fig. 9. Lab-View Simulation Output of System Overview1

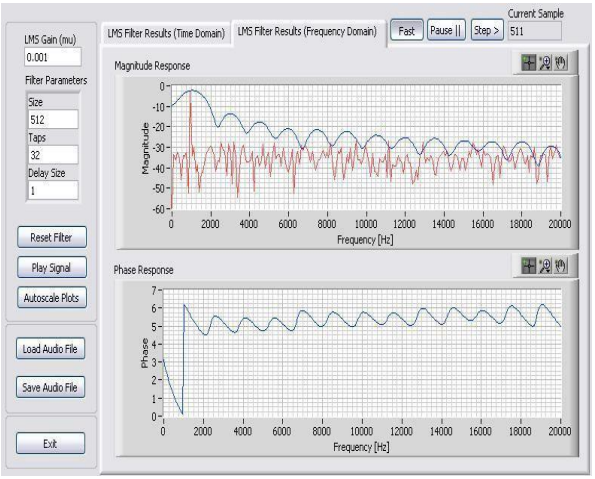

Fig. 10. Lab-View Simulation Output of System Overview2

IV. EXPERIMENTAL SETUP

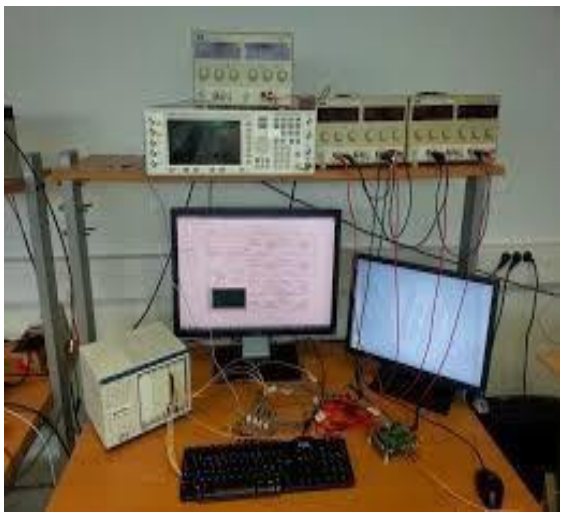

Fig. 11. Experimental Setup

REFERENCES

[1] M. Pozzi.et.al, "A framework for evaluating the impact of structural health monitoring on bridge management," in Proc. 5th Int. Conf. Bridge Maintenance, Safety Manage., Philadelphia, 2010,Pp. 161-170.

[2] J. P. Lynch.et.al, “A summary review of wireless sensors and sensor networks for structural health monitoring,” Shock Vibrat. Dig., vl. 38, issue. 2, 91–128, 2006.

[3] D. Zonta.et.al, “Managing the historical heritage using distributed technologies,” Int. J. Arch. Heritage, vl. 02, issue.03, page. 200–225, 2008.

[4] M. Kruger.et.al, “Wireless structural health monitoring using MEMS,” Key Eng. Mater., vols. 293–294, pp. 625–634, Sep. 2005.

[5] A. Amditis.et.al, “Wireless sensor network for seismic evaluation of concrete buildings,” in Proc. 5th Eur. Workshop Struct. Health Monitor., Sorrento, Italy, 2010.

[6] J. Santana, R.et.al, “A 3-axis accelerometer and strain sensor system for building integrity monitoring,” in Proc. 16th Int. Conf. Solid-State Sensors, Actuate., Microsystems., Beijing, China, 2011, page. 36–39.

[7] A. Amditis.et.al, “An overview of MEMSCON project: An intelligent wireless sensor network for after-earthquake evaluation of concrete buildings,” in Proc. 14th Eur. Conf. Earthquake Eng., 2010

[8] D. Trapani.et.al, “Laboratory validation of MEMS-based sensors for post earthquake damage assessment,” in Proc. 8th Int. Workshop Strict. Health Monitor. Stanford, CA, 2011, page. 2165–2172.

[9] A. Amditis.et.al, "An overview of MEMSCON project: an intelligent wireless sensor network for after earthquake evaluation of concrete buildings", Proc. "14th European Conference on Earthquake Engineering (14ECEE)", Ohrid, 2010.

[10] C.Park.et.al “Battery discharge characteristics of wireless sensor nodes: An experimental analysis” In Proc. of the IEEE Int. Conf. on Sensor and Ad-hoc Communications and Networks (SECON), 2005

[11] L. Yue et al., "The Importance of Dithering Technique Revisited With Biomedical Images—A Survey," in IEEE Access, vol. 7, pp. 3627-3634, 2019. doi: 10.1109/ACCESS.2018.2888503