SAFETY TECHNOLOGIES FOR HIGH RISE BUILDINGS WITH INTELLEGENT CRACK DETECTION USING IOT

Vinay Kumar G[1], Deepak[2], Bharath D R[3], Manasa D[4]

[1] *Student, Department of ECE, RRCE, Karnataka, India*
[2] *Student, Department of ECE, RRCE, Karnataka, India*
[3] *Student, Department of ECE, RRCE, Karnataka, India*
[4] *Student, Department of ECE, RRCE, Karnataka, India*

ABSTRACT

Monitoring the safety of the High rise buildings is a crucial task. We have to ensure the fire safety, safety from excessive load and vibrations, etc… and it is very important to monitor the health of the concrete structures. The cracks on the surface of these structures, especially walls are measured and evaluated by the photogrammetric method using MATLAB. By knowing these cracks, the behavior of the structures, can be interpreted and monitored. In the photogrammetric data the cracks are extracted by analyzing the deformations. Two options are presented. On the one hand cracks are detected by the help of camera followed by using a list of rules in the color extraction method using MATLAB. On the other hand the crack sensor is used which are characterized by small strains and uniform motions, cracks are analyzed and it is monitored in real-time using IOT.Safety of high rise buildings is the primary concern in our paper, we are implementing the necessary safety technologies required for the high rise buildings and we'll monitor the safety of these buildings using IOT.

Keyword: - *crack detection, fire safety, excessive load and Internet of things (IOT), etc….*

1. INTRODUCTION

In the recent years, due to the urbanization there is a rapid growth of the high rise buildings.Many factors must be considered in the construction of buildings like the soil conditions, climatic area and the building structures, etc… Many safety measures must be considered in the construction of the buildings and must be monitored from time to time in order to increase the building life span and to ensure the safety of the people.

Damage detection and health monitoring of the buildings are classified into two methods. The first method is based on vibration measurement, and the other one is based on phenomena such as cracking or heat. Each method has its strong points and its weak points. A damage identification system based on vibration measurements is effective for damage detection of whole structures or the story of a structure but it is not effective for damage detection of a specific portion of a building such as its structural members. On the other hand, damage detection based on phenomena such as cracking or heat is effective for damage detection of a specific portion of a building such as its structural members. By combining these two methods, it becomes possible to monitor structural health precisely [1].

As the height of the building increases, much attention must be given to the safety of the building and damages must be detected in the initial stages else it will lead to huge loss and may become a threat. Therefore we are using the sensors to monitor the excessive load, vibrations, cracks, fire safety and we are implementing it in the real time using the IOT.

1.1 LITERATURE SURVEY

[1] "Intelligent Crack Detecting Algorithm On the Concrete Crack Image Using Neural Network", hyeong-gyeong moon and jung-hoon kim, ISARC 2011. This Paper provides an automatic crack detection system that can analyze the concrete surface and visualize the cracks efficiently.

[2] "Wall Crack Detection Based on Image Processing", Dongna Hu, Tian Tian, Hengxiang Yang, Shibo Xu and Xiujin Wang, 2012 Third International Conference on Intelligent Control and Information Processing. In this paper, a novel crack detection method is proposed based on the digital image of building external wall. The wall surface condition is recorded accurately, and then get the linear characteristics of the image for crack recognition. This paper first does image edge detection, image binary of adaptive threshold and removal of isolated points, obtaining effective linear characteristics. Finally we distinguish the cracks and the normal lines through the curve fitting and its parameter analysis.

1.2 EXISTING SYSTEM METHODOLOGY AND DRAWBACKS

Cracks are detected manually, current system uses highly complex wired network Frequency domain, fuzzy logic techniques. No structural health monitoring and use of IOT in most of the existing buildings. Monitoring the health of high rise buildings is critical in many regions. Lack of Safety Measures in high rise Buildings and report when and where maintenance operations are needed

2. PROPOSED METHODOLOGY

Here an idea of building health monitoring system using wireless is proposed. IOT is used for Sending information to server about building health. The sensors installed on various parts of the building monitors the bend, vibrations, weight on the building. At any point of time if any of these parameters cross their threshold value the communication system informs the management centre giving an alarm for taking precautionary measures. The complete parameters of the building are measured and controlled by an ARM processor. ARM Processor has 32bit RISC architecture which offers high performance and very low power consumption. Crack sensors is used to detect the cracks in the vertical walls of the buildings, crack sensors are basically Flex sensors that change in resistance depending on the amount of bend in the sensor. They are usually in the form of a thin strip from 1" -5" long, they convert the change in bend to electrical resistance - the more the bend, the more the resistance value. camera is also used to detect the cracks with the help of image processing technique (colour extraction method). Load sensor is a device which measures the weight of objects such as vehicles within the building floors, If the weight of a vehicle is beyond the threshold value(here 1.5kg),the gate is closed. Thus preventing the entry of heavy vehicles into the building which inturn affects the building. LCD display is used which is easy to interface with a micro-controller because of an embedded controller, It offers high flexibility to users . Seismic senor is used to detect the vibrations in the building, the fire sensor is used to detect and extinguish the fire with the building. It is monitored with the help of RF/WIFI Module operating at radio frequency range varies between 30 kHz & 300 GHz is connected to the Processor which inturn connected to the IOT for real time monitoring of the system.

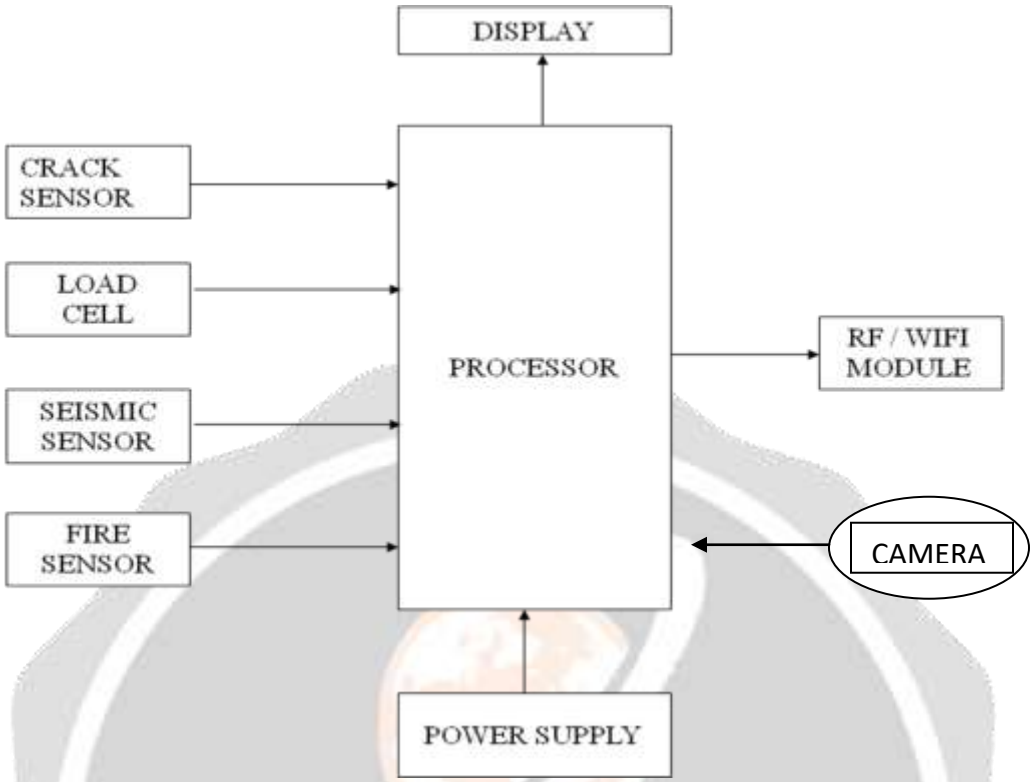

Fig -1: **Transmitter Block Diagram**

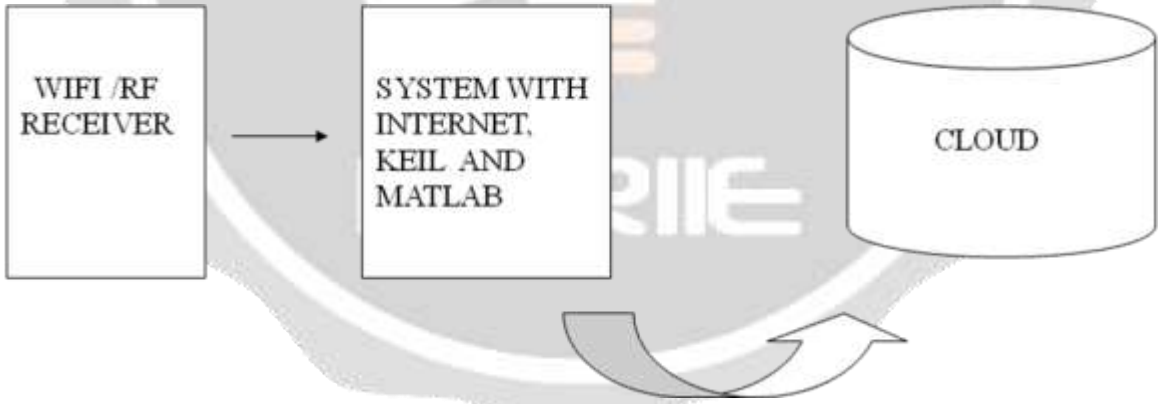

Fig -2: **Receiver Block Diagram**

3. SOFTWARE AND HARDWARE REQUIREMENTS

ARM (Advanced RISC Machine) is one of the widely used micro-controller family in embedded system application. We are using it in the implementation because of it's reliability, high speed processing, low power consumption and accuracy. Crack sensors change in their resistance value depending on the amount of bend in the sensor. They are usually in the form of a thin strip from 1" -5" long. They convert the change in bend to electrical resistance - the more the bend , the more the resistance value. An LCD used here is a small low, cost display. It is easy to interface with a micro-controller because of an embedded controller. Load sensor used here is a device which measures the weight of objects such as vehicles and the vehicles which have the weight beyond the threshold value is not allowed

to enter the building with the help of this sensor. Seismic sensor monitors the vibration measurements within the building. Camera of high resolution is used to capture images here. The software's used here are MATLAB, Embedded C, Kiel and flash magic burner.

4. CONCLUSIONS

There are many methods to detect the cracks, here we have proposed the crack detection by image processing method in which we analyze the crack images to detect the deformations or cracks from color extraction method and it is also done by the crack sensors in order to improve the accuracy of the results. We'll also use various sensors which will help to predict the various parameters in monitoring the health of the building precisely by providing the early warning capabilities, minimizing the threats and maximizing the overall health of the building. We'll also use the Internet of things (IOT) effectively in monitoring the health of the building. Hence this is one of the promising method to monitor the safety of the high rise buildings.

5. REFERENCES

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