IoT Enabled Art Gallery Monitoring System

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Abstract: Museum & Art gallery status of monitoring is very delicate. We should let professional's handle it because analyses can either make or break a business. We know what desires to be done and we will benefit to fix acute customer and client problems instantly. Art work of the museum and galleries are mostly affected from the relative humidity (RH) and temperature variations. Significant variation in temperature can also cause the double inferior in quality rate of the paper usually with oil paints drawings or water color paintings. Irregular rise in levels of relative humidity (RH) cause the material to shrink swell corrode or deform. Indoor climate of the art gallery monitoring is essential and helpful in fortify the preservation of art gallery collection. Precious paintings are present in Art gallery and their cost in millions of dollars. So we cannot take risk due to avoid these unpredictable climatic conditions caused by fire, painting quality deterioration due to humidity and temperature. Moreover security of the art gallery also demands for continuous surveillance. Hence, to secure and monitor art gallery paintings at Museum and to overawed these climatic conditions, we necessity to develop an intelligent system that uses different sensors**.**

Keywords: *Internet of Things, Inferior, Preservation, Deterioration, Fortify, Deform*

1. Introduction

Art work is a precise important part of the life of humans and it's always play vital role in the nature of any society of the country and many people appreciate it. Art Galleries and Museum collect and preserve objects that may obligate a scientific, artistic or historical value. Art galleries are very vibrant in the world. But unfortunately Art galleries and Museums have many problems to maintain their environmental conditions. Art work of the museum and galleries are generally pretentious from the relative humidity variations (RH), temperature variations and Intensity of ultraviolent light [1]. Slightly variation in temperature can also reason the double poorer in quality rate of the paper usually with the painting of oil drawing or Water color paintings. Asymmetrical increases in levels of relative humidity (RH) reason the material to contract swell decompose or distort [2].

Indoor environment of the art gallery monitoring is indispensable and supportive in strengthen the preservation of art gallery assortment. Furthermore safety of the art gallery also strains for incessant surveillance. Therefore, to protected and display art gallery paintings at Museum and also to overcome these climatic conditions, we need to develop an intelligent system that equipped with sensors which need to measure art gallery parameters values.Internet of things (IoT) considered one of the rapid growth ideas in the era of Computing world, with an estimated 50 billion devices will be connected in the end of 2020 [3]. Internet of things (IoT) is the evolution of the mobile and embedded system design applications that are connected to the Internet [4]. IoT aims at integrating and creating the greater computer capabilities enabled networks which are connected to each other [5]. Already many devices are connected to internet with intelligent system and these devices share the data over the cloud from system to system using Internet [6].

2. Related Work

Recently a growing interest has been observed for IoT related application from both industry and academia. There have been various works carried out in this area. The work in [7] proposes an internet of things in agriculture for sustainable rural development. The basic aim of this research is to identify the core contribution of IoT evolution technologies to decrease poverty rate in those remote areas, and for indicating things regarding outdoor climatic conditions like weather forecasting, forestry market information identification and art of rural financing. This paper also identifies examples of IoTs to moderate the agricultural necessities of these communities for the fields of crop farming, weather forecasting.

Authors have designed in[8]multiple sensors based IoT system for data optimization and as well as data fusion for the aquaculture .In this work, for the cultivation of plants and aquatic animals, different sensors have been used to maintain the oxygen, temperature and moisture of soil.This suggested system is surveillance collective through mobile devices and a distant stage to gather real-time farmstead environmental info and also the real-time record is taken too exhibited via wireless broadcast signal receiver to distant computer terminals. This learning authorities real-time reflection also regulator of aquaculture raised area through softened oxygen sensors and also temperature detecting elements via A/D and microcontrollers signal conversion.

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According to [9] Smart IoT based Agriculture Monitoring System helps to reduce wastage, current tradition of fertilizer and thereby growth the crop profit. In this work, a system is basically developed for to monitor crop-field using sensors (soil moisture, humidity, temperature, Light) and also systematize the way of using irrigation system. The received data from sensors are sent to the web server database using wireless transmission.

Author defines in [10] smart city permits the real consumption of Resources and well provides position of services to the citizens. To deal facilities such as the air quality management, monitoring of Weather and systematization of homes and buildings in a keen city, the timid parameters are humidity, temperature and CO2. Mostly this paper offering an modified design of an Internet of Things (IoT) empowered environment monitoring system to monitor humidity, temperature and also CO2. In this advanced system, the data is transfer from the node of transmitter to the receiver node. The data which is accepted at the receiver node is supervised and standard in an excel sheet into the computer (PC) via Graphical User Interface (GUI) completed in LabVIEW. In this paper of [11] IoT enabled smart animal farm in which author design a smart IoT based system in which he measured the entire process of the animal farm with different parameters and such system provide feed and water as required, expend the excess of biogas which is formed by the animals' waste, and sense fire in the farm. Moreover, this Smart system should also do observation of the entire farm. This kind of Smart system can be considered as cost efficiently by using microcontrollers, water level sensor, ultrasonic sensor, gas sensor, temperature, humidity sensor, and an IP Camera along with Internet or Intranet connectivity.

3. Methodology

In this methodology we have already described below two flow charts figures, one figure 3.a for the flow of sensors data real time interface at LabVIEW software in GUI and in second figure 3.b which shows the IP camera interfaced in LabVIEW Software in GUI, So according to first figure 3.a we will first initialize the sensors, means which sensors will be used so we have used here dht11 sensor for temperature and humidity data, bh1750 for light intensity and mq2 gas sensor for smoke, after initializing these sensors than sensors will be interfaced to the Arduino and serial data transfer will give results of sensors values. Now for sending these sensors values to the Things speak cloud server we first need to create an account at Things Speak cloud than we need Esp8266 wifi router through which we can send serial data of sensors at things speak cloud, If these above steps will not working properly than go back to the initialization of sensors and repeat same process as above. If these above steps working properly than Wireless module Esp8266 will be configure and Esp8266 wifi module will transmit the sensors data to the Thing Speak cloud server and that transmitted data to the Thing Speaks cloud will be real time interfaced at the LabVIEW Software via Graphic user interface. Now for the second figure 3b of IP camera Interface with LabVIEW software in GUI, So here we have used an Android smart phone as IP Camera using IP webcam Application. This application is connected with same WIFI router to have IoT based system and IP camera real time interfaced at LabVIEW (GUI).

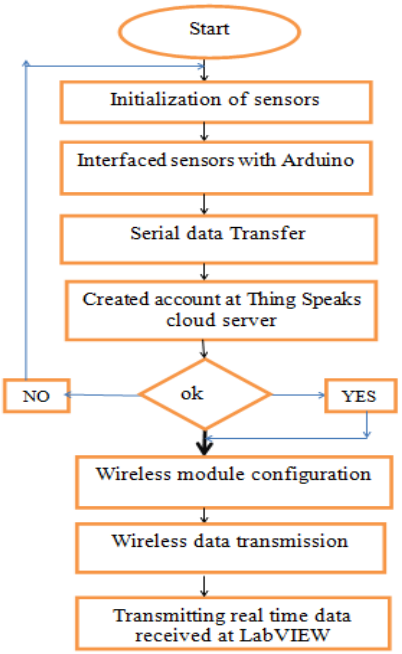

Figure 1.a Sensors data real time Interfaced with labView GUI

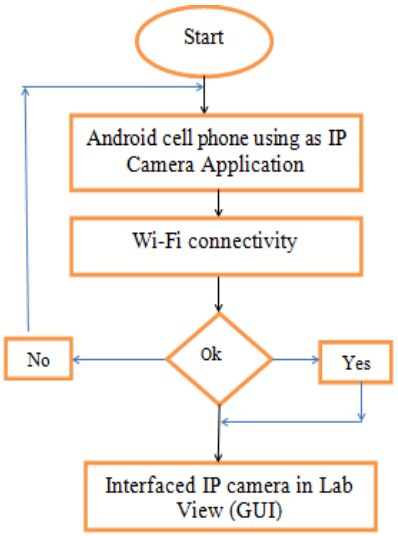

Figure 1.b IP Camera Interfaced with LabView(GUI)

4. System Design

Now here we will discuss the complete system of design in two main parts; i.e. hardware design description and also software design description.

A. Hardware DESIGN Description

This recommended system in below figure 2 for Art gallery monitoring system is mainly depends on the two sections modules such as the embedded system module and also Ethernet communication module. Our first system of module which contains temperature humidity sensor, Light Intensity

sensor, Smoke sensor and microcontroller (Arduino 2560) that are placed in the Art gallery for monitoring and sense the system parameters of the Art gallery. And that sense data from sensor will be transmitted through Esp8266 WIFI Module through the cloud server thing speaks and here on this cloud server the data will be continuously monitoring through Graphically representation and this data of the thing speaks will be read and GUI interfaced with the Lab view software. The embedded system module gets information of the Art Gallery and maintains the record of data and performs particular function in real time. If the system is in automatic mode, the system works according to the programmed threshold values and retains on giving response through Graphic User Interface (GUI) on Certain IP. Moreover, if the System is in manual mode it is measured manually using changes in GUI. This Art gallery monitoring system consists of subsystems which are Temperature humidity detecting System, Light intensity Control System, IP Camera, Fire Detecting System. Complete system is shown in below Figure.

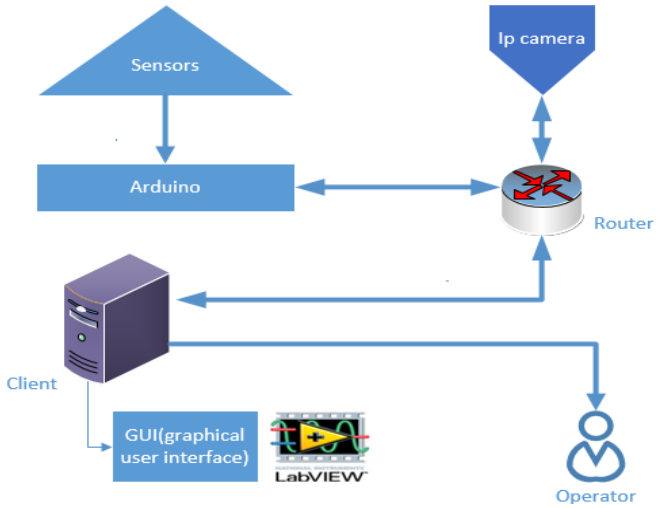

Figure .2. Hardware Design Description

a. Temperature and humidity detecting system

Temperature and Humidity detecting system is consists of Temperature and Humidity sensor module. When a temperature and humidity sensor module detects the values of temperature and humidity high than the threshold values in the system then its gives an indication to GUI via WIFI.

b. Light Intensity detecting system

Light intensity detecting system is consists of light sensor module. When a light sensor module detects the light intensity values high than the threshold values in the system than light intensity detecting system also gives an indication to GUI via WIFI. Block diagram of light intensity Detecting System is given below.

c .Fire detecting system

Fire detecting system is consists of a fire sensor module. When a fire sensor module senses the fire in the system then Fire sensor also provides an indication to GUI via WIFI.

d . IP camera based surveillance system

We have used an Android Cell phone as an IP camera using application "IP webcam". This application is associated with same WIFI router to have IoT based system. Above hardware figure shows the block diagram of an IP camera based surveillance system.

B. Software Description

Art gallery monitoring and controlling take place by getting and transmitting the data over a specific IP address and port address using HTTP GET in LabVIEW. Lab VIEW software is used for creating a GUI of an IoT enabled Art gallery monitoring system. LabVIEW also offers a very good platform for any measurement or mechanism for control system. GUI in lab view consist of switches and dissimilar measuring scale that always keep on delivery data from the environment through using WIFI, whereas the switches are also used to control the system manually.

a. Lab View Model Read data from Things Speak cloud

The model of the Lab view (GUI) in figure 3 which reads data from the Things speak cloud and interfaced with in Lab View GUI. In this model HTTP GET which received the url of the Thing Speaks cloud, Json string which return header and body data returned by the server, String subset returns the substring of the input string beginning at offset, Offset is the starting position and its initial value is numeric. Match pattern searches for regular expression in string beginning at offset, If the function finds a match its split string into three substrings. Decimal string to number convert the numeric character in string starting at offset to a decimal integer and returns it in number, that number values converted in to waveforms same as the below process for all.

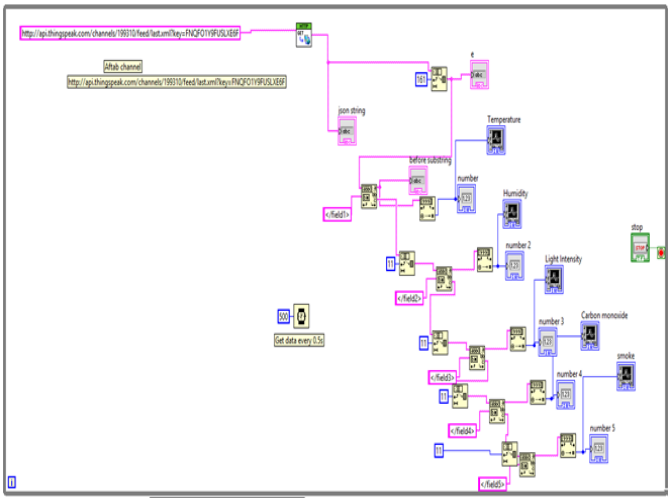

Figure.3: Lab View Model Read data from Things Speak cloud

b. IP camera interfaced in lab view (GUI)

NI Vision Acquisition software is used to save, acquire and display images from hundreds of different Cameras. Here in below figure 4 we have used the Smart phone as IP Camera using "IP webcam" application. And this IP Camera monitors and maintained the entire Art gallery decorum and moments.

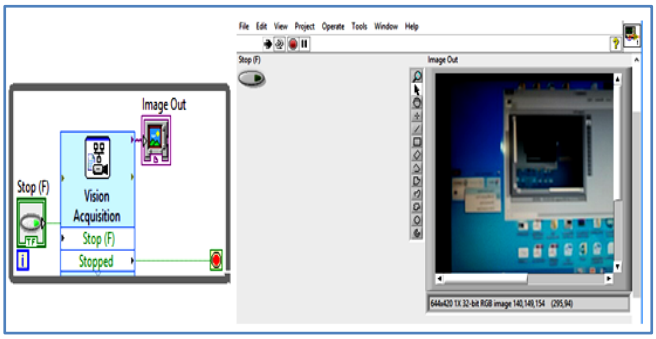

Figure.4 . IP camera interfaced in lab view (GUI)

5. Results and Discussion

5.1 Temperature Result

Here in this below figure 5 is the result of the temperature Sensor which has been sent to the Thing Speak Cloud data. Here temperature is measured in Centigrade and Red dots show the variation of temperature, if the temperature will change at any point then red dot will be appear at particular Scale of values.

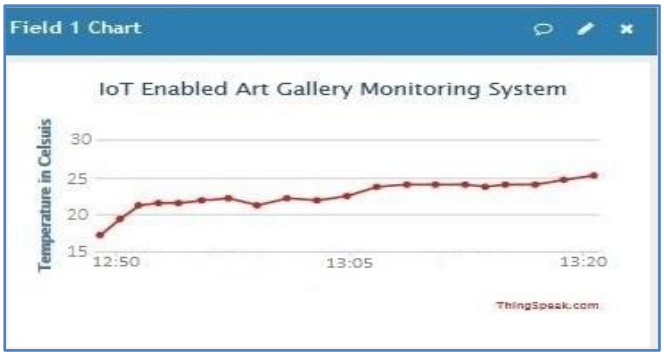

Figure. 5: Temperature Result in Things Speak Cloud

5.2 Real time interfaced Temperature data through LabVIEW in GUI

This is below in figure 6 is GUI environment of LabView software and here real time interfaced temperature data in Graphic user interface, Here white line shows the real time variation of temperature, the last entry value in Thing Speaks cloud data will be real time show in the below environment so we have captured that snap shot in below figure.

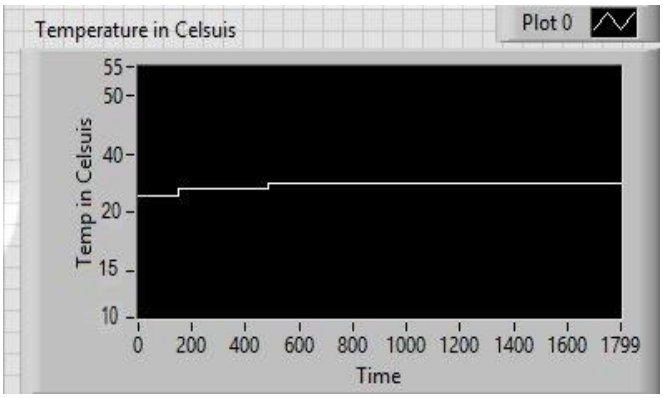

Figure. 6: Real time interfaced Temperature data through LabVIEW in GUI

5.3 Humidity Result

Result of the Humidity data in figure 7 which has been sent to the Thing Speak Cloud data and here the values of humidity is measured in percent and Red dots show the variation of temperature, if the temperature will change at any point then red dot will be appear at particular Scale of values.

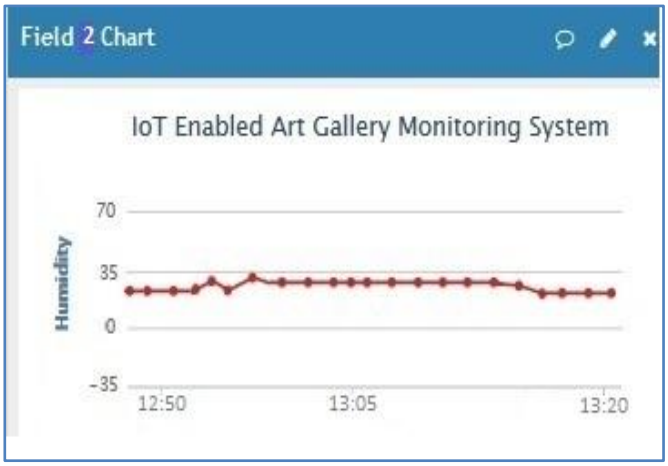

Figure. 7: Humidity Result in Things Speak Cloud

5.4 Real time interfaced Humidity data through LabVIEW in GUI

This is GUI environment of LabView software in figure 8 and here real time interfaced Humidity data in Graphic user interface, Here white line shows the real time variation of Humidity, The last entry value in Thing Speaks cloud data will be real time show in the below environment so we have captured that snap shot in below figure.

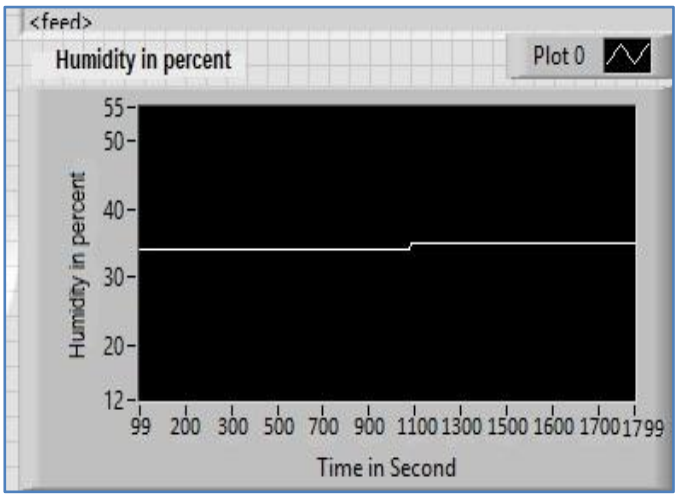

Figure. 8: Real time interfaced Humidity data through LabVIEW in GUI

5.5 Light Intensity Result

Result of the Light intensity data in figure 9 which has been sent to the Thing Speak Cloud data and here the values of light Intensity is measured in lux and Red dots show the variation of lux, if the Light Intensity will change at any point then red dot will be appear at particular Scale of values.

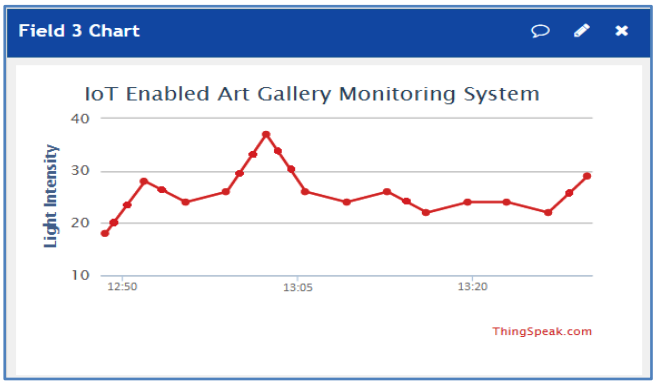

Figure. 9: Light Intensity Result in Things Speak Cloud

5.6 Real time interfaced Light Intensity data through LabVIEW in GUI

This is GUI environment of LabView software in below figure 10 and here real time interfaced Light Intensity data in Graphic user interface, Here white line shows the real time variation of Lux, The last entry value in Thing Speaks cloud data will be real time show in the below environment so we have captured that snap shot in below figure.

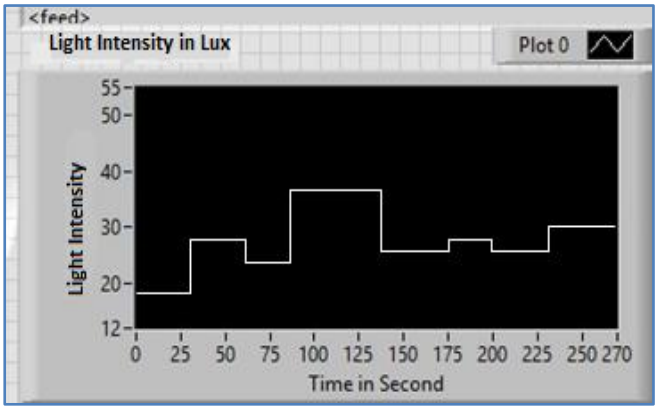

Figure. 10: Real time interfaced Light Intensity data through LabVIEW in GUI

5.7 Smoke Result

Result of the Smoke data in figure 11 which has been sent to the Thing Speak Cloud server and here the values of humidity is measured and Red dots show the variation of smoke, if the smoke will change at any point then red dot will be appear at particular Scale of values.

Figure.11: Smoke Result in Things Speak Cloud

5.8 Real time interfaced Smoke data through LabVIEW in GUI

This is GUI environment of LabView software and here real time interfaced smoke data in Graphic user interface in below figure 12, Here white line shows the real time variation of smoke, The last entry values in Thing Speaks cloud data will be real time show in the below environment so we have captured that snap shot in below figure.

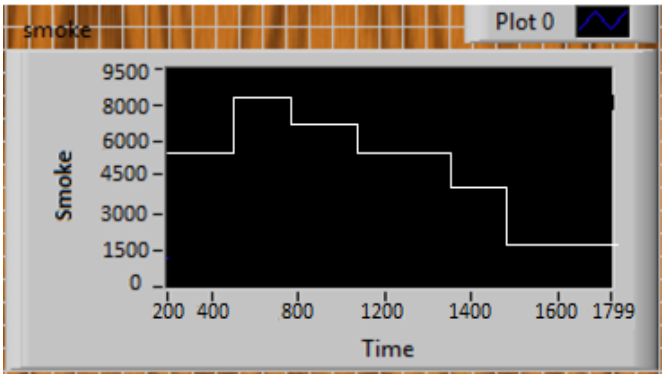

Figure. 12: Real time interfaced Smoke data through LabVIEW in GUI

6. Conclusion

Thus a system that provides continuous monitoring of the environment in an art gallery would be very beneficial to ensure that expensive piece of art is kept in a pristine condition. The usage of IoT based implementation will provide real-time data in a flexible manner. In this research paper we have designed an IoT enabled Art gallery monitoring system. This is a budget efficient system. It continuously monitors the parameters of an Art gallery. It can be controlled data as real time. This kind of pleasant system is appropriate for any kind of an Art Gallery Monitoring System but some little change may be possible.

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