Home Automation using Internet of Things

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Abstract:- **In order to help maintain comfortable living conditions within a home, automation are utilized. The standards of human's comfort in homes can be categorized into several types. Among these categories, the most significant ones are the thermal comfort, which is related to temperature and humidity, followed by the visual comfort, related to colors and light, and hygienic comfort, associated with air quality. A system can be set to monitor these parameters to help maintain them within an acceptable range. Additionally, making the house smart is to allow for intelligent automatic executing of several commands after analyzing the collected data. Automation can be accomplished by using the Internet of Things (IoT). This gives the inhabitant accesses to certain data in the house and the ability to control some parameters remotely. The proposed design uses the Google Firebase platform for collecting and visualizing monitored data and remote controlling of home appliances and devices. The selected platform is very flexible and user-friendly. The sensing of different variables inside the house is conducted using the NodeMCU-ESP8266 microcontroller board, which allows real time data sensing, processing and uploading/downloading to/from the Firebase cloud server.**

Key Words:- IOT, Firebase, Arduino, ESP8266, Node MCU, Sensors, Home_Automation, Google Cloud Services, Remote Communication

1.INTRODUCTION

IOT is going to connect people all over the world.Home-Automation is a recurrent field of IOT and this is used so that we can control the system from anywhere in the world.Our System is going to consist of various different sensors that are connected to a central system made of the arduino and nodeMCU infrastructure and along with it we are going to make use of the Google cloud services in order to setup a communication system which is able to provide a world wide connectivity as long as the user is connected to the internet. All the data from the sensors and modules are updated using a realtime database which is again a part of the Google Cloud Services. This data are updated in real time in an application on the user's smartphone which is going to keep track of all the real time data and any changes in this data will invoke certain functions that will update the user interface on the user's mobile application.

2.LITERATURE SURVEY

N. Sriskanthan [8] has implemented the model for home automation using Bluetooth via PC. But, Bluetooth has range limitation.
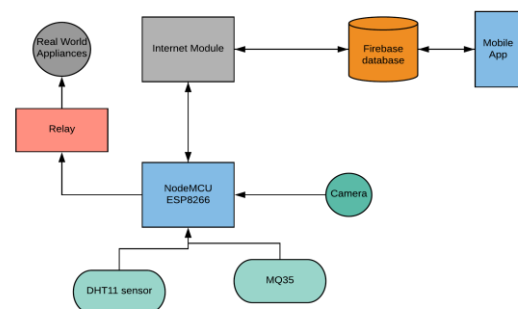
Hasan [9] has developed a telephone and PIC remote controlled device for controlling the devices.pin check algorithm was used to implement the system where it was with cable network but not wireless communication.

Amul Jadhav [10] has used universal XML format to design automation system which can be easily ported to any other mobile devices.

R.Piyare [12] has introduced design and implementation of a low cost, flexible and wireless solution to the home automation.

Jitendra R. [11] implemented a system with the ZigBee network and showed how to eliminate the complication of wiring in case of wired automation.
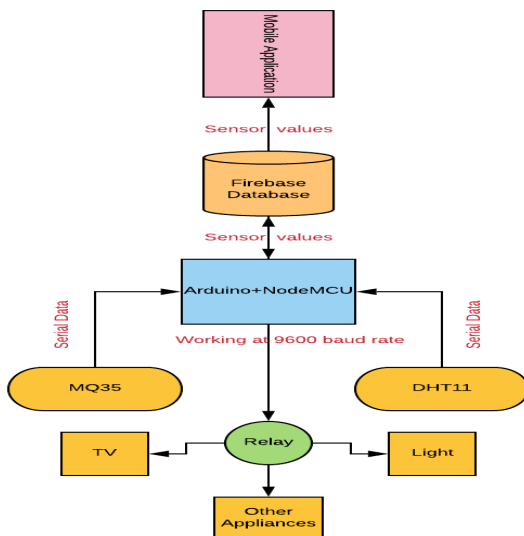
3.SYSTEM ARCHITECTURE

Our System Architecture consist of a number of sensors and modules that when interconnected gives us a fully interconnected system which can be used from any part of the world as long as the user is connected to the internet. It consist of a arduino development board to which multitude of different sensors can be connected. For this prototype we use the DHT11 sensor which is a temperature and humidity sensor which works under the condition of 0-50'C temperature value and at a 20-90% value of normal humidity.The next sensor we will be using is the MQ35 air quality detector which is able to give us percentage of Methane, Carbon Dioxide and various other such gases.From this system we will connect a node MCU to this Arduino so that we can connect the arduino to the internet and as well as send the values read by the sensors in realtime to a cloud based realtime database. Next up we have the use of relays so that we are able to control real world application using real world voltage supply.Finally there is the use of a mobile application which will be connected to the real time database and will contain certain functions which will

inform the user on any changes that have been made to the data upon meeting the said configured conditions.

4.SYSTEM DESIGN

The Arduino is using the prebuild IDE which is able to provide us a basic platform to be able to read the analog data coming from the sensors using its analog A0 to A10 pins in the ArduinoUNO module. This sensors mainly consists of two types and both of them use serial analog communication signal to send their data. Our prototype is used at a 9600 baud rate which is the rate at which the transfer of data will occur. Next up we will use the relays to connect to the various real world appliances like the lights,TV and other such items which is then interconnected to the arduino using the relay module. Another board connected to our arduino is the nodeMCU which helps it to be connected to the world wide web and also provide a way for the sensor values to be updated in real time to the cloud services which in our case is the Google Cloud Services and we are using the Real Firebase Database services in order to be able to make a communication gateway among different devices and we are going to make an Android application which will act as a GUI in order to take in those sensors values and update is GUI whenever any appropriate changes in the data occurs.

5.FUNCTION MODULE

A.FIREBASE
Firebase is a platform provided by the google cloud service that is able to provide its various services similar to that of the AWS(Amazon Web Services).But this is much more friendlier to use and also it has got the feature of real-time database that allows it to change values in real time and once that has been done it can then be used for interconnecting various devices together in order to make a proper and safe IOT interfacing system.

B.ARDUINO
Arduino is an open source hardware platform that takes allow people an user friendly interface to develop electronic

prototypes for their projects.They even provide their own IDE(Integrated Development Environment) which uses a language in form of the objective C language. This also allows the use of various open source sensors and third party shields which are basically attachments for the arduino board that provides to help give it additional customized features unique from project to project.

C.SENSORS
Sensors are going to the MQ35 working at 5v of current and can be used to detect LPG, Alcohol, Propane, Hydrogen, CO and even methane. This are helpful to maintain the optimal condition in the home but it takes around 20seconds to be able to take in any data and read any data. And we have the DHT11 or the temperature sensor which works in the range of 0-50'c with the possibility of +/-2'c and the humidity sensor is incorporated along with it working at a ratio of 20-90% with a 5% rate of error. Both of them uses digital serial communication in order to communicate with the Arduino Interface

D.HARDWARE INTERFACES
The hardware interfacing will consist of a relay which is able to work with the tiny 5V of the Arduino along with the home supplied voltage.Ours uses two combination set that is the Normally Open meaning the circuit will remain open as long as there is no signal from the arduino and Normally Closes where as the name indicates the circuit will remain closed as long as no appropriate commands are not sent from the arduino. This is then used to make an interconnection in between the Real world Appliances, Arduino and the real time firebase database.The real world appliances consists of components like the lights, TV and other such appliances.

6.CONCLUSION

This paper gives a basic idea on how we can control home appliances by using the IOT technology. The main objective of this project is to help users to be able to take control of their home from any part of the world as long as they are connected to the internet. This can be done in a very easy manner and also the users are provided with a proper GUI system which in this case is their smart phones which is connected to the internet and updates the user on any changes that might have happened in the home and also gives them the ability to control the appliances in their home using the same GUI interfacing with the smart phone application.

REFERENCES

[1] J. Lertlakkhanakul, J.W.Choi and M. Y.Kim, Building Data Model and Simulation Platform for Spatial Interaction Management in Smart Home, Automation in Construction, Vol. 17, Issue 8, November 2008, pp. 948-957
[2] A. R. Al-Ali and M. AL-Rousan, Java-based Home Automation System, IEEE Transactions on Consumer Electronics, Vol. 50, No. 2, May 2004,

[3] R. J. C. Nunes and J. C. M. Delgado, An Internet Application for Home Automation, 10th Mediterranean Eletro-technical Conference, MeleCon 2000,Vol. I. pp. 298-301

[4] D. H. Stefanov and Z. Bien, The Smart House for Older Persons and Persons with Physical Disabilities: Structure, Technology Arrangements, and Perspectives, IEEE Trans- actions On Neural Systems And Rehabilitation Engineering, Vol. 12, No. 2, June 2004, pp. 228-250

[5] C. Douligeris, Intelligent Home Systems, IEEE Communications Magazine,Vol. 31, Issue 10, October 1993, pp. 52-61

[6] Y.-J. Mon, C.-M. Lin and I. J. Rudas, Wireless Sensor Network (WSN)Control for Indoor Temperature Monitoring, Acta Polytechnica Hungarica,Vol. 9, No. 6, 2012, pp. 17-28

[7] E. N. Ylmaz, Education Set Design for Smart Home Applications, Computer Applications in Engineering Education, Vol. 19, Issue 4, December 2006, pp.

[8] N. Sriskanthan and Tan Karand. "Bluetooth Based Home Automation System". Journal of Microprocessors and Microsystems, Vol. 26, pp.281-289, 2002.

[9] E. Yavuz, B. Hasan, I. Serkan and K. Duygu. "Safe and Secure PIC Based Remote Control Application for Intelligent Home". International Journal of Computer Science and Network Security, Vol. 7, No. 5, May 2007.

[10] Amul Jadhav, S. Anand, Nilesh Dhangare, K.S. Wagh "Universal Mobile Application Development (UMAD) On Home Automation" Marathwada Mitra Mandal's Institute of Technology, University of Pune, India Network and Complex Systems ISSN 2224-610X (Paper) ISSN 2225-0603 (Online) Vol 2, No.2, 2012

[11] Rana, Jitendra Rajendra and Pawar, Sunil N., Zigbee Based Home Automation (April 10, 2010). Available at SSRN: http://ssrn.com/abstract=1587245 or http://dx.doi.org/10.2139/ssrn.1587245

[12] R.Piyare, M.Tazi " Bluetooth Based Home Automation System Using Cell Phone", 2011 IEEE 15th International Symposium on Consumer Electronics