

Implementation of IOT for Smart Home Automation using Arduino

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Abstract— This project includes implementation of the Home Automation System which can expose the data to the web so that user can access that data from anywhere. Home has heterogeneous distributed computing environment that is many equipment's are available in the home which can operate on different principals. Home automation is all about making your house smart. Just like the people for home to be smart it needs some information about the environment of home. All the equipment's or the sensors are attach to the system to maps the physical world into the digital world. The data get collected from different sensor and send notification to the user through internet. This article covers all the basic functioning of the sensors used in modern automation system.

Key words: IOT, RFID, LDR sensors

I. INTRODUCTION

The importance of the embedded systems and IOT's has been recognized by open source industrial leaders and the social media as the new way of innovation and how to make our daily life easier. The sensors mounted in the environment plays the vital role of sensing the environment i.e. the physical things get measured into the digital and analog readings. Embedded systems always try to attempts the user need and make their work easier. And IOT's can also be applied to make new things which gives us the comfort and quality of life.

Arduino is an open source computer hardware and software project and user community that designs and manufactures microcontroller based digital devices and interactive objects that can sense and control objects in the physical world.

Home automation is developed to make users life easy by giving the remote access of the home. All the sensors are attached to the Arduino board which will maps the physical phenomenon like humidity, temperature, light intensity, water level and much more. User can not only access this values from the android supported phone but also can monitor the home for the temperature and the energy consumption. So that it will save the energy and the cost too. The systems mounted in the house, plant, industrial automation and smart city infrastructure are interconnected to the internet. The information sensed by the sensor is get collected, aggregated and then afterward used for various operations as the input to the system. Sensor can provide the data as status of device, environmental context, level of liquid, energy usage, direction, pressure, temperature and much more. The Proposed system doesn't require pc, so it's easy to control our home from any location at any time.

II. RELATED WORK

In early of 1990 the concept of the embedded system and real time system was being used in the regular daily routine. The microcontroller which is used in such systems are of high computation power which is generally more than

enough to perform the dedicated tasks. Many products are available which works on the real time environment but have a high computing power.

Arduino is open source and available in various computing power. In earlier days the beagle bone boards and the raspberry pi were used but they are of high computation power with high frequency.

There are so many projects developed on real time base like washing machine, air conditioners, microwave ovens and many more. These products we are using in our daily life and without them. This projects are also developed to – provide security, reliability, comfort and convenience to the users.

The available system contains microprocessor They communicate via wireless medium like ZigBee, Bluetooth, Wi-Fi modules and so on. The data get integrated to the respective board and that board sends the data to the user via different media like mail, message etc. but the condition was that the user have to present in the home nearby area so that he can connect to that board via Bluetooth or RFID tags.

III. PROPOSED SYSTEM

A. Feature of System

In related system we survey the issues about flexibility, low-cost and adaptability, so we designed and implemented a standalone, low-cost and reliable home controlling system using cloud based web-service as an application layer. The system consists of Arduino, cloud as web-service based on Ethernet and Ethernet shield which is used to make wireless connections and an android application. The android application takes status of all the equipment's and present it in a very appropriate manner. The mobile app is remotely accessible and easily portable from outside area through Wi-Fi and easy to control the status of Home.

B. Description of System

This system describes the whole architecture with low-cost, flexibility and reliability. In this system we have 3 layers Home Environment, Home Gateway and Remote Environment. Home Environment represents the structure of the home which consist of Home Gateway and the hardware interface modules includes all the devices and appliances and also the doors and windows. Home gateway is nothing but the connection between the Arduino to the Router and intern Router to the internet i.e. web server. Slave Arduino's connected with the Master Arduino intern Master Arduino is connected with the Router and Router to Internet. The Remote Environment is the connection between the Internet with the User operating devices like Mobile, iPad and so on. In this system user can access and control the home by seating in home or far away from the home via Internet. The sensors and actuators are connected to the Arduino board. The sensor maps the physical environment into the values and sends that values to the relative Arduino. Arduino will upload that values to the database and the android app also attach to that database so that the upload

will directly reflects on the android device. When user wants to perform some task say turn on light then he will do by using android app. The app reflects the database and as the Arduino boards with sensors and actuator are connected to the database they can read the value from database and do operations according to the values set by the user via the android smart phone application.

IV. SYSTEM IMPLEMENTATION

The Proposed Home Automation System consist of the Software and the Hardware development. As the system is developed to monitor and control the Home by using the sensors and actuators.

Software Implementation

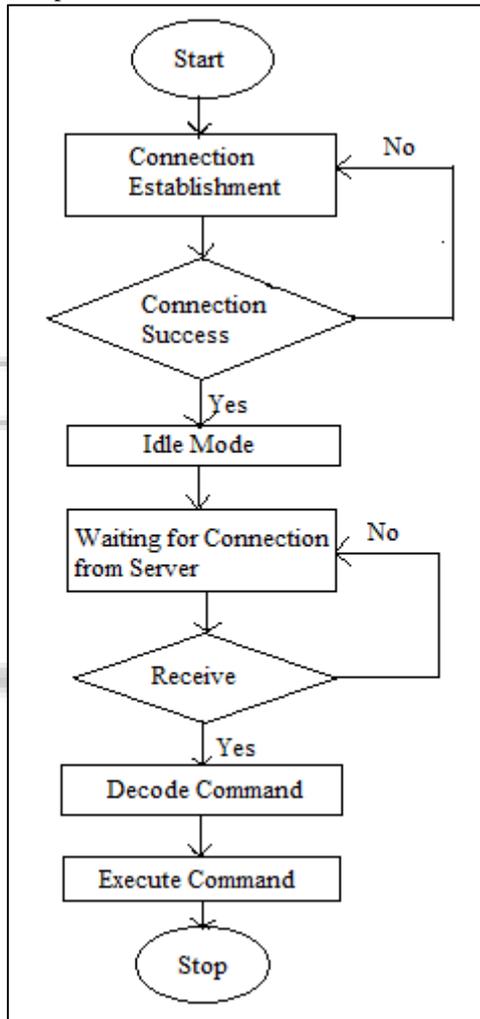


Fig. 1: Home Gateway Connection establishment with the Internet

The Proposed system is the combination of the web service and the micro-controller that is Arduino Board. The first one web-service which is used to connect the Home System to the Wireless media to access the web application. The Connection establishment is shown the above flowchart. The second one is the micro-controller that is Arduino. Arduino is having the Ethernet connection port so we connect Ethernet shield to the Arduino. The Ethernet shield can communicate with client and server both. For the client side communication, the user is connected to the system to access and control the system. The system is having sensors and actuators which are used to sense the

data n perform operations baes on the sensed data. The system's another part is the connection between the wireless media to the Home Gateway. The home gateway is connected to the router and intern the Router is connected to the wireless media. The Home Gateway is having all the appliances. To control the Home gateway, the Ethernet shield establishes the Local Area Network using static IP address. One's the home gateway gets ready the user can control it by the commands. On that user command the system takes actions of sensing and actuating.

V. HARDWARE IMPLEMENTATION

For the implementation of the system we used Arduino Uno. The Arduino board is having the Ethernet shield which is used to establish the connection in between the web-server and the Home Gateway. Arduino Uno is the micro-controller which uses ATmega 328 on which we program in their own Arduino language via USB port. It is having 5 analog pins and 13 digital pins for input and output so we can also interface with other devices. There are some sensors which control the appliances like LM35 which is used to control the Temperature of the Home, LDR sensors used for the Light. The hardware architecture integrates other devices easily. This architecture is easy to use and maintain.

VI. SUMMARY

In this paper, the architecture is developed based on the low cost, flexible and more secure system on the basis of Arduino and android technology which is very easy to use and understandable to the user. The user device is connected to the cloud by using Internet and user can access the app remotely.

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