

Smart Home Control and Monitor System Using Power of IoT's

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Abstract: In today's technological era, the use of modern electronic devices has been increases swiftly with various methods for controlling and monitoring home appliances such as ZigBee, Bluetooth, SMS. With the rapid growth in use of internet, it enables all new approaches to control and monitor smart home remotely. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit; when Internet of Things is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020. Home automation systems are collections of interconnected electronic devices for controlling different types of functions within a house, such as temperature monitoring, light control, fire sensor etc. Smart devices are ideal in providing a user friendly interface in a home automation system, due to their portability and their wide range of capabilities. Proposed system has User Friendly GUI and can be access globally from any device which has internet connectivity.

Keywords: Smart Home, Internet of Things, Home Automation, Remote Control.

I. INTRODUCTION

The Internet of Things connects smart object to the internet. Internet of Things linked smart object and people together and enables new form of communication between them. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. According to Cisco, the IoTs will consist of 50 billion devices connected to internet by 2020[6]. Building IoTs has advanced significantly in the last few years, number of smart devices and appliances connected to the Internet will increases from 99.4 million in 2011 to 2.1 billion by the year 2021, increasing at a rate of 36% per year. Anyone can connect to anything from anywhere and anytime. The proposed system provides a Graphical User Interface (GUI) to monitor and control connected devices through embedded microcontroller web server. The system GUI can be accessed by any device which has internet connectivity.

The proposed system does not require a standalone java server and provide a communication protocol to monitoring and controlling the home environment with more than just ON/OFF functionality. Sensors are used for sensing and monitoring environment and Arduino Yun microcontroller is used to process the sensed data and control as well as monitors the home appliances.

II. PROBLEM STATEMENT

To develop a Smart Home Control and Monitoring System by harnessing the power of IoTs at low-cost which provides flexible and scalable architecture for home automation. It will provides security, energy efficiency

and ease of use with capability of controlling and monitoring home appliances from anywhere in the world.

III. SYSTEM ARCHITECTURE

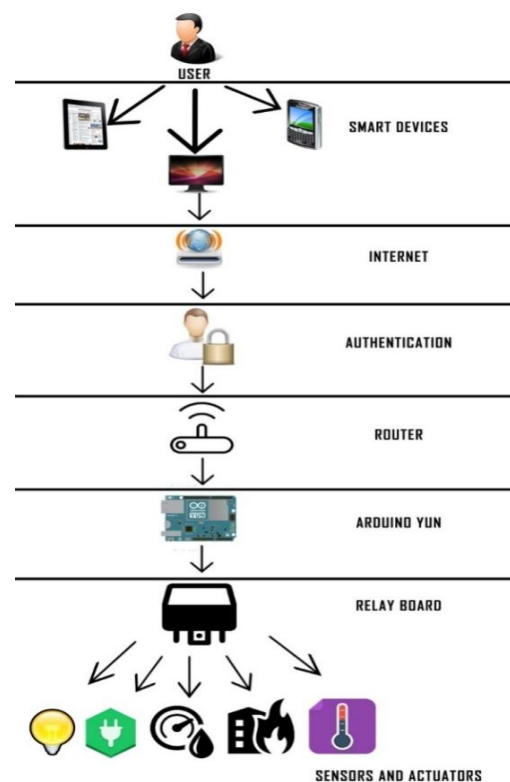


Fig 1. System Architecture

A. Description

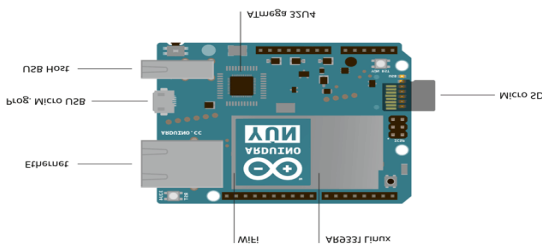
The block diagram of smart home control and monitoring system as shown in Fig.1,

- 1) User will access GUI to control and monitor smart home appliances from any smart devices connected to internet.
- 2) Then user needs to enter unique user ID and password to get authorized on smart home control and monitor system.
- 3) After authorization user can able to access smart home appliances.
- 4) All actuators are connected to Arduino Yun through relay board.
- 5) All sensors and actuators will collect data from environment and send it to Arduino Yun. Arduino Yun will process on collected information and perform operation on it.

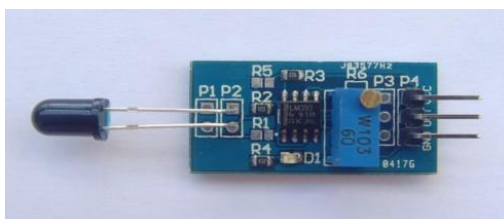
IV. METHODOLOGY

A. Arduino Yun

The Arduino Yún is a microcontroller board based on the ATmega32u4 and the Atheros AR9331 processor which runs OpenWrt-Yun, a customized version of a Linux distribution called OpenWrt. The reason behind choosing arduinoyun is it comes inbuilt Ethernet and wifi which help to make a good IoTproject.



B. Flame Sensor



A flame detector is a sensor designed to detect and respond to the presence of a flame or fire. Flame sensor is the most sensitive to ordinary light that is why its reaction is generally used as flame alarm purposes. This module can detect flame or wavelength in 760 nm to 1100 nm range of light source. Small plate output interface can be directly connected to the microcomputer IO port. The sensor and flame should keep a certain distance to avoid high temperature damage to the sensor. The shortest test distance is 80 cm, if the flame is bigger, test it with farther distance. The detection angle is 60 degrees so the flame spectrum is especially sensitive.

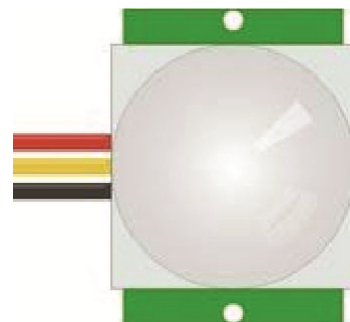
C. Light Sensor

The Light Dependent Resistor (LDR) is made from a piece of exposed semiconductor material such as cadmium sulphide (CdS) that changes its electrical resistance from several thousand Ohms in the dark to only a few hundred Ohms when light falls upon it by creating hole-electron pairs in the material. The net effect is an improvement in its conductivity with a decrease in resistance for an increase in illumination. Also, photo-resistive cells have a long response time requiring many seconds to respond to a change in the light intensity. The resistance of the sensor decreases when the light intensity of the environment increases.

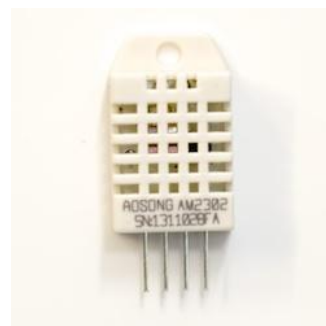


D. PIR Motion Sensor

This PIR Sensor Switch Module detects the Infrared Rays released by human body motion within the detection area 7 Meters For many basic projects or products that need to detect when a person has left or entered the area, or has approached, PIR sensors are great. They are low power and low cost, pretty rugged, have a wide lens range, and are easy to interface with. Each PIR module has buckled port with 3 pin connection VCC, GND and Output Signal, as shown in the figure below:



E. DHT 22 Temperature and Humidity Sensor



The DHT22 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a

thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

Compared to the DHT11, this sensor is more precise, more accurate and works in a bigger range of temperature /humidity, but its larger and more expensive

V. RELATED WORK

Khusvinder Gill, Shuang-Hua Yang, Fang Yao, Xin Lu [2] proposed a ZigBee based implementation for home automation. To join the network a request must be sent to network coordinator. The request is sent on desired network which shares the best signal with the node which can be directly to the coordinator or through a neighboring router. The coordinator permits the request permission to join the home automation network. A private key is used to encrypt the requests to join the home network and all the device communication to improve the security of the proposed system. To successfully connect to the home network devices must have correct private key.

Kwang Ye Lee', Jae Weon Choi [3] proposed a Remote-Controlled Home Automation System Via Bluetooth Home Network. For accessing local home automation, network hardware interface is used from a desktop PC with attached device module and Bluetooth module. Any computers which have internet access can be used to provide access and control services to home network. It needs a less Bluetooth module to control many devices.

Carelin Felix, I.JacobRaglend [4] proposed a GSM-ZigBee based home automation system. The system allows administrator to monitor as well as control connected devices in the home, including a ZigBee based remote control. Users may remotely monitor their home appliances using GSM.

VI. COMPARISON OF GSM, ZIGBEE, BLUETOOTH

ZigBee released in 2004 by ZigBee Alliance standardized as IEEE 802.15.4 while GSM in 1982 by European Telecommunication standards institute standardized as IEEE 802.21 and Bluetooth in 1994 by Smartlabs Inc. standardized as IEEE 802.11[5]. The communication modes of ZigBee is RF while GSM uses GSM, UMTS and LTE and Bluetooth uses RF and ISM band. ZigBee uses 128 bit AES Encryption while Bluetooth uses 64 and 128 bit encryption and GSM uses over the air encryption. ZigBee uses very low power consumption while Bluetooth uses medium power consumption and GSM uses low power consumption. ZigBee and Bluetooth operates on same frequency i.e. 2.4 GHz while GSM operates between 850-1900 MHz for 2G, and for 3G it operates in 2100 MHz.

VII. CONCLUSION AND FUTURE SCOPE

The proposed system overcomes the drawbacks of the past implemented systems. In this paper we discuss about smart home control and monitor system from several aspects such as Bluetooth, ZigBee etc. Several researchers have proposed different methods for home automation. In smart home control and monitor system, IOTs perform better than Bluetooth, ZigBee, GSM and SMS. In future proposed system will be very helpful to save energy in smart way and also it will be very useful for disabled peoples to control home smartly using any smart device. This proposed system will perform vital role in making India digital. It will also contribute up to some extent in government based "Digital India" project. This project can be further extends to voice controlled feature.

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