Smart Home System using Motion Sensing

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Abstract- *The main purpose of this project is to develop a home automation system that uses Arduino board that are remotely controlled by Bluetooth through an Android OS smartphone. As technology develops, homes are getting smarter. Modern homes are increasingly moving from conventional switches to a central control system associated with remote control switches. Currently, conventional wall switches located in different parts of the house prevent the user from being able to get close. It becomes much more difficult for the elderly or physically disabled to do so. The remote control home automation system provides the most modern solution with a smartphone.*

To achieve this, the Bluetooth model is interfaced to the Arduino board of the receiver. At the end of the transmitter, the GUI application on the phone sends an ON / OFF command to the receiver to which the load is connected. You can turn the load on and off remotely via this technology by touching the specified location on the GUI.

Keywords- IOT, Home automation, Sensors, Arduino, Android app

I. INTRODUCTION

In the present time, the technologically advanced world is progressing more and more, as new technologies penetrate deeper into our personal lives, even at home. The home automation system is becoming very popular around the world. Home automation is used to control and monitor electronic security systems, lighting, climate, home appliances, audio and video equipment, etc. Home automation is the residential extension of the automation of a building.
The advantages of automation are its safety, economy, time, maintenance costs and simplicity. A home automation system consists of a device that communicates with a gateway or hub.
The number of devices required at home depends on the control you want to have at home. Each device works with a protocol. Your choice of protocol will determine which products you can use in your system.

Some of the most common protocols include:

Bluetooth - This is common for using a few devices from a computer or mobile device, and is integrated with most smartphones.

Wi-Fi - A large number of home automation devices work on your wireless Internet connection and connect to your wireless router.

Both are wireless protocols that use a mesh network to communicate. Each of these protocols must have a set of products working with its technology.

II. LITERATURE SURVEY

Project name: An IoT-based Appliance Control System for Smart Homes.

Author: Ming Wang, Guiqing Zhang, Chenghui Zhang, Jianbin Zhang, Chengdong L

Paper explanation: With the development of the social economy, more and more appliances have been presented in a house. It comes out a problem that how to manage and control these increasing various appliances efficiently and conveniently so as to achieve more comfortable, security and healthy space at home. In this paper, a smart control system base on the technologies of internet of things has been proposed to solve the above problem. The smart home control system uses a smart central controller to set up a radio frequency 433 MHz wireless sensor and actuator network (WSAN). A series of control modules, such as switch modules, radio frequency control modules, have been developed in the WSAN to control directly all kinds of home appliances. Application servers, client computers, tablets or smart phones can communicate with the smart central controller through a wireless router via a Wi-Fi interface. Since it has WSAN as the lower control layer, an appliance can be added into or withdrawn from the control system very easily. The smart control system embraces the functions of appliance monitor, control and management, home security, energy statistics and analysis.

Project name: WSN-Based Smart Sensors and Actuator for Power Management in Intelligent Buildings

Author: Nagender Kumar Suryadevara, Student Member, IEEE, Subhas Chandra Mukhopadhyay, Fellow, IEEE, Sean Dieter Table Kelly, and Santander Pal Singh Gill

Paper explanation: The design and development of a smart monitoring and controlling system for household electrical appliances in real time has been reported in this paper. The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The novelty of this system is the implementation of the controlling mechanism of appliances in different ways. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers. The prototype has been extensively tested in real-life situations and experimental results are very encouraging

Project name: IoT based Monitoring and Control System for Home Automation

Author: Pavithra.D, Ranjith Balakrishnan.
Paper explanation: The project proposes an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wi-Fi etc. This project aims at controlling home appliances via Smartphone using Wi-Fi as communication protocol and raspberry pi as server system. The user here will move directly with the system through a web-based interface over the web, whereas home appliances like lights, fan and door lock are remotely controlled through easy website. An extra feature that enhances the facet of protection from fireplace accidents is its capability of sleuthing the smoke in order that within the event of any fireplace, associates an alerting message and an image is sent to Smartphone. The server will be interfaced with relay hardware circuits that control the appliances running at home. The communication with server allows the user to select the appropriate device. The communication with server permits the user to pick out the acceptable device. The server communicates with the corresponding relays. If the web affiliation is down or the server isn't up, the embedded system board still will manage and operate the appliances domestically. By this we provide a climbable and price effective Home Automation system.

Paper name: Intelligent Household LED Lighting System Considering Energy Efficiency and User Satisfaction
Author: Jinsung Byun, Insung Hong, Byoungjoo Lee, and Sehyun Park, Member, IEEE
Paper explanation: Saving energy has become one of the most important issues these days. The most waste of energy is caused by the inefficient use of the consumer electronics. Particularly, a light accounts for a great part of the total energy consumption. Various light control systems are introduced in current markets, because the installed lighting systems are outdated and energy-inefficient. However, due to architectural limitations, the existing light control systems cannot be successfully applied to home and office buildings. Therefore, this paper proposes an intelligent household LED lighting system considering energy efficiency and user satisfaction. The proposed system utilizes multi sensors and wireless communication technology in order to control an LED light according to the user's state and the surroundings. The proposed LED lighting system can autonomously adjust the minimum light intensity value to enhance both energy efficiency and user satisfaction. We designed and implemented the proposed system in the test bed and measured total power consumption to verify the performance. The proposed LED lighting system reduces total power consumption of the test bed up to 21.9%1.

Paper name: An Intelligent Light Control System for Power Saving

Author: Sherif Matta and Syed Masud Mahmud, Senior Member, IEEE

Paper explanation: Saving energy has become one of the most challenging issues these days. The most waste of energy comes from the inefficient use of the electrical energy consumed by artificial light devices (lamps or light bulbs). This paper presents a system with detailed design for saving electrical energy by controlling the intensity of artificial light to a satisfactory level and getting use of the day light when possible with the best effort for energy saving. An improvement to daylight harvesting and controlled dimming systems is introduced while counting for over illumination cases. The idea behind is to control the venetian blinds or curtains in such a way to make use of the daylight if it is available. Otherwise, it uses the artificial internal building light. Controlling the amount of daylight passing inside is via controlling the opening angle of the venetian blinds while controlling the intensity of artificial light is by controlling the amount of power delivered to the lamp via Pulse Width Modulation (PWM) for DC lamps or clipping the AC wave for AC light bulbs. The system uses Controller Area Network (CAN) as the media of communication with the sensors and the actuators. The system is modular and can be expanded to span large buildings. The advantage of the design is that it gives the user a single point of operation which is the amount of desired light. The controller is responsible to determine a way to satisfy the amount of light desired with the least energy consumption. One of the major issues considered is the ease of installation and the low cost of the system components. The

system shows a significant amount of energy saved and feasibility in practical implementation.

III. PROPOSED SYSTEM

Anyone who has experience with the existing system can imagine a system that offers more flexibility and can be run with some common applications. This work is designed to avoid the disadvantages of the existing system. The proposed system supports more elasticity, comfort capacity and safety. The main objective is to design and implement an open source and low cost home automation system capable of controlling most of the home and maintaining the home automation system. The predictable system has great elasticity when using reliable wireless technology to connect multiple modules to the server of the home automation system. This, in turn, lowers the implementation cost, increasing the flexibility of the system's progress and reconfiguration. The projected system may utilize wireless connections between various sensors, hardware modules and various communication protocols between users and servers.

Process model used in this proposed system is waterfall model. It is simple to use.

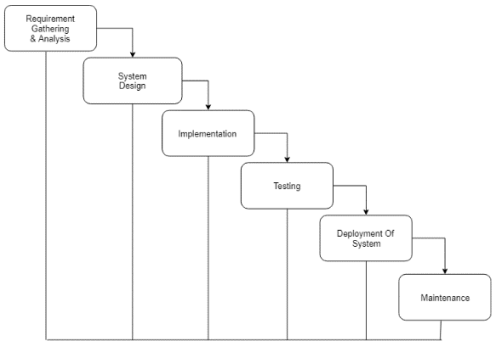

Fig 1. Waterfall Model

The working of this project is explained as below:

Switch the DPDT switch to select mode which are automatic & manual.

If mode is on automatic mode then we don't have to do anything. Sensor's work automatically by using motion detection, light intensity & temperature in the room.

If it is on manual mode, then the person has to choose the facilities.

First, Register the user account using android application.

Login into the authorized account.

Choose the option of ON/OFF for light & fan.

Use case diagrams model the functionality of systems that use actors and use cases. A use case is a set of actions, services, and functions that a system must perform.

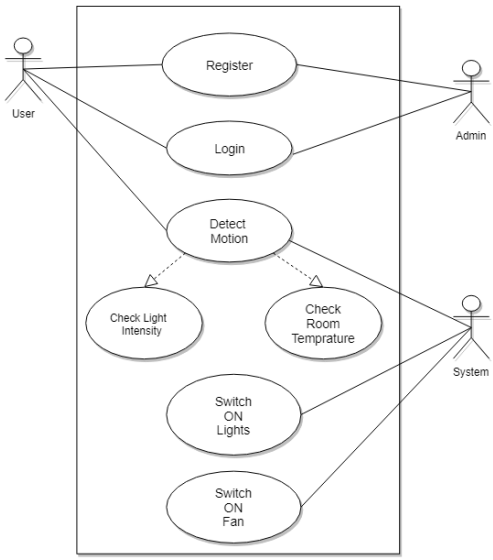

Fig 2. Use Case Diagram

Some of sensor's used in project are explained as follows:

PIR sensor: A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light emitted by objects in its field of view. They are most commonly used in PIR-based motion detectors. When the sensor is idle, both slots detect the same amount of infrared radiation, the amount of space radiated from space, walls, or outdoors. When a warm body like a human or an animal passes by, it first intercepts half of the PIR sensor and causes a positive difference change between the two halves.

LM35 sensor: The LM35 is an integrated analogue temperature sensor whose electrical output is proportional to degrees Celsius. The LM35 sensor does not require external

calibration or trim to achieve typical accuracy. The LM35 temperature sensor is used to capture an accurate Celsius temperature. The output of this sensor describes the linearity. The O / P voltage of this IC sensor is linearly comparable to the Celsius temperature. The operating voltage range of this LM35 ranges from -55 ° to + 150 ° C and has a low self-heating.

Arduino Uno: The Arduino UNO is an open-source microcontroller card based on the Microchip ATmega328P microcontroller developed by Arduino.cc. The board is equipped with digital and analog I / O pins that can be connected to various expansion boards (shields) and other circuits. The board has 14 digital and 6 analog pins that can be programmed with the Arduino Integrated Development Environment (IDE) via a Type B USB cable.

IV. SYSTEM ARCHITECTURE

The software architecture of a program or computing system is a depiction of the system that aids in the understanding of how the system will behave. Software architecture serves as the blueprint for both the system and the project developing it, defining the work assignments that must be carried out by design and implementation teams. The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer knowledge over a network without requiring human-to-computer interaction. Home automation or smart home is the residential extension of building automation and involves the control and automation of lighting, heating, ventilation, air conditioning (HVAC), and security.

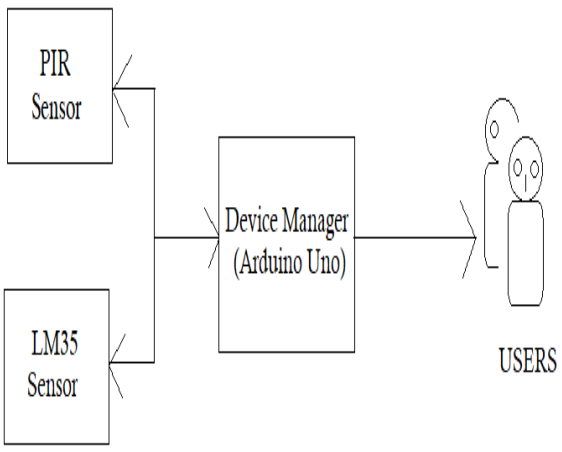

Fig 3. System Architecture

Home automation systems using IOT consists of three major aspects as shown in fig. which are explained as follows:

1. The first part detects things. this is Sensors at various locations in the house to measure and collect desired information such as temperature, humidity, and the presence of objects.

2. The second part is the system process data. The sensor provides raw format data. These data are transferred to the processor over a transfer, wired connection, or wireless mode. The processor then converts the data to a value that it can understand. These values are sent automatically or manually to the user to be controlled by the user interface.

3. The final part of automation is behavioural performance. Automated systems automatically run multiple commands to save time, improve the quality of life in your home, and help save energy.

V. ADVANTAGES

• Wireless connection i.e. Bluetooth

• Simple construction

• Gives you a peace of mind with security solutions

• Save money and help build a friendly environment by avoiding wastage of electricity

• Flexible and Compatible

VI. APPLICATIONS

a) To control the lights and fan in the room without human involvement.

b) In offices and schools, to save the wastage of energy.

VII. SOFTWARE AND HARDWARE RESOURCES

•Operating system : Any Android OS

•Coding language : Java,C

•IDE : Android Studio

•Database : MYSQL

•Toolkit : Android 2.3 and above

There should be required devices to interact with software.

- Arduino UNO
- PIR Sensor
- LM35 Sensor
- LDR Sensor module
- Bluetooth module (HC-05)
- Relay module

VIII. CONCLUSION

The project proposed the idea of smart homes that can support a large number of home automation systems. A smart home contains a connection between wireless communication, sensors, monitoring and tracking. Smart homes are a huge system with many technologies and applications that can be used to provide security and control of the home easily.

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