SMART HOME USING IOT

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Abstract: In this modern day world, people all are connected and depended on internet. People also prefer automation when compared to manual in both industry and domestic domains, however nowadays home automation tech has reached out so many families all over the world making them feel ease at monitoring and controlling home appliances. In this paper, this home automation device monitors and controls various applications in a domestic home using Arduino UNO. The device is equipped with user-friendly mobile application to control the appliances. Various applications are integrated by internet of things (IoT) with the Wi-Fi module ESP8266 and programmed on Arduino IDE as the output will be displayed on LCD.

Index Terms: Home Automation, Arduino UNO, Internet of Things (IoT), Arduino IDE, LCD, Wi-Fi module ESP8266.

I. INTRODUCTION

Lately, automation has changed powerfully on different applications where digitization individuals are partial to programmed gadgets or keen gadgets. Since the 2000's with the advancement of new innovations, the web of things (IoT) has additionally arisen to make brilliant gadgets more honed. Prior to the 1900s, pretty much every home comprised of electrical apparatuses like TV, radiator, air system, clothes washer, enlistment, electronic security frameworks, and other electrical and electronic gadgets which were physically controlled making a shrewd home. Fundamentally, IoT has three degrees of working its capacities: the principal layer is the detecting layer primarily utilized for gathering data; the subsequent layer is the organization layer utilized for data transmission and preparing; the third layer is the application layer utilized for capacity and dynamic. The principle idea of IoT is that it can make a virtual association between a center point and electronic, electrical items. This virtual association assists with controlling, find and track down these associated objects. IoT has become reality and its objective is to make gadgets more mindful, intuitive, and proficient for a superior and more secure world.

In this proposed system, this system uses ATmega328 microcontroller chip within Arduino UNO integrated with ESP8622 Wi-Fi module for all connections consisting of various applications in this device. This proposed system consists of theft alert, water leak alert system, gas leakage alert, automatic water tank filling system, motion sensing lights and fan. Also the user is provided with a user-friendly mobile application for controlling lights, fan. The alert notifications will also come by the app.

III. METHODOLOGY

In the proposed system, various sensors, rectifiers, relays are used. It also consumes less power which is purposeful to the home. The advantages of using this system are, high level security, no user interface required for operation of any devices, cost efficient, and power efficient, handy mobile apps. The block diagram for the smart home device is just below.

Figure 1. Block Diagram of Proposed Smart Home System

From the block diagram, the device’s operation is meticulous. The input supply given from the step down transformer of AC 250V which steps down the large amount of supply to required level, then the rectifier converts the AC to DC for the device and...
the rectifier supplies the desired current of 5V to the device, hence the circuit is powered. All the sensors, modules, relays, are interconnected to the Arduino UNO board. The PIR detects a movement it send the data to the UNO board and from the board the decision signal is sent to the device via a relay hence that makes the lights/Fan ON, even switching on/off lights and fan can be controlled by mobile application. Next input, the flow measurement gives us exact level of water flow in the pipes if any leaks detected the user will be notified by LCD as well as app notification. The theft alert is the next input, so when the IR detects any suspicious movements it will automatically raiser alert using a buzzer and inform the user via mobile application as well as in LCD. The gas sensor detects the gas leakage in the home and raise alert with the help of a buzzer and notify the user via LCD. Final application is level sensor, this works by the help of ultrasonic distance sensor where it covers of distance 15cm accuracy, so if the water level in the tank gets lower than 15cm, the pump automatically fills the water to the tank, as well as same proposition when the water level in tank is beyond 15cm the pump automatically switches OFF. These applications are integrated by IoT module and functions perfectly. The mobile application transmits commands and receives alert notifications by interconnecting with Wi-Fi module.

III. SYSTEM IMPLEMENTATION

3.1 PROPOSED SYSTEM HARDWARE:

Figure 2. Smart Home Hardware

3.2 COMPONENTS:
A. ARDUINO UNO:
Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

B. POWER SUPPLIES:
The ac voltage, typically 120 V RMS, is connected to a transformer, which steps that ac voltage right down to the extent for the specified dc output. A diode rectifier then provides a full-wave rectified voltage that's initially filtered by an easy capacitor filter to supply a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to supply a dc voltage that not only has much less ripple voltage but also remains an equivalent dc value albeit the input dc voltage varies somewhat or the load connected to the output dc voltage changes. This voltage regulation is typically obtained using one among the foremost popular transformer IC units.
C. WI-FI MODULE-ESP8266:

The ESP8266 Wi-Fi Module could even be a self-contained SOC with an integrated TCP/IP protocol stack which may give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The ESP8266 module is a particularly cost-effective board with an enormous, and ever-growing, community.

D. RELAY:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic flux that draws a lever and changes the switch contacts. The coil current are often on or off so relays have two switch positions and that they are double throw (changeover) switches. This circuit is meant to regulate the load. The load could also be motor or the other load. The load is turned ON and OFF through the relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547).

E. PASSIVE INFRARED SENSOR (PIR):

PIR sensors are commonly utilized in security alarms and automatic lighting applications. PIR sensors detect general movement but don't give information on who or what moved. For that purpose, an imaging IR sensor is required. The term passive refers to the very fact that PIR devices don't radiate energy for detection purposes. They work entirely by detecting infrared (radiant heat) emitted by or reflected from objects. There are two PIR sensor circuits in this system, one for motion sensor lights and a fan. The module has just three pins, a Ground and a VCC for powering the module, and an output pin that provides high logic level if an object is detected. Also, it's two potentiometers. One for adjusting the sensitivity of the sensor and therefore the other for adjusting the time the output stays high when the thing is detected.

F. INFRARED SENSOR (IR):

An infrared sensor is an electronic device that emits to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Once the infrared transmitter generates emission, then it arrives at the object & some of the emission will reflect toward the infrared receiver. The sensor output can be decided by the IR receiver depending on the intensity of the response. In the proposed system, the IR detects the movements of any suspicious persons, it will raise alert and pop up a mobile notification via app.

G. GAS SENSOR:

A basic gas sensor has 6 terminals in which 4 terminals (A, A, B, B) acts as input or output and the remaining 2 terminals (H, H) are for heating the coil. Of these 4 terminals, 2 terminals from each side can be used as either input or output (these terminals are reversible as shown in the circuit diagram) and vice versa. In the gas sensor, the supply voltage is given to the input terminal. The gas sensor is used here in a way that it detects any cooking gas leakages in the user’s home and rise alert through buzzer and app notification.

H. FLOW MEASUREMENT SENSOR:

Flow measurement methods aside from positive-displacement flowmeters consider forces produced by the flowing stream because it overcomes a known constriction, to indirectly calculate flow. Flow could also be measured by measuring the speed of fluid over a known area. For very large flows, tracer methods could also be wont to deduce the flow from the change in concentration of a dye or radioisotope. A water clock or clepsydra is any timekeeper operated by means of a regulated flow of liquid into (inflow type) or out from (outflow type) a vessel where it's the measure. Here the rotating wheel is fixed within the inside pipe where the water flow has got to measure. When the water is flowing with pressure, the wheel is rotating. The wheel rotation is monitored by the proximity sensor. The proximity sensor is delivered the output within the sort of a pulse which is given to the microcontroller. The microcontroller counts the pulse which is adequate to the speed of water flow within the pipe. So when a water leak occurs the app will notify the user.

I. LEVEL SENSOR:

Ultrasonic Distance Sensor provides very short (2CM) to long-range (4M) detection and ranging. The sensor provides a precise and stable non-contact distance measurement of about 15cm with very high accuracy. It can be easily interfaced to any microcontroller. Whenever the water level goes below the desired level the pump will be switched ON as well as whenever the water level goes high the pump will get OFF.

3.3 SOFTWARE:

A. ARDUINO IDE:

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board. The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.
B. PHP (HYPERTEXT PRE-PROCESSOR):

PHP may be a server-side scripting language designed specifically for web development. Its open-source which suggests it's liberal to download and use. It’s very simple to find out and use. The files have the extension “.php”. Rasmus Lerdorf inspired the primary version of PHP and participating within the later versions. It’s an interpreted language and it doesn't require a compiler. PHP can actually do anything associated with server-side scripting or more popularly referred to as the backend of an internet site, for instance. PHP can receive data from forms, generate dynamic page content, can work with databases, create sessions, send and receive cookies, send emails, etc.

This system is monitored and controlled by two main mobile applications, ZENO IOT and Pushbullet. There will no privacy issues regarding the user’s info in the mobile as these apps are user-friendly and can be easily handled by all age groups. The fan, lights can be controlled by ZENO IOT app whereas the alert notifications are intimated via a popup by the Pushbullet app.

IV. RESULTS

![Figure 3. Lights ON/OFF](image1)

![Figure 4. Fan ON/OFF](image2)
4.1 DESCRIPTION:

These lights/Fan are switched ON when motion is detected as well as it can be switched OFF via app also as shown in figure 3 and figure 4. The theft alert is raised with buzzer when a suspicious movement is detected from IR sensor as shown in figure 5. The water level results are shown in figure 6 as per the level sensor conditions. The gas leak alert is also raised with buzzer using gas sensor the result is shown in figure 7. When water leak is detected the alert is sent through pop via the app as shown in figure 8. The above results are from mobile application where can control the appliances, receive alert notifications. These will come handy when the user is out of station as well as if there are old aged persons even they can be easily understand the automation system. The mobile application is just as simple as is it user-friendly.

V. CONCLUSION:

This proposed system can be easily monitored and controlled for each and every households. This system is proposed mainly to the middle class people, from this it is understandable that this home automation system is cost efficient and user-friendly. Each and every device which are interfaced with the IoT are merged with the apps and which is able to receive the alert notifications. This system gets handy to all the user’s variant to age differentiation likewise cost-efficient. These applications project you for a classy living home essentially. The IoT tool marketplace has passed through radical modifications in only some quick years. Wastage of electricity is duly reduced using this proposed system.

Though the system needs continuous internet connection it is very much cost effective when compare to other home automation systems. The proposed design of the smart home is very flexible and can be easily expanded and applied to larger homes by
increasing the number of sensors, measured parameters, and control devices. Smart phone is nowadays an unavoidable device, hence smart phone integrated devices will reduce the cost of additional hardware setups and get more convenient handling.

REFERENCES:


