A PROJECT REPORT ON

SMART HOME AUTOMATION

Submitted in fulfilment of the requirement for the award of the degree of II Bachelor

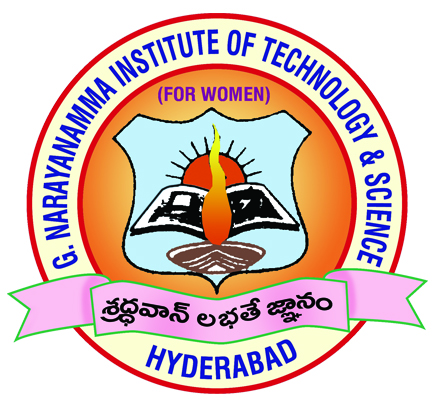
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**(for Women)**

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ABSTRACT

Automated systems are being preferred over the non-automated systems because of the rapid growth in the number of consumers using the internet over the past years.

Internet of things, Iot in short plays an crucial and important role in human life because They possess the capability to furnish information and fulfil assigned tasks while we are busy doing some other work.The system will additionally have the ability to oversee different variables like temperature, humidity, water levels through a range of sensors linked to the NodeMCU. Users can access the data from these sensors on their smartphones. It focuses on the development of an IOT based home automation system that is able to control various components via internet or Be fundamentally configured to function based on surrounding environmental conditions. The main control system implements wireless technology to provide remote access from smart phone. We're implementing a cloud server-based communication system that enhances the project's practicality by granting unrestricted user access to the appliances, regardless of distance factor. The system intended to control electrical appliances and devices in our house with relatively low-cost design, user-friendly interface and ease of installation. The status of the appliance would be available, along with the control on an android platform. Also, the smart home concept in the system improves the standard living at home.

System Functionality:

Sensor Data Monitoring:

* The sensors connected to the NodeMCU microcontroller continuously monitor environmental parameters such as temperature and humidity.
* The data is sent to the control unit for processing and further actions.

Remote Access and Control:

* With intelligent appliance control, users can enjoy greater comfort and convenience.

Key features of smart home automation:

* Remote Control**:** Control devices from a distance using devices**.**
* Energy Efficiency: Saves resources through efficient use.
* Security: Monitors and secure home through sensors and cameras.
* Voice Control: controlling and monitoring devices using voice.
* Automation: Create device routines and schedules.
* Integration: link devices for unified control.

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List of Abbreviations

IoT - Internet of Things

ESP8266 - Wi-Fi module used in the project

HAS - Home Automation System

Node MCU - Open-source IoT platform

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**1**.**INTRODUCTION**

**1.1 DESCRIPTION ON SMART HOME AUTOMATION**

A smart home automation system with multiple sensors and IoT technology allows the connection and automatic operation of different devices inside a house. It also utilizes interconnected sensors to monitor conditions such as motion, temperature, and light, while a central hub acts as the control center. The system makes it possible for devices to connect using methods like Wi-Fi or Bluetooth, which allows for automation and control from a distance. Additionally, it improves the way energy is used, enhances security, and ensures safety by making devices work better, identifying unauthorized entry, and warning residents about possible dangers. Users can eventually customize preferences, add more devices to the system, and have a more convenient and comfortable living experience.

These sensors are placed throughout the home and are connected to a central hub or gateway, which acts as the control center. The central hub gets information from the sensors and uses it to make smart choices according to set rules and user preferences.

Through IoT connectivity, the smart home automation system creates smooth communication and teamwork among sensors, the central hub, and other clever gadgets. It relies on technologies like Wi-Fi, Zigbee, Z-Wave, or Bluetooth to set up connections and share information. This helps all the different parts of the system work together efficiently.

To sum up, a smart home system that uses various sensors and IoT technology which offers homeowners convenience, energy efficiency, better security, and well-furnished way of living. It makes day-to-day tasks easier, and gives more control over devices, and makes homes more comfortable and efficient.

**1.2 SOFTWARE AND HARDWARE REQUIREMENTS**

**LIST OF TABLES: TABLE 2.1**

**SOFTWARE REQUIREMENTS:**

* Sensors: ultrasonic sensors, Mq3 sensor, PIR sensor
* Bluetooth Terminal Application
* IoT platforms - Arduino IDE cloud
* Blynksimple Esp8266
* Node MCU ESP8266

**HARDWARE REQUIREMENTS:**

* Arduino Uno or similar microcontroller board
* Bluetooth module (HC-05 or HC-06)
* Relay module
* Jumper wires
* Breadboard or PCB
* Buzzer

**2.IMPLEMENTATION**

**2.1 METHODOLOGY**

In Creating a smart home automation system using multiple sensors with Blynk and Arduino we have several steps to follow, here are the steps:

1)Define Requirements:

Defining the automation goals ,types of sensors, and also the functionalities you want to implement in smart home.

2)Sensor Selection**:**

Choose right sensors like motion, temperature, humidity sensors which are compatible with Arduino and Blynk.

3)Blynk Account Setup**:**

Firstly, we Sign up for Blynk account, and also create a new project, and obtain an Auth Token for communication between Arduino and the Blynk app.

4)Arduino Setup**:**

Setting up your Arduino board (e.g., NodeMCU) with the required libraries and hardware connections for the chosen sensors.

5)Blynk Library Integration:

Install the Blynk library in the Arduino IDE ,use it to build communication between the Arduino board and the Blynk app.

6)Sensor Connections:

Connect the sensors to the pins on the Arduino board and ensure they are correctly powered.

7)Blynk App Design:

Design the Blynk app interface by adding widgets like Value Display, Gauge, Button to display sensor data and control actuators.

8)Auth Token Configuration:

Add the Auth Token to your Arduino code.

9)Sensor Data Display:

Use Blynk's widgets to display real-time sensor data in the Blynk app.

10)Actuator Control Widgets:

Add control widgets (e.g., buttons) to the Blynk app to remotely control actuators .

11)Automation Rule Setup:

Configure the Blynk's automation feature to set up rules based on sensor data.

12)Alerts and Notifications:

Setting up Blynk to send alerts and notifications to your mobile device based on sensor thresholds.

13)Remote Control Testing:

Test the control process and automation features to ensure they are functioning properly as intended.

14)User Interface Testing:

Verify that the Blynk app interface displays accurate sensor data .

15)Security Measures**:**

Implement Blynk's security features for protecting your system from unauthorized access.

16)Power Management:

Optimize power usage for sensors and Arduino to extend battery life.

17)Scalability Planning:

Design the system with scalability in mind.

18)Maintenance and Updates:

Have to regularly update firmware, libraries, and Blynk app configurations to ensure system security, flexibility and reliability.

19)Monitoring and Troubleshooting:

Setting up monitoring tools to detect issues,erorrs and troubleshoot problems efficiently and effectively.

20)User Feedback Incorporation:

Gathering feedback from users to make any improvements and enhancements to the system.

21)Stay Updated:

Keeping up with Blynk library updates and Arduino community resources to enhance your system over time.

**2.2 ALGORITHM**

1)Initializing Libraries and Variables:

* Include required libraries (ESP8266WiFi.h, BlynkSimpleEsp8266.h, DHT.h).
* Defining the authentication token (auth), WiFi credentials (ssid, pass), and pins for various components.

2)Setup Function:

* First, Initialize Serial communication.
* Set the pinMode for components (Buzzer, PIR, trig, echo, relay1, relay2).
* Initialize Blynk connection using Blynk.begin().
* Initialize the DHT11 sensor using dht.begin().
* Set up timer intervals for functions related to different sensors using
  + timer. setInterval().

3)Gas Sensor Function (gas-sensor):

* Read analog value from MQ2 sensor.
* Map the analog value to a percentage scale.
* If gas level is below or equal to 55, turn off Buzzer.
* If gas level is above 55, send a notification to Blynk app and turn on Buzzer.
* Update the gas level value on Blynk app using Blynk.virtualWrite().

4)DHT11 Sensor Function :

* Read temperature and humidity values from DHT11 sensor.
* Check if readings are valid or not.
* Update temperature and humidity values on Blynk app using Blynk.virtualWrite().

5) PIR Sensor Function (pirsensor):

* Read digital value from PIR sensor.
* If the PIR button is enabled (1),
* perform the following:
  + If PIR sensor value is 0, turn off Buzzer.
  + If PIR sensor value is 1, send a notification to Blynk app and turn on Buzzer.

6) Ultrasonic Sensor Function :

* Generate ultrasonic pulse by controlling the trigger pin.
* Measure the duration of the pulse's return echo.
* Convert the duration to centimeters.
* Update the distance value on Blynk app using Blynk.virtualWrite().

7) Relay Control Functions (BLYNK\_WRITE(V5) and BLYNK\_WRITE(V6)):

* Read button values for relay control from the Blynk app.
* If the button is pressed (1), turn on the respective relay.
* If the button is released (0), turn off the respective relay.

8)Loop Function:

* Run the Blynk library using Blynk.run().
* Run the Blynk timer using timer.run( ).

9) End of the program.

**ARDUINO IDE:**

Arduino is a kind of electronic toolbox that lets you create and control things using simple parts. It has a small computer board, a software tool to make things, and a group of people who share ideas.

Arduino boards are designed to be easy to use for both beginners and experts in electronics and programming.

The IDE is open-source meaning it is freely available for Windows, macOS, and Linux operating systems and is free of cost.

Arduino IDE allows customization of programmer options, communication ports, and compiler settings.

It also offers a built-in code editor with features like syntax highlighting, and error checking.

Its simplicity makes it suitable and easy for beginners entering the world of electronics and programming.

To install the Arduino IDE, follow these steps:

* Go to the Arduino website at <https://www.arduino.cc/> and click on the "Software" tab.
* Choose your operating system from the list of options.
* Click on the "Download" button to download the installer file.
* Once the download is complete, double-click on the installer file to begin the installation process.
* Follow the on-screen instructions to install the Arduino IDE on your computer.
* Once the installation is complete, you can launch the Arduino IDE and begin programming your Arduino board.



**BLYNK:**

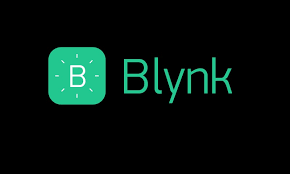
Blynk is a mobile phone app that helps you manage and control smart devices over the internet. It's easy to use and doesn't need coding. You can make your own app for your smart project using Blynk without writing any complicated instructions.

Blynk app also offers a user-friendly interface to create custom control interfaces without coding.

This app supports a wide range of hardware platforms, including Arduino, Raspberry Pi, ESP8266 etc.

Here's how Blynk works in IoT projects:

* Install the Blynk app on your mobile device and create a new project.
* Choose the type of hardware you will be using for your project (such as an Arduino or Raspberry Pi).
* Use the Blynk app to generate a unique authentication token for your hardware device.
* Use the Blynk library in your hardware project code to connect to the Blynk server and authenticate your device with the token.
* In the Blynk app, add user interface widgets (such as buttons, sliders, and displays) to control and monitor your IoT device.
* Use the Blynk library in your hardware project code to read input from the user interface widgets and control your IoT device accordingly.



**FEATURES SUPPORTING SMART HOME AUTOMATION(IOT):**

* Monitoring and control of various home functions, such as temperature, lighting, and security etc.
* Integration with voice assistants and mobile apps for easy control and customization.
* Analytics and insights into energy consumption and user behavior to optimize efficiency and improve user experience.
* You get instant notifications/messages on your devices if something unusual happens, like a leak or an unlocked door or anything.so you can react accordingly.
* You can expand your home ecosystem by adding new devices and functionalities as needed.
* People who are physically incapable can use smart home devices to control things, which helps them do things on their own and be more independent.
* According to your daily routine, You can tell devices when to start or stop working by themselves.
* Smart devices in your home gather information about how you use them. This information can be studied to help you make smart choices about saving energy and deciding which devices to use.
* Even when you’re far away from home, Security systems using IoT can watch your home all the time and it also let you control cameras, locks, and alarms . which also makes your home safer and secure.
* In waste management, Bins which use IoT can tell you when they're full, so you don't have to keep checking and making trips to empty them too often.
* Even When you're not at home, smart devices can automatically give food and water to your pets and keep an eye on them.
* The Devices can react based on your location, like turning on the lights when you're near home.

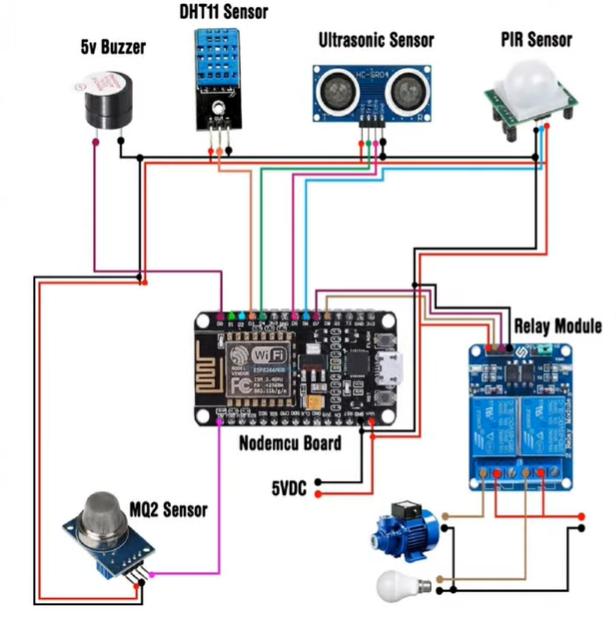
So, like this the smart home automation offers many features in our household to protect and make it simplier for humans and their daily lives.

**Best practices for implementing Smart Home Systems by IoT:**

* Conduct a thorough risk assessment of the smart home system to find if there’s any possible security or privacy issues. Then, coming up with ways to reduce or avoid these problems.
* Choose IoT devices and systems that work well together. Keep them up-to-date and well-maintained.
* To protect user data, implement strong authentication and encryption measures and also prevent unauthorized access to IoT devices.
* Supply users straightforward explanations about how their data will be gathered, used, and shared through clear privacy policies and agreements.
* Gather only important and necessary data and keep as little as possible to lower the risks from breaches.
* Before collecting private data or sharing it with others, Get clear permission from users.
* As to avoid leaking data, carefully get rid of old devices.
* Customarily and continuously save system settings and data as a backup for fast recovery in case of problems or security issues.

**2.3 PSEUDO CODE:**

**2.4 CIRCUIT DIAGRAM**

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In this circuit diagram, as we can see the 5v buzzer,DHT11 sensor, Ultrasonic sensor, PIR sensor and MQ2 sensor are connected to the Nodemcu Board. Here we use relay module as well.

**EXAMPLES OF SMART HOME SYSTEMS BY IOT:**

* Amazon Echo/Alexa: A well-known smart home system that responds to voice commands for controlling lighting, temperature,humidy and entertainment. It also works together with other IoT devices like smart locks and security cameras.
* Nest: A smart thermostat that learns your habits to save energy by adjusting temperature. You can also control it through a mobile phone.
* Philips Hue: Smart lights which can control your voice using mobile phone and also Change colors, brightness, and set them to turn on/off automatically.
* Ring: A smart security system that includes video doorbells, security cameras, and smart locks. It allows users to monitor and control their home's security remotely via a mobile app.
* Wink Hub: It is a hub which connects to various smart devices and offers a single interface to control and manage them efficiently.
* Wyze Cam: An affordable and cost-effective smart camera that lets you watch live video and receive notifications when it detects movement or sound.
* Netatmo Weather Station: Netatmo Weather Station is a smart device that measures the quality of air in your home and gives you up-to-date weather information.