



ALEXA BASED SMART HOME MONITORING SYSTEM

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ABSTRACT

This paper describes an IOT application “Alexa based Smart Home Monitoring System” which helps people to monitor and control their house, even if they are miles away from their home. This is achieved by developing a system by harnessing the power of IoT to provide flexible and scalable architecture for home automation. It will provide security, energy efficient and easy to use with capability of controlling and monitoring home appliances from anywhere in the world by using a simple command.

Keywords- Home Monitoring system, Alexa home automation, Smart home, IOT, Alexa.

INTRODUCTION

The home automation systems are used for controlling the indoor & outdoor lights, heat, ventilation, air conditioning in the house, to lock or open the doors & gates, to control electrical & electronic appliances and so on using various control systems with appropriate sensors. In the present world people spend more time in workplace rather than their homes which creates a need of home monitoring system where people can get to know the conditions of the house while they are at work. This can be achieved by developing a Smart Home Control and Monitoring System by harnessing the power of IOT at low-cost which provides flexible and scalable architecture for home automation. It will provide security, energy efficiency and ease of use with capability of controlling and monitoring home appliances from anywhere in the world. It would be even better if one can just ask "someone" about their home during work hours. This can be accomplished by making use of Amazon Alexa as an assistant which can give the user the need information about their home. The user can get to know the house condition at any place in the world as long as they have an internet connection and Amazon Alexa device or App support.

LITERATURE REVIEW

The paper “Home Automation Using Wi-Fi Interconnection” states, automation is a technique or a system of controlling a process by electronic devices with reducing human involvement to a minimum. This report presents a design of monitoring and controlling home automation system from an android application based on Arduino. This system uses Wi-Fi technology as a communication protocol to connect system components. The main objective of home automation is to help handicapped and old aged people who will enable themselves in controlling home appliances [1].

The case study “Amazon Alexa as a Case Study” states, there are three kinds of Alexa devices: Amazon Echo, Amazon Tap, and Echo Dot. To support voice commands, they connect to a cloud-based Amazon voice

service, Alexa. Amazon Echo is the first-generation Alexa device. It always stays in a listening mode, so it does not take any voice commands until a voice word “Alexa” wakes it up. Every time it wakes up, it serves only one voice command and then returns to the listening mode. The Alexa voice service supports the recognition of voice commands to Alexa devices. To control a smart device, a user can speak a voice command to an Alexa device after waking it up with voice “Alexa”. Once the cloud recognizes the sounds as a valid command, it is forwarded to a server, called smart home skill adapter, which is maintained by Amazon to enable the cooperation with third party service providers [2].

EASE OF USE

It can control the household appliances such as light, fan, AC, etc. without any manual work like for example we can turn on the light by giving a simple command to Alexa like “Alexa turn on lights” and it will turn on the lights.

It can get information about the status of the various devices that are installed by simply asking Alexa and she will tell us about the status of devices whether they are on or off.

It will notify the user about the weather conditions such as temperature and humidity about the user’s house. It will help to notify the user in the case of fire with the help of push box.

It can get the real time status of the interior of the house with the help of camera which will send the snapshot of the room where camera is installed with just one command.

It also provides a security mechanism through which the user will be notified if there’s an intruder in the house i.e. if someone tries to enter the house then they are sensed by the microcontroller circuit as they try to open the door or window and their every action is sent to the user via real time feed through camera.

It will also notify the user if there are any guests in the house with the help of security mechanism installed at the doorbell. When a person rings the doorbell, the mechanism sends a picture of the person who rings the bell to the user.

ARCHITECTURE

Block diagram

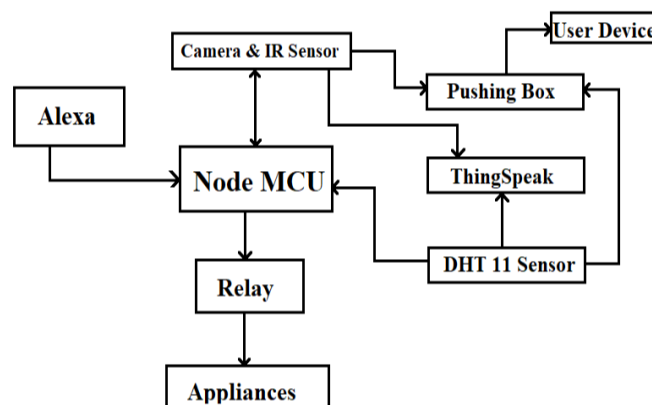
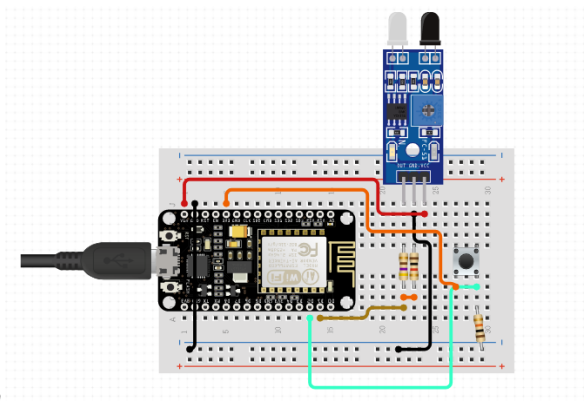


Figure 1: Block Diagram for overall architecture

Figure1 shows the overall structure of the system which contains several components like NodeMCU, Relay, Pushing Box, Alexa, ThingSpeak, etc. The NodeMCU is the main component of the system which controls the whole system wherein different components like DHT11 Sensor, Relay are interfaced. The ThingSpeak cloud is used to update and read the data from various IoT output based devices.



Circuit diagram

Figure 2 : Circuit diagram for Smart Door Bell

Figure2 shows the circuit diagram for Smart Door Bell module which contains a NodeMCU, IR sensor and camera interfaced with NodeMCU with the help of Linkit smart 7688 duo.

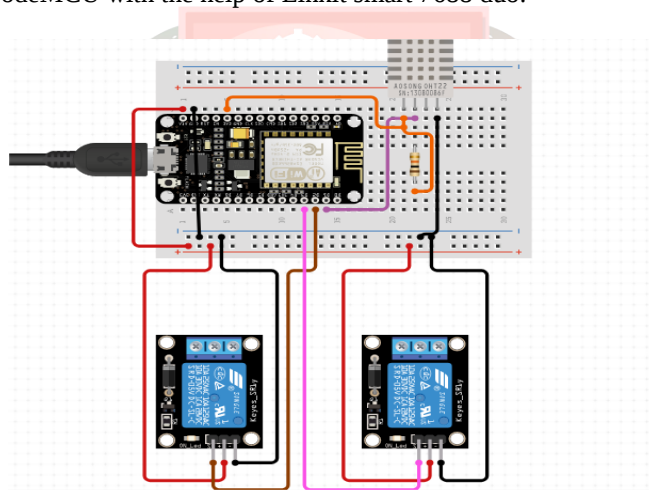


Figure 3: Circuit diagram for Monitoring system

Figure3 shows the circuit diagram for the home monitoring module which consists of NodeMCU, Relay and DHT11 sensor.

TECHNOLOGY USED

Table 1: Hardware components

Sr No	Hardware
1	NodeMCU
2	DHT11
3	Relay Module
4	IR Sensor
5	Push Button

Table1 enlists the Hardware components requirements of the system. It includes the sensors, Microcontroller and the other requirements of the system.

Table 2 : Software Components

Sr No	Software
1	Arduino IDE
2	Amazon Developer Console
3	ThingSpeak AI
4	AWS Lambda
5	Pushing Box

Table2 enlists the Software components that are used in the project. It includes the environment used for developing the system as well as the cloud platform used for the system.

IMPLEMENTATION

1: The components include DHT11 Sensor, IR Sensor, Relay and NodeMCU board, etc. are tested individually by running the code of them.

2: NodeMCU is used as the main component to work as the heart of the system and to control the whole system. The NodeMCU is tested for the WI-FI connection.

3: Two NodeMCU are used; one for the Smart Door Bell and other for the Home Monitoring System.

4: For Smart Door Bell an IR sensor and a camera are interfaced with the NodeMCU. Linkit smart 7688 duo is used with camera.

5: For Home Monitoring System the NodeMCU are interfaced with DHT11 and relay.

6: ThingSpeak cloud is used as the middle object between the alexa developer console and the System. The channels in ThingSpeak are used to store the device control information and route it to NodeMCU/Alexa. It stores values like temperature, humidity, etc. in the channels. It's like storage location for the information.

7: This system uses 8 channels on ThingSpeak cloud which can further be extended as per the components.

8: Http request for updating a channel is:

https://api.thingspeak.com/update?api_key=<writekey>&field1=<value>

<write key> is replaced by corresponding write keys of the channel and value can be (0/1 in case of device control or temp/humidity values)

9: Http request for reading value from a channel is:

<https://api.thingspeak.com/channels/<channel id>/field/field1/last.html>

<channel id> is replaced by the particular channel id of the channel from which data is to be read.

10: Webcam is used to capture required photo and Linkit smart 7688 duo is used to stream it locally and hosting the same to public, so that the public hosted streaming link can be used to access the required feed to user.

11: Pushingbox is used to send notification about different alerts in the project to the user.

12: The API for executing a pushing box scenario is: <http://api.pushingbox.com/pushingbox?devid=<device id>>

13: To enable the alexa module of this model, AWS lambda endpoint is connected to alexa developer console where in AWS lambda provides IDE to write the logic of alexa which was done using Python. Once the Alexa skill is created it is configured using the Amazon Developer Console.

14: All the data is handled by ThingSpeak cloud which acts as the middle object between alexa developer console and all sensors interfaced with NodeMCU.

15: Use amazon echo or echosim.io to test the skill. Alexa Developer console can also be used to test the built skill.

16: To activate the skill an invocation name is used like for this system, it is "my home". Invocation name is must as the Alexa API only detects this name through voice to enact the given logic.

CONCLUSION

This paper proposes a cost efficient smart home monitoring system comprising of smart home appliances and home security system through remote control and access which include smart door bell, temperature and humidity sensing, voiced enabled smart home appliances. The implementation of this system upgrades the existing home appliances rather than buying the new and expensive appliances.

FUTURE SCOPE

An individual AI system can be developed in AWS lambda to enable Alexa logic through Alexa developer console. This AI can analyze the user routine self train itself to work as per the day to day routine of the user. Based on the user routine, the system will take the decisions such as tuning on and off the appliances, smart temperature controlling, etc.

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