IOT Home Automation Using Alexa

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Abstract: The use of Internet of Things (IOT) has been increasing day by day, though in the field of home automation this idea is not much implemented yet. The aim of this research paper is the use of IOT using Alexa and Raspberry pi for making human life convenient. The entire working of the house can be controlled through human voice using Alexa. The people just need to give the command through voice to Alexa and the required activity will be performed. House operation such as switching on/off the tube lights, fans, geyser, Television, running washing Machine, microwave oven, Dishwasher, shutting down the house window. The entire activity can be handled by using raspberry pi board and some sensors connected to Alexa through a network, various devices will be connected to the raspberry pi which will be programmed to perform the operation on voice recognition connected to Alexa. All the programs will be written on a SD card which will be inserted into Raspberry pi board.IP address of Alexa will be used to provide network connection between Raspberry pi and various devices.

Keywords:-IOT, Raspberry pi, Alexa, Home Automation, voice recognition, SD card.

I. INTRODUCTION

Alexa is actually an Amazon Dot product. The existing iot based home automation system is implemented using a relay which is connected to a Raspberry pi board. Relay is basically a switch which used to turn on/off the device. The example is given as switching on/off the Tube light or a bulb, like raspberry pi board is connected to the relay and the relay is connected to the bulb. At the first we have to give the Alexa a command to connect to raspberry pi make sure that the raspberry pi is on and required command on SD card is inserted on it "Discover Device". The raspberry pi will respond to the Alexa and raspberry pi will get connected to the Alexa than when we will give the command like "Hey Alexa switch on the bulb" the Alexa will execute the command on raspberry pi which is connected to the relay ,the relay will switch on the bulb.

1. Home Automation:-Basically home automation means how your home appliances become automated i.e. how they sense and take action. Making your home appliance automated helps in many things like saving electricity. In today's world most of houses are using convention method of switching on/off appliance, but making these home appliance automated can make human life more easy and convenient. Home automation with Internet of Things (IOT) provides better flexibility in managing and controlling household objects. Home automaton is actually building automation for home, called a smart home or smart house.

2. Internet of Things (IOT):-Internet of Things is the network of devices, in this case various appliance connected to Alexa and the Alexa is connected to the Internet. IOT basically requires devices to be connected to internet 24/7.Iot is the new revolution of the internet and expansion of internet service. Alexa will be always connected to Alexa cloud service and also Alexa will be connected to various appliance so that when the command is given to Alexa it will perform the required action with corresponding home appliance

3. Smart Home:-In today's world more and more house are build but most of the house are built in convention way. But if these house are built in a smart way keeping in mind the concept of smart house than the demand of such smart home will increase. Smart home is actually a term used to characterize home appliance that are capable of communicating or accessing remotely through speech. A home is said to be smart home when your home appliance sense and take action accordingly based of various voice command and environment.

Figure 1: Smart Home [7]

II. LITERATURE REVIEW

The main aim of this paper is to help people to make their daily life as easy as possible and also how to prevent wastage of electricity i.e. how the sensor will detect the device and will automatically switch on/off the television through the voice command of human. This system provide secure and easy access to the home appliance through voice .For example if someone is sleeping at night and the temperature drops down due to change in nature, So to adjust the room temperature someone doesn't have to break his sleep getup from the bed and change the room temperature, he/she just have to command ton Alexa and the Alexa will change the room temperature according to the command.

Following Diagram shows how our smart home automation system works

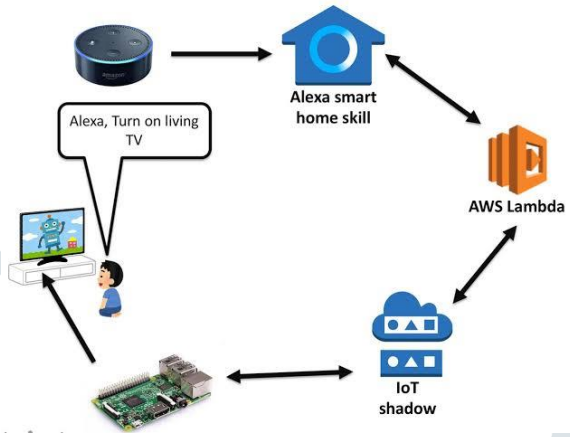

Figure 2: Working of smart home automation system [1]

Various wireless technology used to make a smart home are as follows:

1. Home automation using Bluetooth:-

Bluetooth is a wireless technology for transferring data between two devices that are in close proximity; it is most suitable for short timed communications [5] .In this idea a mobile Bluetooth device is used to communicate to the home appliance, as in this case Alexa is used for communication. An application will be used in a mobile to pass commands through Bluetooth to a microchip which will further execute the action.[5].The microcontroller was set in a polling status and constantly checks any input command every 500 millisecond from the Android phone application.

2. Home automation using ZigBee:-

Smart can also be build using ZigBee network, it is a wireless protocol that can be used to communicate with the home appliances. The ZigBee protocol uses the IEEE 802.15.4 specification as its Medium Access Layer (MAC) and Physical Layer (PHY) [6]. ZigBee provides secure and wireless communication. Compared to other wireless protocols, the ZigBee wireless protocol offers low complexity, reduced resource requirements and most importantly, a standard set of specifications [6].

The following are the Technology hardware that will be used to implement or configure the system design

1. **Alexa:**-Alexa is basically an amazon dot product which works on voice command, Alexa can also be coded with AWS lambda + JAVASCRIPT an AlwaysBCoding Screencast. Each Amazon dot has a web UI (User Interface) at "Alexa.amazon.com" where different skills can be downloaded into the Alexa, which can also be modified to implement customized skills into one's Alexa. How amazon actually works is Amazon host its own cloud service called amazon Alexa service. One can register his/her required skill using amazon developer portal where metadata of the skills will be saved for example name. Logos, and what type of queries you want to respond to. This metadata will be deployed to the amazon Alexa service, Note that the custom code is not deployed in Alexa service but it is deployed separately. This will ease upgrading to the Alexa without any hardware changes. For example when user speaks to the Alexa device the audio streams to the Amazon Alexa service it lookups the skill finds the reference to the skill implementation and calls out to it, now the skill will return a text respond to the Alexa service and the Alexa service will deal with response back to the Alexa device. So it's basically a cloud service.

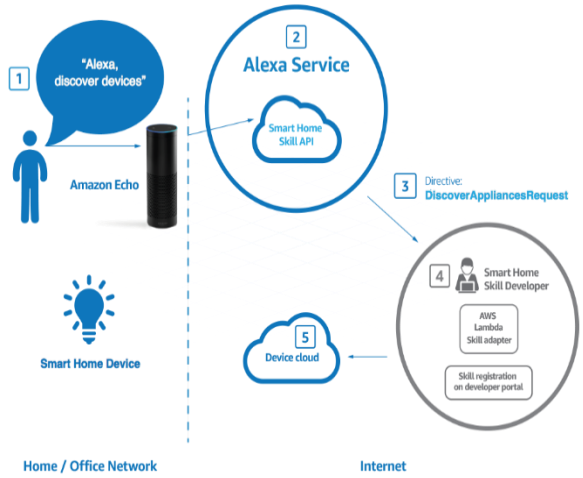

Figure 3: Working of Alexa [2]

R**aspberry pi board**:-Raspberry pi is a small credit card size single board computer intended to help people learn more about programming, how the computer works etc. The CPU is basically a system on chip .It contains ports such as USB 2.0 x 2 ,HDMI,RCA video out, stereo audio out , Ethernet,GPIO header, Micro USB (power supply) 5V , SD/SDHC slot. It also contains processor that are used in most of the embedded devices with a Broadcom GPU which is actually a fairly powerful graphic processor which is capable of displaying 4x resolution 1080p HD video, the RAM of the latest Raspberry pi is 2 GB which is shared by the CPU and GPU .The Raspberry pi is the cheapest computer that can be used for programming. The micro USB port is actually used for powering the Raspberry pi board. It also helps people that are new to computer hardware to get into it without the cost and risk associated with more expensive standard hardware. Another good thing about Raspberry pi is GPU is pretty powerful it had 1080p video which makes it really attractive to lot of people as media center PC as well.

Figure 4: Raspberry Pi [3]

Relay:- A relay is a electromagnetic switch. It is used in application to turn on/off a circuit by a low power signal, or where several circuit must be controlled by one signal. There are 2 circuit control circuit and load circuit. In our case it is actually used to turn an appliance on/off. The relay will be connected to a raspberry pi through a wire. The raspberry pi will be programmed to send signal to a relay and the relay will do his job.

Figure 5: Relay [4]

III. SYSTEM DESIGN

It can be seen that raspberry pi and a relay can be used to switch on/off the appliances through Alexa, but with the help of a infrared or other sensors attached to the raspberry pi anybody can also control the TV channels or Temperature of the AC . The Idea is that a raspberry pi can be used as a remote to change the channel or to set the temperature. A sensor will be attached to the raspberry pi and the board will be programmed in such a way that through the voice command to Alexa the channel or the temperature will be changed. The hardware setup is such that the sensor will be attached to the raspberry pi board and will be kept near the TV or the AC such that the sensor could reach the respective appliances and the raspberry pi board will be connected to the Alexa to interact with each other through network. The working is such that if anybody gives a voice command to Alexa to switch on the TV the Alexa will switch on the TV through relay, after switching on the TV if anybody wants to change the channel he/she doesn't need to search for the TV remote he/she just need to give a voice command that 'Alexa please change the channel to number 53' or any other channel as per the requirements and the TV will change to the respective channel. This idea makes human life easier such that he/she doesn't need to go in search of the remote to change the channel or change the AC temperature. It would be an add on to the IOT home automation system using Alexa. An infrared sensor is a sensor that are mostly used in our TV and AC remote. An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings to configure this we would require to add skills to Alexa so that Alexa could respond to a particular voice command. In most of the house it is not necessary AC is centralized, but there will be cases where temperature of an AC will be controlled by remote in such situation this system design can be implemented where complete process will automated with the help of infrared sensor connected to raspberry pi. The main Advantage of this system is that you do not have to code Alexa, he/she only need to add skills in Alexa developer official website. The following diagram shows the perfect flow of system design.

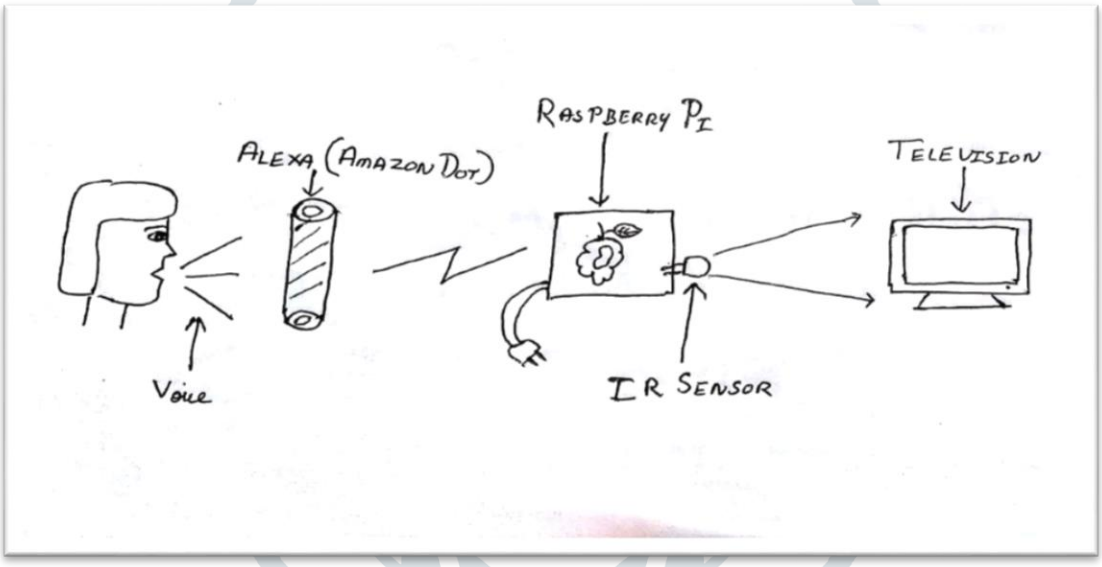

Figure 5. Figure System Design Flow

IV. Conclusion

There are number of factors to be concentrated in home automation system. The main point of Alexa to notice is its Configuration in different languages as in a family it is not necessary that all of them will know English language to interact with the Alexa. There may be members in the family who knows only Hindi, Marathi or any other of their Mother tongue. For such people it becomes difficult to interact with the Alexa. There may be an updation to Alexa to recognize and interact with the user with a particular number of languages. But this drawbacks can be handled with future updation of Alexa. The main aim of this module is to make life of the people more convenient and easy such that all home appliances can be controlled only through voice.

V. REFERENCES

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