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Voice Enabled Home Automation Using Amazon Echo

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Abstract— In recent years, the field of Internet of Things (IoT) has seen significant investments made by the research community and the industry. Specifically, the Smart Home space has been a prime focus with the introduction of devices such as Amazon Echo, Google Home, Samsung Smart Things among others. The growth of an industry results in innovative, economic, and advanced solutions. In this paper, we focus on making non-smart homes smart and how to build a robust, cost-effective system that can be widely used. We power our system using Amazon Echo, Amazon's cloud services, its speech services. A Raspberry Pi 3 is used as the hardware component for providing smart features for non-smart homes. We describe the different components of our product and we show that our system works effectively to switch on and switch off our appliances.

Keywords— **Amazon Echo, Alexa , automation, non-smart, Internet of Things (IoT) , raspberry pi, relay;**

I. INTRODUCTION

Amazon Echo is a voice-enabled wireless speaker developed by amazon. The device connects to the voice-controlled intelligent personal assistant service Alexa, which responds to the name "Alexa". The device is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic and other real time information. It can also control several smart devices using itself as a home automation hub. Home automation is a very expensive luxury that a lot of people in India and other countries cannot afford. The objective of our product is to provide a cheap and inexpensive way to control non-smart devices using the power of voice. Amazon Echo is a smart speaker that has been developed by the Amazon company that can be used to play music, listen to the news and control a lot of smart devices. We use the Amazon echo to develop a skill (app) that will communicate with our raspberry pi to control our devices.

We use the Publisher-Subscriber design pattern to communicate between the Amazon Echo and the Raspberry Pi. The Amazon echo runs a Nodejs program and the Raspberry pi runs a Python program to communicate with each other and control the devices.

Whenever we want to turn on or turn off our appliances, we ask the Amazon Echo to turn the appliance on or off.

II.RELATED WORK

In this section, we will present the various systems available in the market and also the recent advancements in the research working in this area. Most of the state-of-the-art systems today can be integrated with IFTTT recipes[1]. To give some context to the reader, IFTTT is the acronym of If This, Then That. It is an initiative in the Internet of Things space where several services can be integrated to provide a robust solution. A. Existing Products The smart home space has seen a lot of industrial investment in the recent years. The following are some of the successful smart home products available today:

Lifx Color 1000: Lifx's second-gen smart bulbs are brighter and more efficient. It has an easy-to-use app, the integrations with IFTTT and Alexa, and the fact that Lifx bulbs don't need a hub is also an advantage.

Philips Hue Wireless Dimming Kit: The Philips Hue Wireless Dimming Kit is a simple, and affordable way to get started with smart lighting. It allows you to control the lights of your home using voice and the internet. It also allows you to control the intensity of the light.

III.TECHNOLOGY STACK

In this project, we have integrated many technical components and established a seamless functionality among them. Our technological stack is delineated as follows:

• Physical Layer: This layer comprises of the devices with which the user interaction takes place:

1) Raspberry Pi 3 Model B [11] - enabled with WiFi

2) Amazon Echo - Smart Personal Assistant device that is present in the user's home. It is triggered using voice commands. Based on the request made, a response will be returned to the user.

• Application Layer: This layer consists of the following components:

1) Alexa Skills Kit (ASK) [12]-It is a minimalist Software Development Kit (SDK) for developing "skills" for the Amazon Echo

2) Amazon Web Services(AWS)Lambda [14] - Functionality that runs programs when invoked rather than hosting programs on a server

• Programming Layer: The source codes of all our programs are written in Python 2.7 and Node.js 4.3.

The technological stack is elaborated in the following sections.

A. Devices

The input is given through Amazon's Echo. Echos natural lifelike voices result from speech-unit selection technology. It is able to perceive what the users are saying using NLP algorithms built into the Echos text-to-speech (TTS) engine. The Echo hardware complement includes a Texas Instruments DM3725 ARM Cortex-A8 processor, 256MB of LPDDR1 RAM and 4GB of storage space. It connects to the internet through WiFi 802.11a/b/g/n. The Raspberry Pi serves as another I/O device. For this project, we have used a Raspberry Pi 3 Model B, which uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache.

B. Infrastructure

Alexa voice services powers Amazon Echo by converting speech into text and giving intelligent replies to user requests. Alexa is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic and other real time information. Alexa can also control several smart devices using itself as a home automation hub. Amazon has released the 3 AVS API that allows Alexa to integrate with devices and applications. AWS Lambda is an event-driven, serverless computing platform provided by Amazon. It is a compute service that runs code in response to events and automatically manages the compute resources required by that code. The purpose of Lambda, as compared to AWS Elastic Compute Cloud (AWS EC2)[15], is to simplify building smaller, on-demand applications that are responsive to events and new information. AWS targets starting a Lambda instance within milliseconds of an event. Node.js, Python and Java are all officially supported languages. Moreover, choosing AWS Lambda is much more cost-efficient option in this scenario.

C. Codebase

Node.js is used to seamlessly integrate AVS with RaspberryPi. Node.js package system is called npm which comes with a lot of libraries making it a very efficient and flexible choice for programming. In addition to Node.js, we have also used Python to build the Computer Vision module. Python comes with inbuilt libraries that manipulate images according to the users needs. There are also many implementation of face detection algorithms in python which utilises both complex algorithms like HOG to simple ones like Haar Cascade. For coding this, we have used Python 2.7 which has been a stable release since 2010.

IV.SYSTEM DESIGN

A. System overview

Our system as shown in Figure 1 - User, Raspberry Pi and Alexa Voice Service. In this section, we will explain briefly about each component's role to make the system function.

B. Alexa Voice Service (AVS)

Alexa Voice Service is the intelligent voice control service that powers the device, Amazon Echo. Alexa uses natural language processing techniques trained by the developers and the user community of Amazon to process user requests and cater to their individual needs. The voice service can be triggered using the keyword ”Alexa”. As mentioned earlier, the skill/application that we have developed can be triggered using the voice command, ”Alexa, Turn the lights on”. Once Alexa is triggered, it runs a script on the cloud, which in-turn runs a subroutine on the Raspberry Pi to Switch on the light. Once computation is done in the Raspberry Pi, it sends the confirmation back to Alexa. Only the essential information is sent to Alexa which passes it on back to the user.

C. Raspberry Pi

Our application relies on Raspberry Pi as it satisfies the hardware requirements and also does all the computation. The Raspberry Pi has a WiFi and it will use the relay to switch on and switch off the appliances.

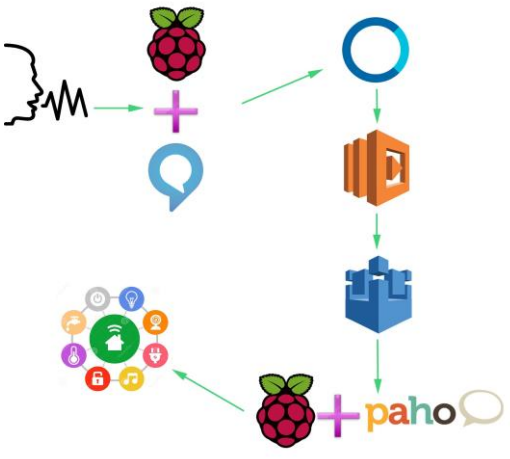

Fig. 4. System Design

VI.TECHNOLOGIES USED

Platform and Language Used :

1) IoT platform for Pub Sub Services
2) Node.js
3) Linux based Raspbian OS (Jessey Debian)

VII.APPLICATIONS

As discussed in the earlier section even though there a abundance of smart appliances available in the market this is not feasible for the Indian market since it is very expensive. Our product makes it viable for the market since it is an easy and affordable and can be used with any appliance.

CONCLUSION

The smart home space has a lot of interesting challenges to be solved. One very important problem that we tried to address in this paper is that of non-smart. We made use of one of the hottest smart devices available today in the market, Amazon Echo and coupled it with the Raspberry Pi. The module we used for performing home automation tasks worked well. Further, on testing the application on Amazon Echo in real-time, we obtained promising results. We believe that this a step towards a cost-effective smart homes. We aim to build similar applications in the future for Google Home and other personal assistants that can revolve around using simple voice commands to provide a cost effective solution for non-smart homes.

REFERENCES

[1] https://ifttt.com/
[2] https://www.smartthings.com/
[3] https://my-digitallife.att.com/learn/explore-home-automation
[4] https://madeby.google.com/home/
[5] https://www.raspberrypi.org/products/raspberry-pi-3-model-b/
[6] https://developer.amazon.com/alexa-skills-kit
[7] https://firebase.google.com/
[8] https://aws.amazon.com/lambda/
[9] https://aws.amazon.com/ec2/