

Project Report for E-90 Cloud Services Infrastructure and Computing(AWS).

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Project statement

Through this project I wanted to get some hands on experience with building alexa skills and integrating them different devices (in this case raspberry pi and pi camera)

In this project I have built two skills

- Alexa Skill to turn the lights on and off.
- Alexa Skill to take a picture.

Hardware Needed

- Amazon Echo device
- Raspberry pi 3b+
- Pi Camera 5mp
- 32 GB micro sd card
- Monitor for display
- Bread board
- LED emitter
- 330 ohm resister
- Jumper cables (male to female)

Software Installations

- Amazon developer account to setup alexa skill.
- Raspbian OS -- OS for raspberry pi
- Flask-ask -- flask api to interact with alexa skills
- Ngrok -- making your local flask apis accessing thru a secured channel (giving a public url so alexa can call them)

Git Location

<https://github.com/vmishra2018/hes-e90>

Setup

Pi Setup

Pi Setup is very standard, I followed the below steps

- Download raspbian from [official site](<https://www.raspberrypi.org/downloads/raspbian/>) and unzip into your micro sd card and update the packages.

```
sudo apt-get update && sudo apt-get upgrade -y
```

- Install flask-ask on raspberry pi

```
sudo apt-get install flask-ask
```

- install ngrok on raspberry pi from <https://ngrok.com/>

Pi Camera Setup

I used a youtube videos to basically setup the camera with raspberry pi and test if the camera was working or not.

Once the camera is attached to the pi, then we need to

- enable camera from raspy-config

```
sudo rasp-config
```

 this will show the options

- test camera with following commands

```
raspistill -o image-name
```

 this will capture the image.

Breadboard setup

Alexa skill setup

I have created two skills,

1. one is to send a gpio signal to turn the light on and off
2. Another one to take a picture using the camera module.

Skill Setup is very standard similar to what we have learnt in the class.

1. **Invocation name** raspberry pi
2. **Intents** Two intents for two skills
 1. gpiocontrol intent
 2. camera intent

Below is the complete json of the skill.

```

{
  "interactionModel": {
    "languageModel": {
      "invocationName": "raspberry pi",
      "intents": [
        {
          "name": "AMAZON.CancelIntent",
          "samples": []
        },
        {
          "name": "AMAZON.HelpIntent",
          "samples": []
        },
        {
          "name": "AMAZON.StopIntent",
          "samples": []
        },
        {
          "name": "AMAZON.NavigateHomeIntent",
          "samples": []
        },
        {
          "name": "AMAZON.FallbackIntent",
          "samples": []
        },
        {
          "name": "gpio",
          "slots": [
            {
              "name": "status",
              "type": "GPIO_CONTROL"
            },
            {
              "name": "pin",
              "type": "AMAZON.NUMBER"
            }
          ],
          "samples": [
            "turn gpio lights {status}",
            "turn {status} the gpio lights"
          ]
        },
        {
          "name": "camera",
          "slots": [],
          "samples": [
            "take a picture",
            "take my picture"
          ]
        }
      ],
      "types": [

```

```

{
  "name": "GPIO_CONTROL",
  "values": [
    {
      "name": {
        "value": "off"
      }
    },
    {
      "name": {
        "value": "on"
      }
    }
  ]
}

```

Testing.

I tried testing the skills using my echo device as well as through the test interface from developer console on amazon site

The screenshot displays the Alexa Developer Console interface. At the top, there are navigation tabs: Your Skills, RPI Control, Build, Code, Test, Distribution, Certification, and Analytics. The 'Test' tab is selected. Below the navigation bar, there are settings for skill testing, including 'Skill I/O' and 'Device Display' checkboxes. The main area is divided into three sections: 'Alexa Simulator', 'Manual JSON', and 'Voice & Tone'. The 'Alexa Simulator' section shows a conversation history with the user asking 'ask raspberry pi to take a picture' and the skill responding 'Picture taken. Thank you.' The 'Manual JSON' section shows the JSON input and output for the skill invocation. The 'Voice & Tone' section is currently empty.

JSON Input 1

```

1- {
2-   "version": "1.0",
3-   "session": {
4-     "new": true,
5-     "sessionId": "amzn1.echo-api.sess
6-     "application": {
7-       "applicationId": "amzn1.ask.s
8-     },
9-     "user": {
10-      "userId": "amzn1.ask.account.
11-    },
12-    "context": {
13-      "System": {
14-        "application": {
15-          "applicationId": "amzn1.a
16-        },
17-        "user": {
18-          "userId": "amzn1.ask.acco
19-        }

```

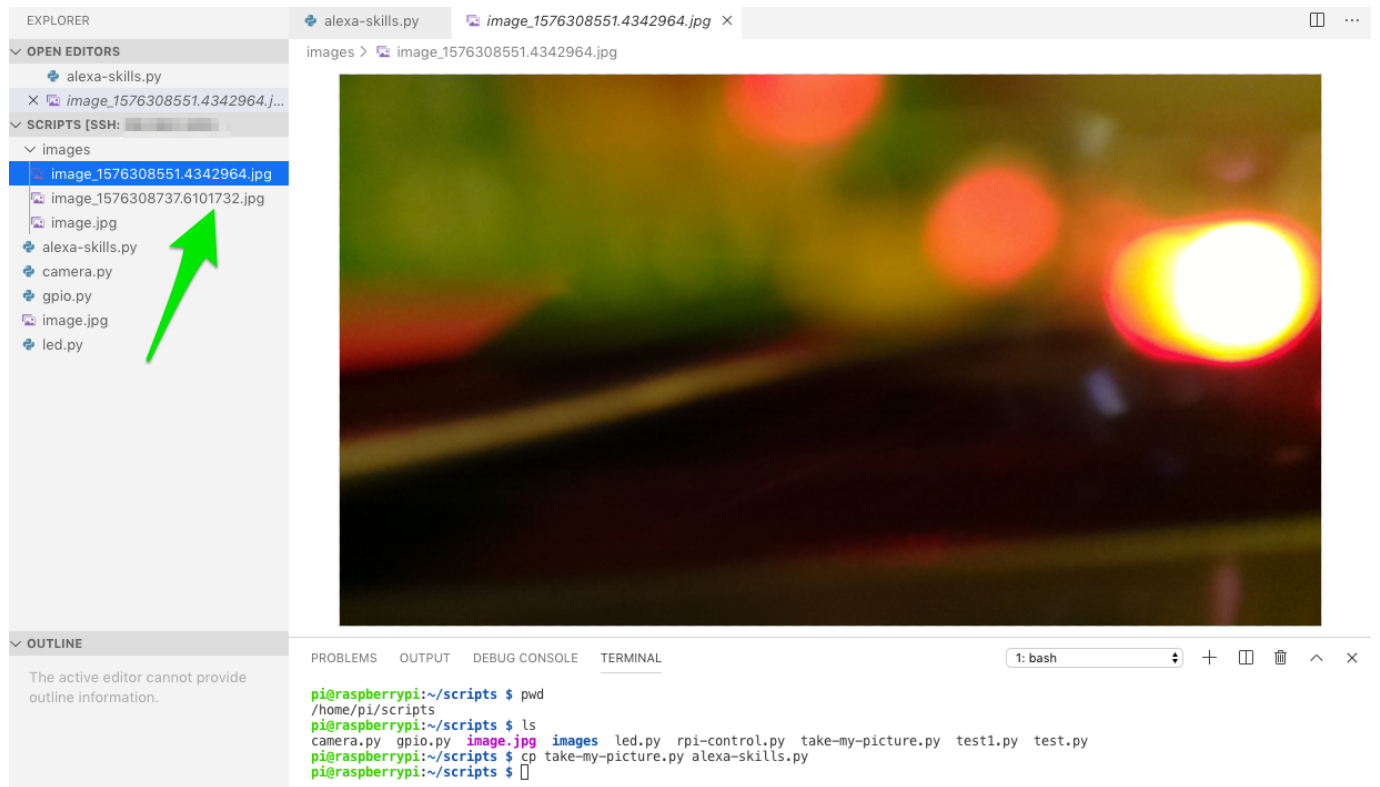
JSON Output 1

```

1- {
2-   "body": {
3-     "version": "1.0",
4-     "response": {
5-       "outputSpeech": {
6-         "type": "PlainText",
7-         "text": "Picture taken. Tha
8-       },
9-       "shouldEndSession": true,
10-      "type": "_DEFAULT_RESPONSE"
11-    },
12-    "sessionAttributes": {}
13-  }
14- }

```

You can see the images being stored in the directory as well.



LED Test

The screenshot shows the Alexa Developer Console interface. The top navigation bar includes tabs for `Your Skills`, `RPI Control`, `Build`, `Code`, `Test` (selected), `Distribution`, `Certification`, and `Analytics`. Below the navigation bar, there are settings for skill testing (enabled in `Development`), and checkboxes for `Skill I/O` (checked), `Device Display` (checked), and `Device Log` (unchecked).

The main content area is divided into two sections. On the left, the `Alexa Simulator` tab is active, showing a conversation history with the following messages:

- ask raspberry pi to turn on gpio lights
- Lights are already on
- ask raspberry pi to turn off gpio lights
- Turning lights off
- ask raspberry pi to turn on gpio lights
- Turning lights on

On the right, the `Skill Invocations` tab is active, showing a single invocation with the following JSON input and output:

```

JSON Input 1
{
  "version": "1.0",
  "session": {
    "new": true,
    "sessionId": "amzn1.echo-api.sess",
    "application": {
      "applicationId": "amzn1.ask.s"
    },
    "user": {
      "userId": "amzn1.ask.account."
    }
  },
  "context": {
    "System": {
      "application": {
        "applicationId": "amzn1.a"
      },
      "user": {
        "userId": "amzn1.ask.acco"
      }
    }
  }
}

JSON Output 1
{
  "body": {
    "version": "1.0",
    "response": {
      "outputSpeech": {
        "type": "PlainText",
        "text": "Turning lights on"
      },
      "shouldEndSession": true,
      "type": "_DEFAULT_RESPONSE"
    }
  },
  "sessionAttributes": {}
}

```

Conclusion

I know I am just scratching the surface here. but i have learnt a lot about alexa skills and how we can integrate them with different devices. I am hoping to build on this and make a voice remote and a magic mirror.

References

<https://www.hackster.io/user00317224/control-raspberry-pi-gpio-using-amazon-echo-ngrok-de41d1#toc-step-1--setup-0>

<https://www.youtube.com/watch?v=eObSqbe9aqU>