**SMART CAMERA APPLICATION WITH VOICE CHAT CAPABILITY USING RASPBERRY PI AND AWS**

**Introduction:**

In this project, we designed a smart camera which detects the human faces and objects along with voice chat capability. This project includes hardware components Raspberry pi Model 3B, Pi Camera, Speaker, and Mic.

**Software Installations to the Raspberry PI:**

* The raspberry pi is configured with the operating system version stretch.
* Open CV modules are installed and configured to integrate the PI camera with the raspberry pi.
* Installed python3 and pip3 on Raspberry pi.
* Installed Sox on Raspberry Pi for integrating mic and speaker to the raspberry pi.

**Architecture:**

Diagram

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Created an AWS account to use the web services for storing the data to the cloud. The AWS services used for the project:

* S3 storage buckets
* Dynamo DB
* AWS Rekognition

**S3 Storage:**

In our application we created three buckets,

* “slack-images-s3bucket” to store images captured by raspberry pi.
* “voice-recordings-s3bucket” to store visitors voice recordings by pi.
* “face-images-s3bucket” to store indexed faces by AWS Rekognition.

Graphical user interface, application

Description automatically generated

**Dynamo DB:**

We created a dynamo db tables to store all the slack images and voice recordings.

* “PI Notifications”
* “PI Messages”

The Pi Notification tables stores all the facial images that were captured by the pi camera which got registered in the slack.

Graphical user interface, application, table

Description automatically generated

The dynamo DB table Pi Messages will store the voice recordings of humans when they speak in front of the camera which were recorded through mic

Graphical user interface, application, table

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**AWS Rekognition:**

The Amazon Rekognition service is used for identify the objects, people in the images and as well as to detect any inappropriate things in the video surveillance. The below code snippet represents the rekog services.

Graphical user interface, text, application

Description automatically generated

**Created slack webhook:**

Here we are using Slack to get notified when someone appears in front of the camera. The Pi camera will detect the face and send the image to the slack channel.

**Set up for incoming webhook:**

**Step 1:** Registered to the slack account using <https://api.slack.com/apps?new_app=1> .

**Step 2:** Once you login to the slack, From the Features page, toggle Activate Incoming Webhooks on.

**Step 3:** Click Add New Webhook to Workspace.

**Step 4:** Pick a channel that the app will post to, then click Authorize.

**Step 5:** Now under the Webhook URLs in Workspace section, we can find an URL <https://hooks.slack.com/services/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>

**Step 6:** Now the slack is integrated with the Raspberry PI by configuring this URL in config.json

When the PI camera captures the images, it will be sent to slack. In slack the owner of the house find an URL “SMART CAMERA” which redirects him to a web application where he can register the details of that person. These details will be useful when the person re appears in front of the camera. When the person re-appears he will be greeted with his name through the speaker connected to the application.

**Snapshots captured during the demo:**

Graphical user interface, website

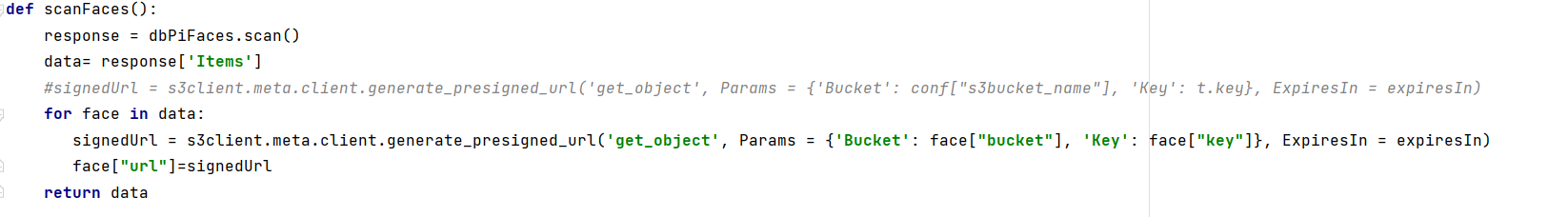
Description automatically generated

The AWS services and slack are integrated to the application in config.json file. Below is the code snippet of config.json.

Text

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**Code snippet for storing scanned images into the bucket:**



**Code snippet for deleting face Id’s from AWS:**

**Graphical user interface, text, application

Description automatically generated**

**Code Snippet for searching the data over AWS:**

**Text, application

Description automatically generated**

**Conclusion:**

Finally, we successfully implemented security camera with voice capability using Raspberry Pi and AWS cloud services for accessing across the globe. Future scope will be implementing different objects detection for monitoring pets at home and creating a healthy and safe environment.

**References:**

* <https://thepihut.com/blogs/raspberry-pi-tutorials/16021420-how-to-install-use-the-raspberry-pi-camera>
* <https://www.pyimagesearch.com/2017/09/04/raspbian-stretch-install-opencv-3-python-on-your-raspberry-pi/>
* <https://get.slack.help/hc/en-us/articles/115005265063-Incoming-WebHooks-for-Slack>
* <https://docs.aws.amazon.com/AmazonS3/latest/userguide/create-bucket-overview.html>