FACIAL RECOGNITION SMART LOCK

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Abstract— Security and accessibility is the main concern in today's world. We always try to keep our house secure and at the same time we want to make our home devices easy accessible even from the remote location. Think, you have a guest waiting at your front door and you are outside of the home. But you want to allow him inside your house. Or you are doing a very important task in your desk and want to know who came at the front door without leaving your seat.

Keywords— AWS, Arduino, Python, AWS Rekognition, AWS S3 bucket, AWS Lambda.

I. INTRODUCTION

The project works in 3 parts first the face of the person is detected and stored in a database and then it is trained for the recognised faces in second part the photo of the person is sent to aws s3 bucket and from there it is sent to users email to notify them that someone is present at the door. The whole process can be divided in three major steps – (i) The first step is to create a good database of faces of the authorised person. (ii) The next step is to supply images from the database and use them to train the system. (iii) The last step is to test the face recognizer to recognize faces it was trained for and image is sent to the cloud and then the servo motor is started to unlock the door.

II. COMPONENTS USED

A. Physical components

First, arduino, Servo motor, Buzzer, Jumper wires, Web camera, and lastly Connector (USB to arduino).

B. Software required

We have used two software in our project and they are, Arduino and Python (3.5 & above).

C. AWS seervices required

We have used multiple AWS services to enhance our project. The services involved are AWS Polly, AWS Rekognition, AWS Lambda, AWS Cloud Watch, AWS SNS, and AWS S3.

D. Python modules specification

Modules being implied are Open CV, Os, Numpy and image.

III. IMPLEMENTATION

A. Modules required to be imported to the program

- cv2 – This is the OpenCV module and contains the functions for face detection and recognition.
- os – This module will be used to manoeuvre with image and directory names. First, we will use this module to extract the image names in the database directory and then from these names we will extract the individual number, which will be used as a label for the face in that image.
- Image – Since, the dataset images are in gif format and as of now, Open CV does not support gif format, we will use Image module from PIL to read the image in grayscale format.
- numpy – Our images will be stored in numpy arrays.

B. AWS Services

- AWS s3 - Amazon S3 runs on the world's largest global cloud infrastructure, and is designed from the ground up to deliver 99.999999999% of durability. Data in Amazon S3 Standard, S3 Standard-IA, and Amazon Glacier storage classes is automatically distributed across a minimum of three physical Availability Zones (AZs) that are typically miles apart within an AWS Region.
- AWS Lambda - is an event-driven, serverless computing platform provided by Amazon as a part of the Amazon Web Services. It is a computing service that runs code in response to events and automatically manages the computing resources required by that code. It was introduced in November 2014.
- Amazon Simple Notification Service (SNS) is a highly available, durable, secure, fully managed pub/sub messaging service that enables you to decouple microservices, distributed systems, and serverless applications. Amazon SNS provides topics for high-throughput, push-based, many-to-many

messaging. Using Amazon SNS topics, your publisher systems can fan out messages to many subscriber endpoints for parallel processing.

- Amazon CloudWatch is a monitoring and management service built for developers, system operators, site reliability engineers (SRE), and IT managers. CloudWatch provides you with data and actionable insights to monitor your applications, understand and respond to system-wide performance changes, optimize resource utilization, and get a unified view of operational health. CloudWatch collects monitoring and operational data in the form of logs, metrics and events, providing you with a unified view of AWS resources, applications and services that run on AWS and on-premises servers.

- Amazon Rekognition makes it easy to add image and video analysis to your applications. You just provide an image or video to the Rekognition API, and the service can identify the objects, people, text, scenes, and activities, as well as detect any inappropriate content. Amazon Rekognition also provides highly accurate facial analysis and facial recognition on images and video that you provide. You can detect, analyse, and compare faces for a wide variety of user verification, people counting, and public safety use cases.

- Amazon Polly is a service that turns text into lifelike speech, allowing you to create applications that talk, and build entirely new categories of speech-enabled products. Amazon Polly is a Text-to-Speech service that uses advanced deep learning technologies to synthesize speech that sounds like a human voice.

IV. WORK FLOW

(i) Writing the python code to create a good database of faces of the authorised person by taking 21 images for database creation. (ii) The next step is to supply images from the database and use them to train the system. (iii) Next, we need to test the face recognizer to recognize faces it was trained for and image. (iv)Prepare the Arduino code to start the servo motor and buzzer once the recognised face is detected. (v) Serial communication will take place between the python code once the person is recognised to the Arduino. (vi) To send the image of unrecognised person a folder named fault is created in which images of all the unrecognised person is captured.(vii) Setting up of AWS Services (AWS S3 Bucket, AWS Cloud watch, AWS Lambda, AWS SNS, AWS Rekognition). (viii) Writing program for AWS lamda (for sending images from images that has been uploaded to S3, sending email to the owner,

receiving message). (ix) Read the image uploaded to the S3 Bucket. (x) Sends a face search request for the image to AWS Rekognition. (xi) It sends an email with the photo to the house owner. (xii) It sends a greeting text to AWS Polly and then play the audio greeting for the guest returned by the Polly. (xiii) Connecting all the hardware. (xiv) Servo motor rotates (for 15 seconds then gets back to original position) once a recognised face is detected along with the buzzing of buzzer. (xv) Testing & Debugging.

V. RESULTS

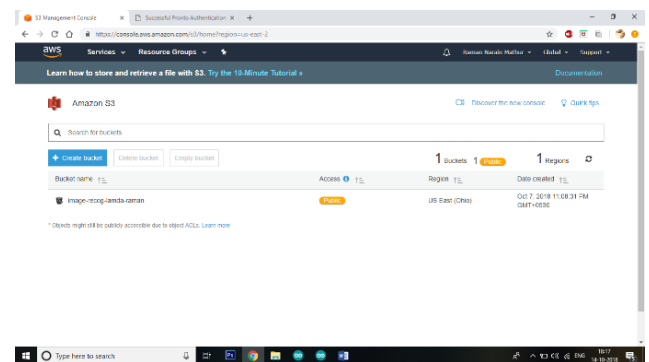We were successfully able to run the project. Below are some screenshots of the project.
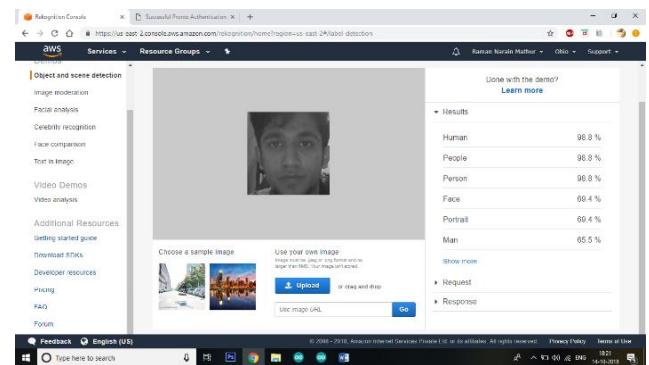

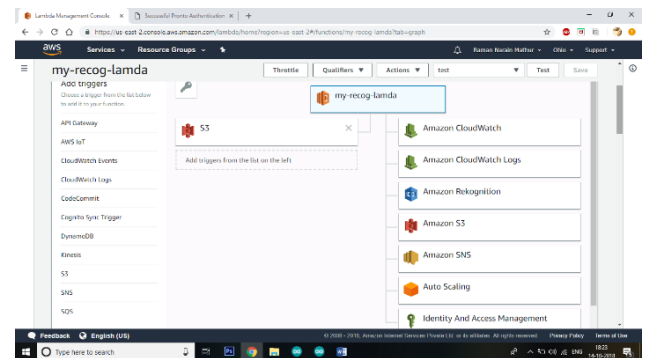
Fig 1 S3 bucket
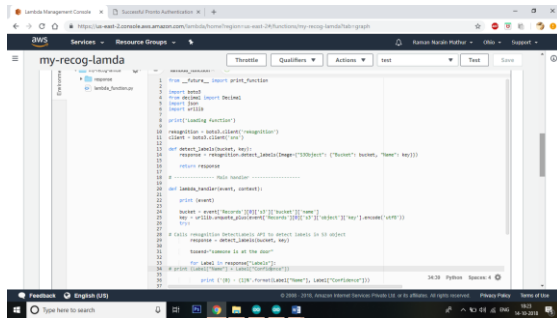

Fig 2 AWS Rekognition

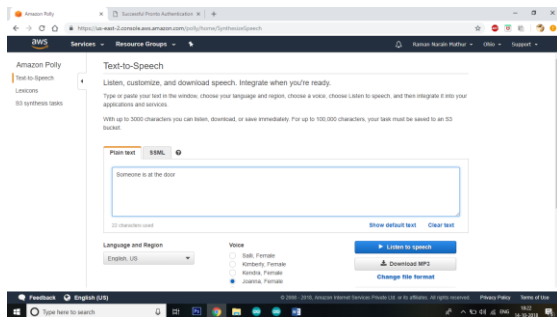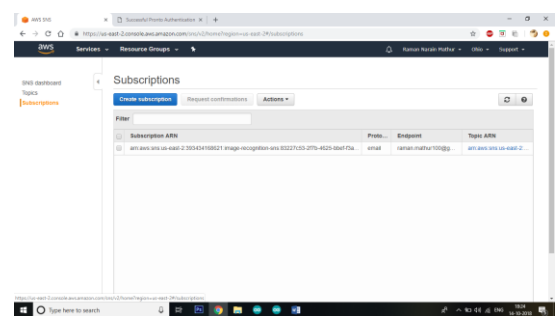*Fig 3(i) AWS Lambda*

Fig 3(ii) AWS Lambda

Fig 4 AWS Polly

Fig 5 AWS SNS

We have also uploaded the demonstration video of our project to the below given link.
https://photos.google.com/photo/AF1QipNPjeOghf--Sy8NYsdzwe5PXSpdDOFR5x6Lys6s

VI. CONCLUSION

The main purpose of the paper is achieved that is to improve security systems in homes, offices, etc. The idea is to unlock a door by reorganizing the face of an authorized person and then send the image to the cloud for analysis and to notify the user.

VII. ACKNOWLEDGMENT

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IX. ABBERVATIONS

AWS – Amazon Web Services
USB – Universal serial Bus
SNS – Simple Notification Services
PIL – Pillow Packages
API – Application Program Interface
AZ – Availablity Zones
SRE – Site Reliability Engineers

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