Door Lock System

By :-

Kanishka :CS21MDS14034

Shravya :CS19MDS11017

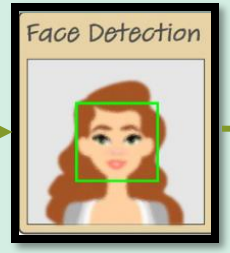
Use Case

The objective : To create a Door Lock system based on the IOT and Face recognition system, that recognises the owners of the house and unlocks the door for them

Description: The proposed door lock system is based on the pi camera sensor, that first detects the presence of face in the frame and then runs a face recognition algorithm using raspberry pi to match the face with the ones that are the owners of the house. In case of a match it unlocks the door and logs the entry in a database, in case of mismatch it send a notification to host for approval and owner has to approve the entry

End to End : Design

Yes



Is there a match ?

No

RPI

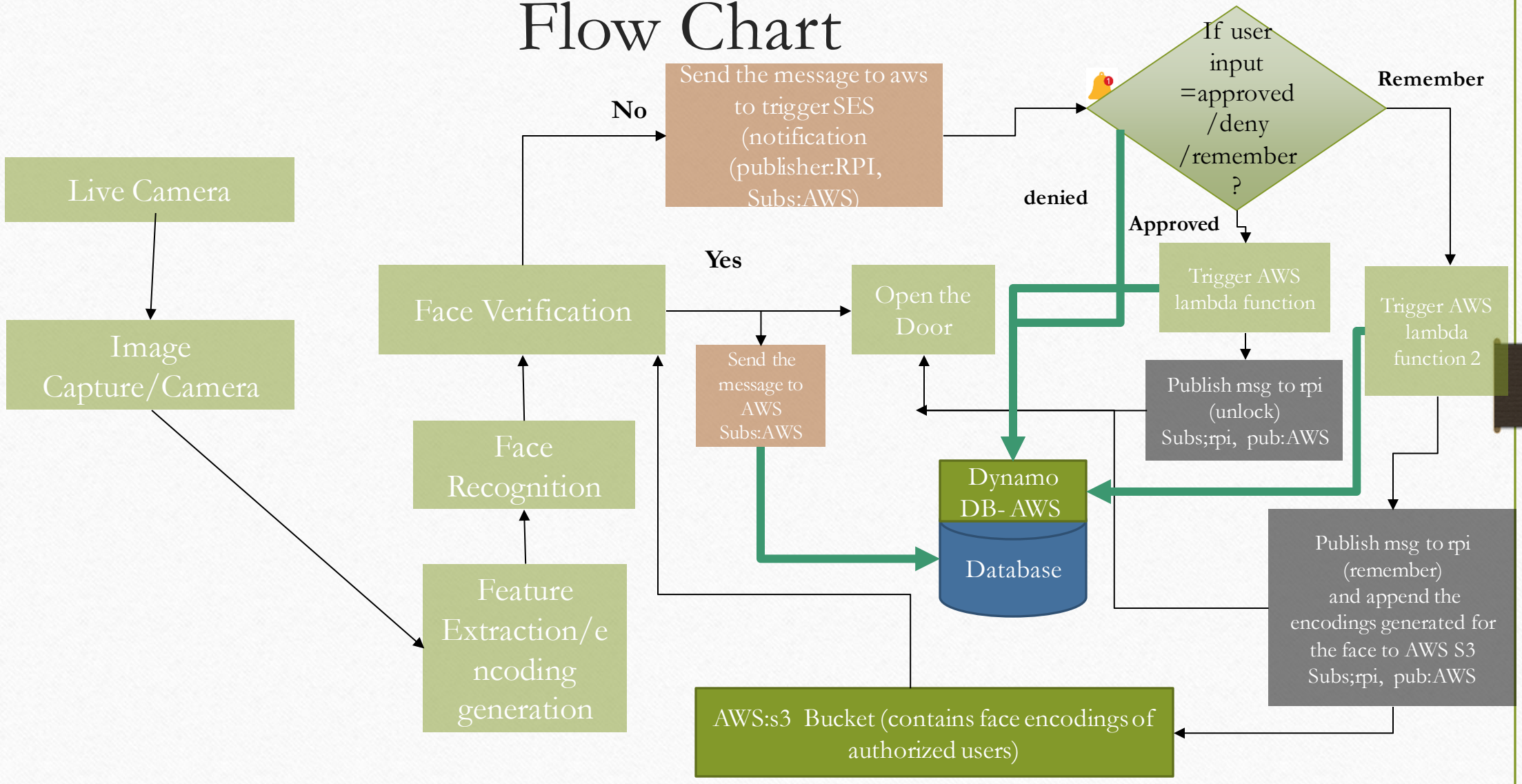
Retrain

Notify

Approval

Update Authorization List

Flow Chart


Live Camera
Image Capture/Camera
Feature Extraction/encoding generation
Face Recognition
Face Verification
No
Send the message to aws to trigger SES (notification (publisher:RPI, Subs:AWS)
Yes
Send the message to AWS Subs:AWS
Open the Door
If user input =approved /deny /remember ?
denied
Approved
Remember
Trigger AWS lambda function
Trigger AWS lambda function 2
Publish msg to rpi (unlock) Subs;rpi, pub:AWS
Dynamo DB- AWS
Database
Publish msg to rpi (remember) and append the encodings generated for the face to AWS S3 Subs;rpi, pub:AWS
AWS:s3 Bucket (contains face encodings of authorized users)

Hardware Requirements

- Raspberry Pi Kit
- Raspberry Pi 3Bplus
- Raspberry Pi Camera V2 Module
- MicroSDCard –16GB Class10
- Raspberry Pi Power Supply (5V 2.5A)
- LED
- Resistor(220 or 330 ohms should work)
- Breadboard
- Jumper wires
- Servo motor
- Latch
- Display

Software Requirements

- Python
- AWS MQTT
- AWS
- Lambda
- SES
- ~~Azure~~
- ~~Django/Flask~~
- ~~Pushover/Twilio~~

Modules to be developed

- **Module 1**: Face detection module
- **Module 2** : Face recognition module
- **Module 3**: Notification and app creation
- **Module 4**: Database entry
- **Module 5** : MQTT Publisher/Subscriber Code

Contributions:

- Kanishka : Module 1 & 2
- Shravya : Module 3,4 & 5,HW

Deliverables

- **DEMO**: Final demonstration of entire development using a prototype.
- **CODE**: GitHub repo with code and samples of
  - Face detection
  - Face recognition
  - MQTT
  - Database entries
  - AWS function:Lambda

Updates

- Dlib and face recognition libraries will be used for face detection and recognition
  - https://pyimagesearch.com/2018/09/24/opencv-face-recognition/
- If there is a new authorized user, the user details are stored in S3 and the model will be retrained with the new user details.
- AWS will be used for training as it has high computing power compared to raspberrypi
- Computations will be performed on AWS or Raspberrypi based on the response time.

References

- https://www.youtube.com/watch?v=o-x1PE0LVKM
- https://www.pantechsolutions.net/capturing-an-image-using-mobile-by-ip-camera-with-raspberry-pi#:~:text=As%20the%20Raspberry%20Pi%20beginner,when%20compared%20to%20USB%20camera.
- https://ijcrt.org/papers/IJCRT2106293.pdf
- https://www.youtube.com/watch?v=-icJaVEPBaM