Athlone Institute of Technology

Bachelor of Engineering (Honours) in Software Engineering

Interim Report – Academic Year 2018/19

Project Title:

“Alexa, who is it?”

Based on Face Recognition integrated with Alexa

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ABSTRACT

The main objective of this project is to create a face recognition mechanism to identify the people vising the home and providing security.

In todays generation everything is being automated using voice-controlled devices like Alexa, Siri. This project will use Alexa to integrate the face recognition API.

The advantages of this project are:

- Communication
- Automation
- Information
- Money
- Comfort

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1. Introduction

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1.1 Overview:

The project titled Alexa, who is it? is a project based on the face recognition mechanism integrated with Alexa. This report will help in the understanding of how the project has been implemented in detail. This report will serve as a base for the current definition and future evolution of this IoT project.

1.2 Problem Statement:

The problem with the old security system is that we do not have the ability to identify the visitors of our house from our living rooms or bedrooms. Tragedies happen such as thefts especially late at night when the users are not at home. This is because home does not provide any secure system. Also, the security systems are very expensive and consume a lot of electricity. This Alexa system will solve all these problems.

1.3 Work Proposal:

Recently, production companies are streamlining their prototype development process with Raspberry Pi. The microcomputer offers a variety of features, including four USB ports, an Ethernet port, an HDMI port and additional hardware equipment's like camera, etc, this project uses the Raspberry pi camera and a facial recognition API with integration of Alexa to recognize a person's face and store it in the database.

2. Scope of Work

2.1 Aim:

The main aim of this project is to provide automation and security to the house by recognizing the people visiting the home through face recognition mechanism.

2.2 Objective:

The main objective of this project is to use the camera module of the Raspberry Pi to detect the face of a person using Face Recognition API at the door of the house and help Alexa to recognize the face and dynamically inserting them into the real-time database as whitelist and also to improve her recognizing skills each time the person visits the home.

2.3 Technology & Associated Platforms:

Software:

- Raspbian Operating system
- AWS Lambda
- Firebase (Google based Cloud Service)
- Kairos (Face Recognition API)

Programming Language:

- Node.js

Hardware:

- Raspberry Pi 3
- Raspberry Pi Camera Module
- Alexa Integrated Speaker

3. Technology Research

3.1 Internet of Things (IoT):

The Alexa skills that integrate with home features make voice-controlling a smart home easy and straightforward. Currently, Amazon and Google together account for 69% of smart speaker shipments, but there are plenty of companies improving their technology to compete. These platforms have the ability to integrate with almost every aspect of a smart home — refrigerators, lights, televisions, washing machines and so forth. As more devices become connected, voice commands will control more in the house.

3.2 AWS Lambda:

AWS Lambda is an event-driven computing cloud service from Amazon Web Services that allows developers to program functions on a pay-per-use basis without having to provision storage or compute resources to support them. One of the main benefits of AWS Lambda is that it abstracts server management away from the IT professional. With AWS Lambda, Amazon manages the servers, which allows a developer to focus more on writing application code.

AWS Lambda functions

A function is a small piece of programming that carries out a specific task. Developers use AWS Lambda to code and run functions in response to specific events in other Amazon cloud services, such as the creation of an object in an Amazon Simple Storage Service (S3) bucket. Each Lambda function runs in an isolated computing environment with its own resources and view of the file system.

When AWS Lambda functions are called, the storage and compute resources for that function spin up automatically as a metered service.

3.3 Firebase

- The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in real-time to every connected client.
- The Firebase Realtime Database lets you build rich, collaborative applications by allowing secure access to the database directly from client-side code. Data is persisted locally, and even while offline, real-time events continue to fire, giving the end user a responsive experience. When the device regains connection, the Realtime Database synchronizes the local data changes with the remote updates that occurred while the client was offline, merging any conflicts automatically.
- The Realtime Database provides a flexible, expression-based rules language, called Firebase Realtime Database Security Rules, to define how your data should be structured and when data can be read from or written to. When integrated with Firebase Authentication, developers can define who has access to what data, and how they can access it.
- The Realtime Database is a NoSQL database and as such has different optimizations and functionality compared to a relational database. The Realtime Database API is designed to only allow operations that can be executed quickly. This enables you to build a great real-time experience that can serve millions of users without compromising on responsiveness. Because of this, it is important to think about how users need to access your data and then structure it accordingly.

3.4 Kairos

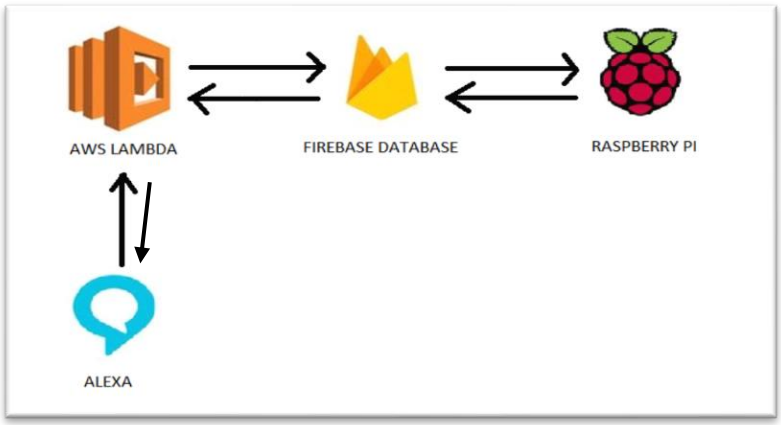
- Kairos is a facial recognition API that allows users to integrate advanced security features into their applications and services. The Kairos API uses REST calls, and requires and API key for access.
- **Patented 2D to 3D technology:**

  Kairos captures the depths and contours of each face it detects and build a 3D model of it. The 3D technology enables accurate comparisons of uncontrolled images by compensating for issues like uneven lighting or facial accessories.
- **Ease of use:**

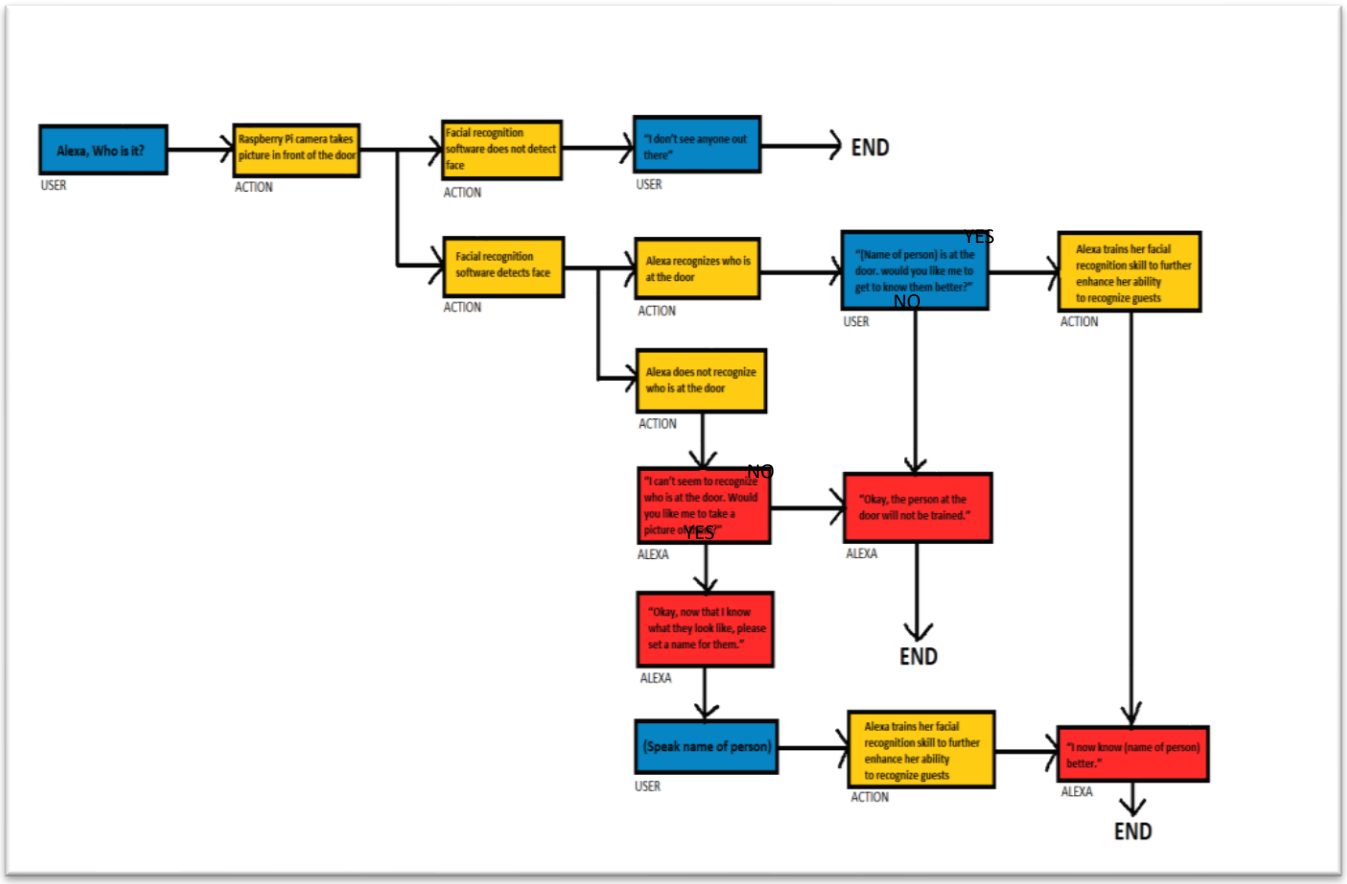
  Kairos can detect and recognize faces from the cameras on most tablets, smartphones and webcams and can automatically fix image rotation.

4. System Architecture/ Design

4.1 Data Communication Flow:



4.2 VUI Diagram:



5. Work Progress

- **Setting up the working environment:**

1. Installed Raspbian O.S on Raspberry Pi
2. Setup the Raspberry Pi Camera Module
3. Created an amazon developer account.
4. Created an AWS account
5. Created an Alexa skill in the developer console of Amazon.
6. Created a Realtime Database in the Firebase by using a simple JSON file.
7. Created a VUI Diagram for the project.
8. Learnt some basics about Node.js.
9. Created sample utterances for Alexa.