Detailed Design Document

Subject: Engineering Capstone Project

Group Number: 21

Group Members: Deep Shah (8750086) | Jeevan Dsouza (8716171)

CONESTOGA
Connect Life and Learning

Team Name: Vision: A virtual assistant for the visually impaired

Project Description: We would like to incorporate our skills in AWS and Data Structures by working on a virtual assistant for visually impaired individuals. In our first phase of the prototype, we would like to design the architecture with the help of many services offered by AWS and would like to first work on text detection from the live video feed of Rasberry Pi Cam. Then, we can give live feedback on the text by converting it to a speech by Amazon Polly. After this, we can also integrate AWS Alexa on the Pi and write custom Alexa skills. We can store all the logs in Amazon S3 buckets and do a log analysis with the help of Athena. Once the initial architecture is implemented, the opportunities on this project are endless as we can leverage an ample amount of services on AWS and the computing power of Rasberry Pi. Over the last four months during the GCM term, we have developed a good skill set in AWS and Data Structures, and hence, we would like to incorporate those skills into our capstone project.
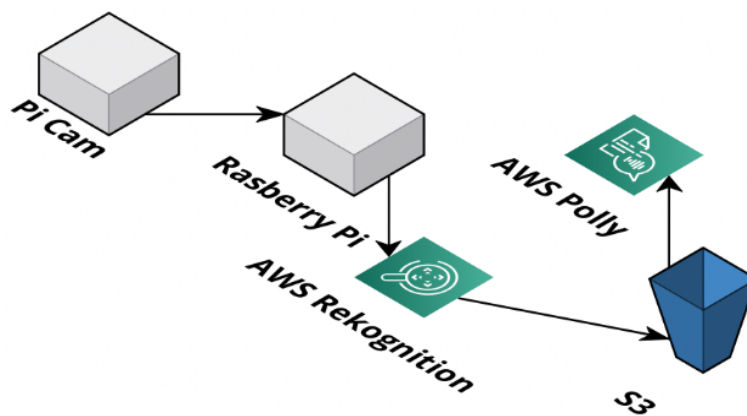
Proposed Architecture of Vision

Problem Statement: The first and primary objective is to start with text detection (It can be a billboard, a book's cover letter, etc.). After successful detection, the feedback on the detected text can be given by voice commands.

The second phase will make this assistant more advanced by installing Alexa on the pi. We want to create custom Alexa skills to make our assistant more interactive. We could ask Alexa what the user saw at a particular time and date... This can be achieved using S3 and Athena. As all the data will be stored in S3 buckets, we could do a log analysis using simple SQL queries with the help of AWS Athena.

Project Requirements: The hardware requirement of this project are Rasberry Pi and a camera. This assistant will heavily leverage cloud computing, and we will be using AWS for the hosting.

The AWS services we would like to leverage but are not limited to:

- AWS Rekognition: To perform a visual analysis of the live video feed
- AWS Kinesis Video Streams: To transfer live video feed to AWS via Rasberry Pi
- AWS Lambda: To do serverless computing and interconnect all the services
- AWS S3: To store all the data
- AWS Alexa: To make the assistant more interactive
- AWS Polly: To perform the text to audio conversion

Team Member Roles / Responsibilities:

Deep Shah (8750086): I would be working on most AWS services and making sure to be proficient in them. Cloud Computing can get very expensive if we are not careful enough with our usage of resources. I will make sure that we are not charged an enormous cloud usage bill on our credit card at the end of the month. I will focus more on the architecture and integration of all the services for our virtual assistant.

Jeevan Dsouza (8716171): My responsibility will be to provide a live video feed from the outside world to AWS. I will install Rasberry Pi OS and the required libraries for the Kinesis Video Stream. As we would be using Lambda functions to do serverless computing, I will also be coding those functions.

TimeLine:

Phase One (Present):

- So far, we have set up our AWS accounts, and they are good to go.
- We have also created our alerts and budgets to prevent us from getting a big AWS bill.
- We received our required hardware components yesterday (19th May).

Phase Two (May End):

- Getting familiar with the required AWS services.
- Send data to AWS using PI via Kinesis.
- If video quality is not good enough for text recognition, then we will find alternatives for the camera.
- Be proficient with AWS Rekognition, as this is the heart of the project.

Phase Three (June End):

- Integrate all the services.
- Getting proficient with AWS Lambda for serverless computing will help us interconnect all the services.
- Ready with the first phase of the assistant, which is to integrate all AWS services, and the model should do text detection proficiently.

Phase Four (Mid August):

- We plan to install Alexa on Pi during this phase.
- To make our assistant more and more interactive.
- We will also work on designing a custom case for our hardware components.