Deep Learning Based Smart Survilance Robot

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Abstract. Surveillance Robot aims to blend IoT capabilities with the support of cloud and machine learning is an advancement to deliver a sophisticated solution for real time security. Industrial and commercial surveillance data security is required   for small camera as well as large scale deployment with a drones or robot cars. This paper deals with face recognition using AWS Rekognition and video streaming using AWS kinesis and AWS SNS(Simple notification Service) . AWS Rekognition uses deep learning algorithms to introspect the video stream and find objects / faces on them and compare it with the collection of information that it has trained previously. It detects face with video feed and scans the database to identify the person with AWS Rekognition ,there is also an option of adding   new faces by uploading photo of the person to an S3 bucket and face can be indexed .

1 Introduction

Internet of Things (IoT) fasten with Robotics   in real time fields such as Industry surveillance , superintendence of skilling worker in connection with video ,image data is a challanged work for smart attendance management with face detection , sentiment analysis ,Face based user verifications .With the suppor of Amazon Rekognition,Facial analysis and search is used to identify andexamine user verification,counting faces , and also for public safety. As well as   it support tagging and indexing of photos as a service with scaling infrastructure.Visual search, tag-based browsing and discovery models are reinforced by Amazon Rekognition. AWS Rekognition   contributes in validatting authentication and security. For example, in artisan attendance bio metric system, authentication has been done for entering into secure place   by comparing   the stored employee images with real time camera images and giving a sign before allowing an employee to enter in to secured zone.

AWS SNS with details of known and unknown person in the video acts as a message broker and forwards the notification to Google cloud messaging subscriber ,an android application running on a phone. A notification will be popped up on the android mobile phone running the application with a picture of the person detected in the video feed.

Real time process,analyze and streaming data in short time processing is by Amazon Kinesis with cost-effectively process .Video, audiologs, URL click streams, and IoT telemetry data uses kinesis by machine learning algorithm . Amazon Kinesis process and analyze data quickly so, waiting time will be less .

Amazon Rekognition, identify the images and videos and get facial attributes such as skin tone, texure, eye color, age and facial hair which are used to measure changes based on constructing a timeline of the emotions expressed by an action

The paper is divided in 4 parts. First , using Deep Learning based Smart surveillance. Second ,working methodology and a platform for reads and transmits the data to android based application. Third, creation of AWS Rekognition for data collection and storing . Fourth ,AWS Kinesis analyzing video to get contextual data. Working methodolgy results, and future enhancements are discussed at the end of the sections.

2 . Literature Review

Quality of Experince(QoE) for Video gushing in a distributed environment is encoded by an erasure code.[1],[2]. A customization or contextual system is required to dectect event based or semantic based video anaysis with less computational power and hardware. In cloud, Customized or contextual video surveillances analysed by cloud based object detection.It is by You Only Look Once (YOLO) object detection model, which identifies the objects within the frame[3],[4].

Real-time Video survillience is more rational to increase communal safety, e-commerce and health technology support commutations . In the existing technologies of cloud the video analytics has been done by preloaded video data and which is to from centralized cluster or the cloud. Most of the time is wasting in transmission and latency , which leads to high cost of video data transmissions between IoE devices and cloud [5]. Computer vision is in need to pecularities in video processing of public safety. High detection and accuracy of video by

Deep Neural Networks (i.e., DNNs) can be used for skinning layered video with less amount of computing power and storage space. Thus, DNNs-based video analytics service is required in the cloud to perusal the stationary cameras [6],[7][8].

The main motivation of this work is to identify the pitfalls in cloud video synthesis to process large-volume of data to avoid latency in critical applications[11][12]. Cloud computing aims enormous resources that can be flexibly used to fit dynamic demands which leads to avoid substantial latencies when using services placed at distant locations [9],[10]

3.WORKING PRINCIPLE

There are Three Different Sections to be discussed

1. AWS Rekognition
2,AWS kinesis
3. AWS SNS
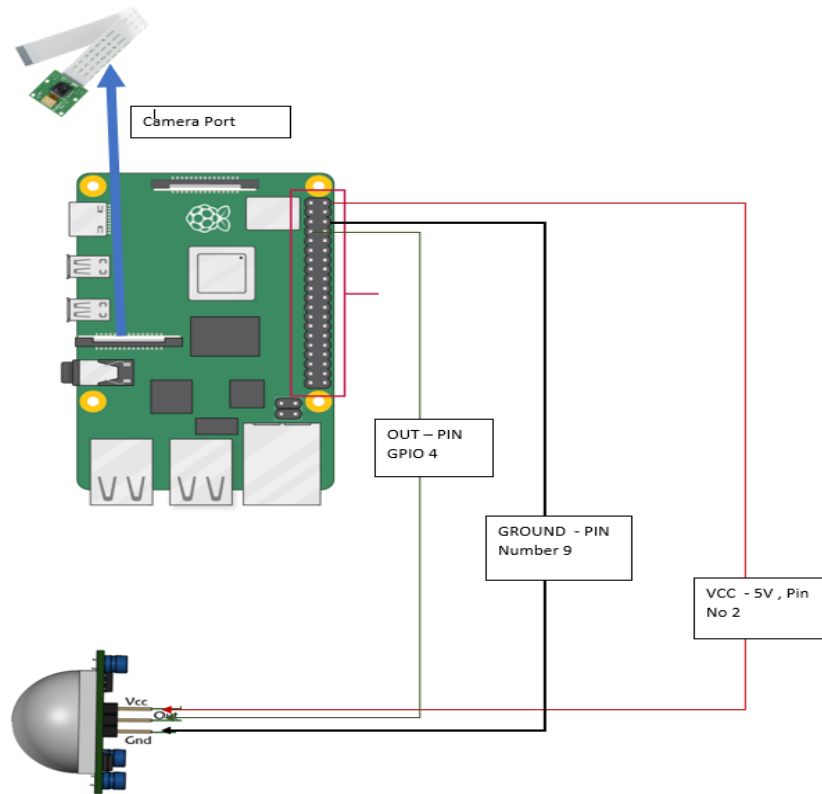
Figure 1 explain the pin configuration of camera robot

Fig. 1. Pin configuration of Camera Robot

3.1 AWS Rekognition

To recognize faces in the video streams using Amazon Rekognition Video, or process it for live streaming. It detects face with video feed and scans the database to identify the person with AWS. AWS Rekognition uses deep learning algorithms to interrospect the video stream and find objects / faces on them and compare it with the collection of information that it has already learned previously.

Creating a collection and make the engine learn an image:

- aws rekognition create-collection --collection-id surveilance_bot_collection --region us-west-2

- aws rekognition index-faces --image '{"S3Object":{"Bucket":"shefeekjbits","Name":"shefeek.jpg"}}' --collection-id "surveilance_bot_collection" --detection-attributes "ALL" --external-image-id "Shefeek" --region us-west-2

To start with AWS Rekognition , a cloud formation stack need to be created with all the required components.AWS provide pre provisioned stack that can be used directly and explained in **Figure 2**.
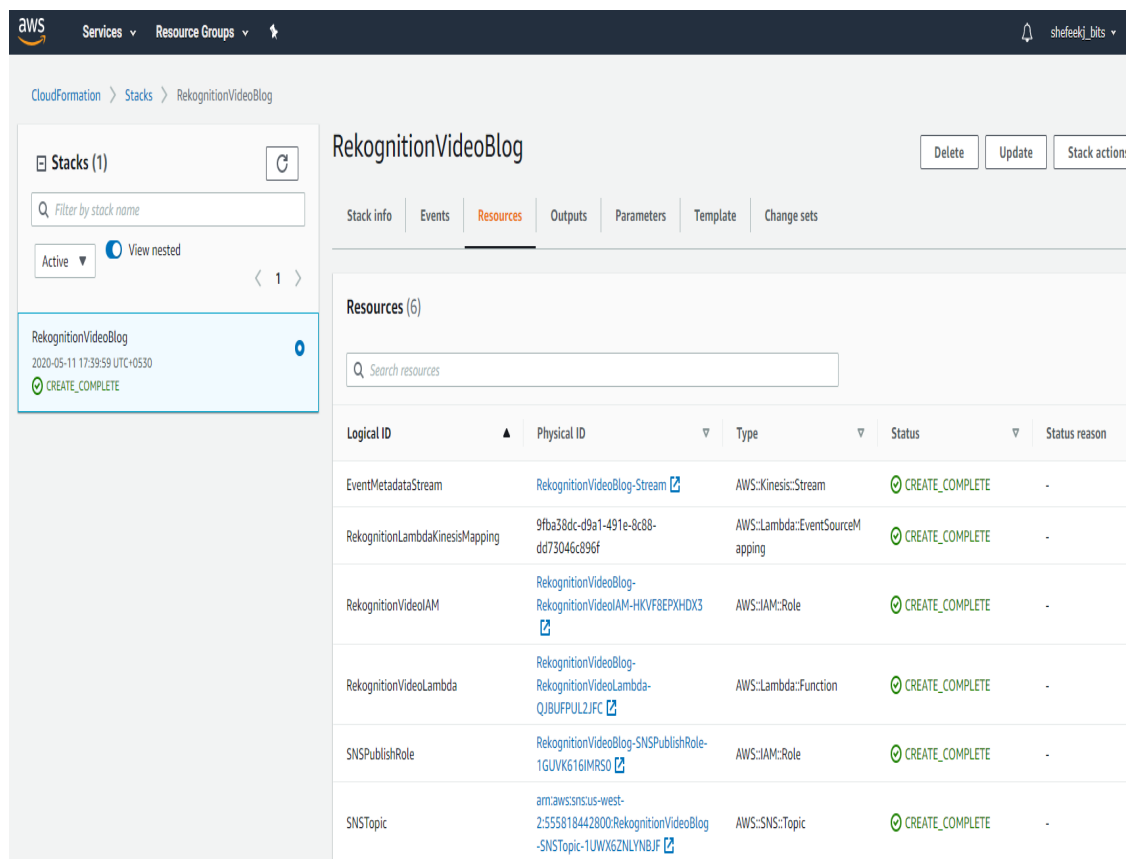
Fig: 2. Creation of AWS Rekognition

3.2 AWS KINESIS

Kinesis video stream is created on AWS by Kinesis Video Producer libraries need to be downloaded (CPP) and compiled on the target machine operating system (Raspbian) .This library enables to stream videos from the device to a kinesis video stream.

Stream video from a Raspberry Pi (with camera module) to AWS using Kinesis Video Streams for securly stream video. In AWS Rekognition there is also an option of adding new faces by uploading photo of the person to an S3 bucket and face can be indexed and shown in **Figure 3.**
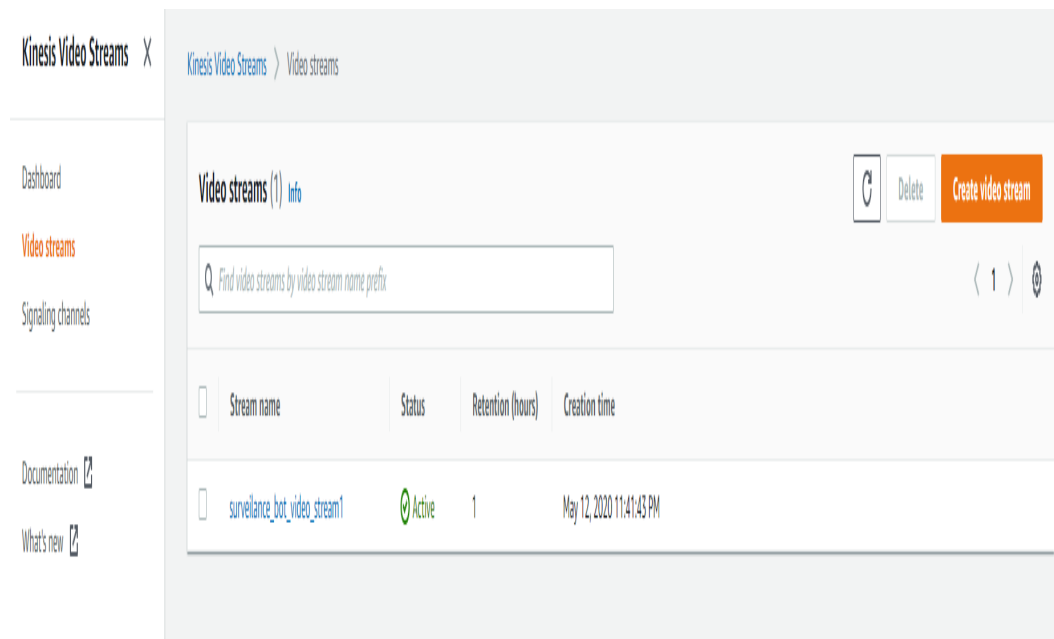

Fig 3. Kinesis Video Stream

AWS SNS with details of known and unknown person in the video .AWS SNS acts as a message broker and forwards the notification to Google cloud messaging subscriber ,an android application running on a phone. A notification will be popped up on the android mobile phone running the application with a picture of the person detected in the video feed shoes in **Figure 4.**

Fig 4. Video streaming from Rasberrypi

An AWS Rekognition video stream processor need to be created and integrated with kinesis video stream with the following command

aws   rekognition   create-stream-processor   --region   us-east-2   --cli-input-json
file:///home/pi/aws_rekognition/cli-input.json
Cli-input – https://shefeekjbitss3.s3-us-west-amazonaws.com/cli-input.json

Once created , it can be started by
 aws rekognition start-stream-processor --name <stream_processor_name>

3. 3AWS SNS(Amazon simple notification Service)

Notification Push is delivered to a platform application (Android application). An android project is created in Google FireBase, an application development platform and the registration token is used to develop a simple android application that has two features

- Show the token of the application installation instance .Each device which installs the application will be assigned a unique token by Google FireBase.

- Show notification on to the phone as and when it receives one from google firebase cloud messaging service.

AWS Simple Notification Service(SNS) is created and is integrated with AWS Rekognition to ensure that a notification message is received by sns whenever a known or unknown face is detected by aws rekognition.SNS acts as a message broker and aws rekognition acts as a message publisher. Android devices will be added as subscribers on to SNS with the token generated on the android device and it is shown in **Figure 5.**
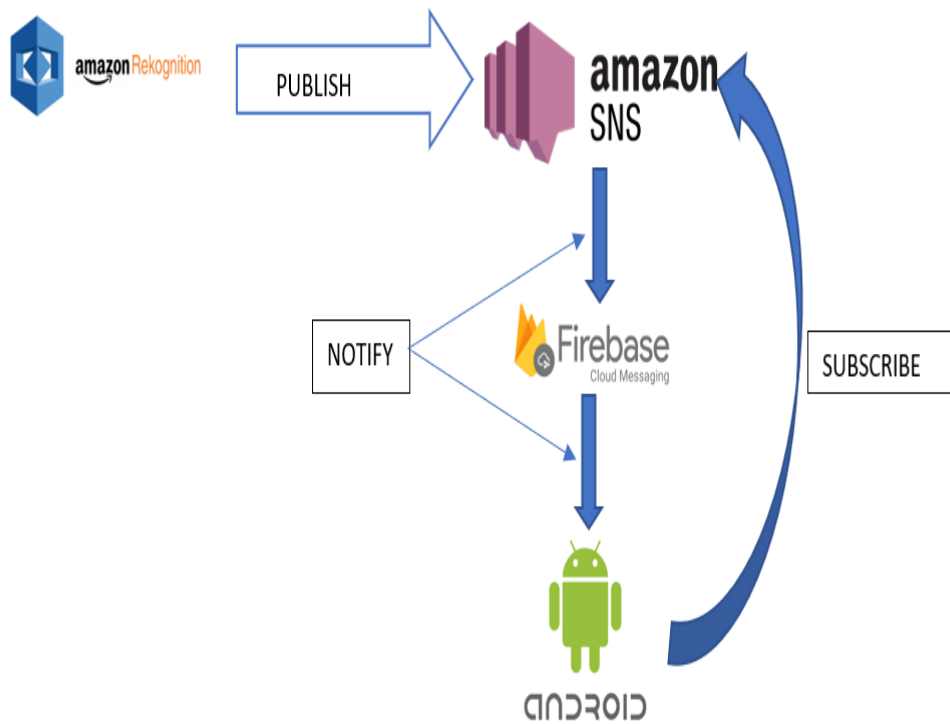

Fig 5. Android project in Google FireBase

4. Conclusion and future Enhancement

AWS Rekognition and Amazon Kinesis relate accurate facial analysis by detecting facial identification marks. It is useful for comparing faces, wide variety of user verification, people counting, and widespread safety by using AWS. Rekognition ,Amazon Kinesis suits well for process and analyze real-time, streaming data within shorter duration of time .It can get timely insights and react quickly to accord new information. video streaming analysis identifies the person in the video by comparing the database which contains already trained data, it also identifies the new persons which is not trained using the concept of deep learning.

As a future enhancement convolutional neural network (CNN) can be used for facial recognition in live video streaming without training the network. it can learn by itself when a new person arrives within a fraction of second. The computational time can be reduced to a grater extent.

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