Proposal

for

Artificial Intelligence based Facial Recognition real-time Live Video surveillance

To

Department of Police, Kerala

Law Enforcement

Submitted By

K-DISC
Kerala Development and Innovation Strategic Council

Kerala Development of Innovation and Strategic Council

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1 Organization Profile-KDISC

K-DISC is a strategic think-tank and advisory body constituted by the Government of Kerala. It aims at bringing out path-breaking strategic plans that reflect new directions in technology, product and process innovations, social shaping of technology and creating a healthy and conducive ecosystem for fostering innovations in the State. In the sphere of development, K-DISC is promoting and initiating new projects in Emerging Technologies such as Block Chain, Internet of Things, Machine Learning, Artificial Intelligence, Robotics and soon that would enable transparent and cognitive advances in various departments of the state Government and deliver the ultimate benefit to the citizens. K-DISC would facilitate with different government departments that may need any of these technological advances to solve their critical problems and to arrive at the proof of concepts stage with adequate technical and financial resources in order to promote innovation. Also, K-DISC will ease the implementation by overseeing of the same

2 Introduction

2.1 Need for technology Intervention

Since the invention of face recognition in the 1960s, wherein first manual measurements were created using electromagnetic pulses, the promise of its role in law enforcement has sparked fascination for public safety officials, journalists and especially Hollywood filmmakers. Films like 2002's Minority Report, directed by Steven Spielberg, helped spark the imagination of face recognition (and five other technologies) as a potential crime prevention and crime solving tool. Once used only by the military and public safety officials, the technology has become mainstream, appearing in the iPhone, Facebook and elsewhere. Today, it is also used by hundreds of law enforcement agencies to carry out the following:

- Identify a person with over 99% accuracy from mugshots, live video footage or archived footage
- Help patrol officers make instant IDs in the field
- Alert stations and courthouses about the presence of unwanted or potentially dangerous individuals in sensitive areas
- Quickly match an image against vast databases of mugshots from multiple state, local, federal and international agencies

Face recognition technology can be used by many different types of law enforcement personnel across four major categories.

Forensic Face Recognition

Typically used by investigators, forensic face recognition software systems can recognize individuals from mugshots and surveillance footage, typically after a crime has been committed. These were the first types of face recognition systems to be used in law enforcement.

Mobile Face Recognition

Typically used by patrol officers, mobile face recognition enables police to take a photo with a smartphone and match it against a vast database of known criminals and suspects. The primary objective of mobile systems is to instantly identify individuals in the field and gain immediate access to outstanding warrants and prior criminal history, if any.

Surveillance System Face Recognition

Typically used in public places, stations and courthouses, face recognition surveillance attempts to identify known criminals, wanted criminals and missing persons, the moment they enter an area and alerts command center staff or patrol officers about their presence.

Access Control Face Recognition

Face recognition can be used to enable entry into sensitive areas, such a station's back offices. The technology is typically used as a secondary method of access, with a badge or code also being required as well. Quality data – mugshots, names, criminal history and more – is essential to all four major use cases. Ideally, a fully managed and curated criminal intelligence database should allow departments to publish and subscribe to data from other local and state partners, as well as networks.

2.2 Face Recognition Makes Criminal Intelligence - Actionable for Police Officers.

When confronted with individuals that don't present their valid identification, present false information, don't speak a common language or are unconscious, patrol officers' resort to manual searches which can be time consuming and prone to errors. Face Recognition allows law enforcement agencies to:

- Establish ID from a safe distance
- Minimize false arrests, preventing lawsuits and bad publicity
- Surface outstanding warrants, cases or prior arrest records
- ID persons that are unconscious or dead

In view of the huge advantages to Law enforcement agencies as cited above, there is a need for technology intervention by its introduction to law enforcement agency. AI based Facial recognition technology is being proposed to be piloted as first step in Surveillance Face Recognition because of the following:

- Facial recognition has long been used on static images to identify arrested suspects and detect driver's license fraud, among other things.
- Using the technology with real-time video is less common. It has become practical only through recent advances in AI and Machine learning
- Surveillance systems have proliferated across geographies due to systems being cheaper and people have gained more awareness to use them. With input feed point population having grown exponentially, impact can be substantial

3 Project Objectives

- To implement a platform to carryout AI based Facial Recognition on live video feeds from surveillance systems.
- To match face recognized from live video feeds with photos of wanted criminals, known criminals and missing persons and notify the concerned law enforcement officer in seconds.

4 Project Scope

The proposed Facial Recognition System with Live Video Surveillance, in general, shall have the following features:

- The facial recognition system shall be able to integrate with IP Video Cameras (Internet/Intranet) as required in the solution and shall be able to identify multiple subjects of interest in real-time, through leading face recognition technology and provide an alert when subject of interest of match is found.
- The system shall be able to match faces from recorded media and detect a face from a group photo and detect a face from stored videos.
- The system shall detect multiple faces from live video feed in Crowded area on the move preferably from up to 7 feet or less for CCTV Cameras
- The system shall preferably have short processing time (less than 2 seconds for 1 million images) and high recognition rate (NIST standards).
- The system shall be able to utilize file formats like JPEG/PNG/any other standard image format for enrolment/registering the threat.
- The software may have FNMR (False Non-Match Rate) of less than 0.035
- The system shall enroll faces detected to the database automatically; user shall have the option to upload a photo or use events to search similar faces among the events
- The system shall be able to identify, authenticate and alert based on individual facial features. The alert shall be displayed to user on Computer / Mobile etc. and notify them until turned off manually.
- The system will be easily scalable that can support large scale systems and large database sizes
- The system shall preferably record the feeds and display the results in the dashboard with the number of identified threats, strangers etc.

Refer Fig 1. The scope of the project (Pilot Implementation) shall be as follows:

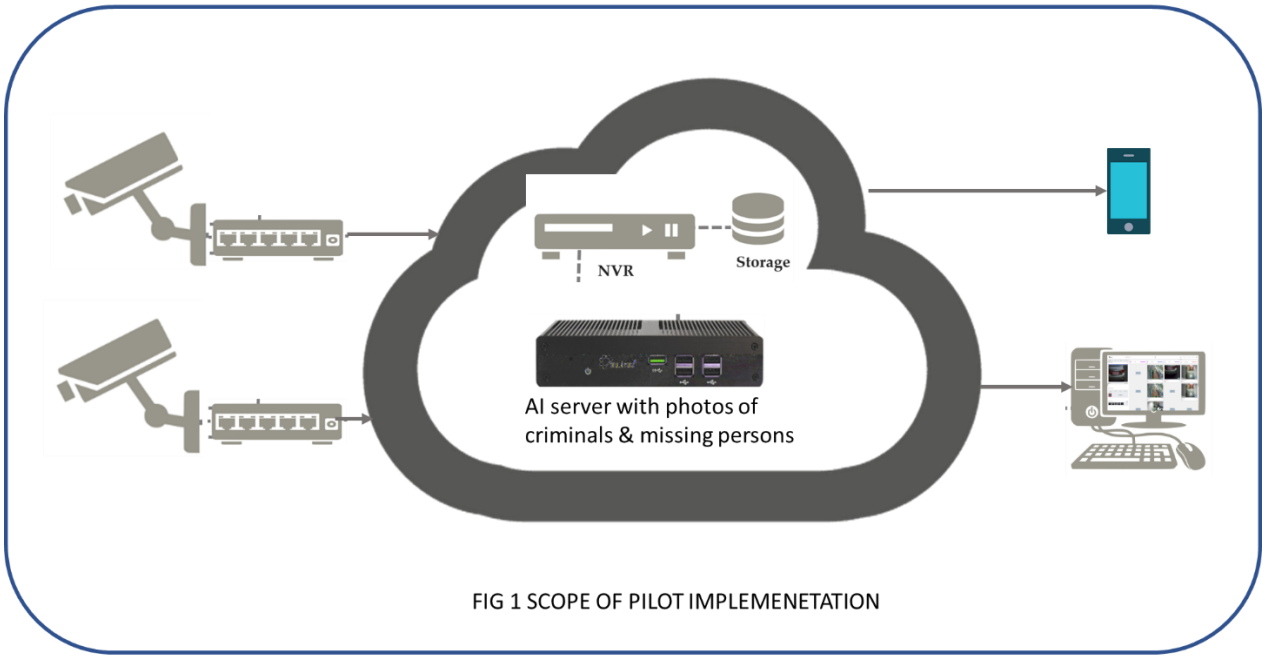


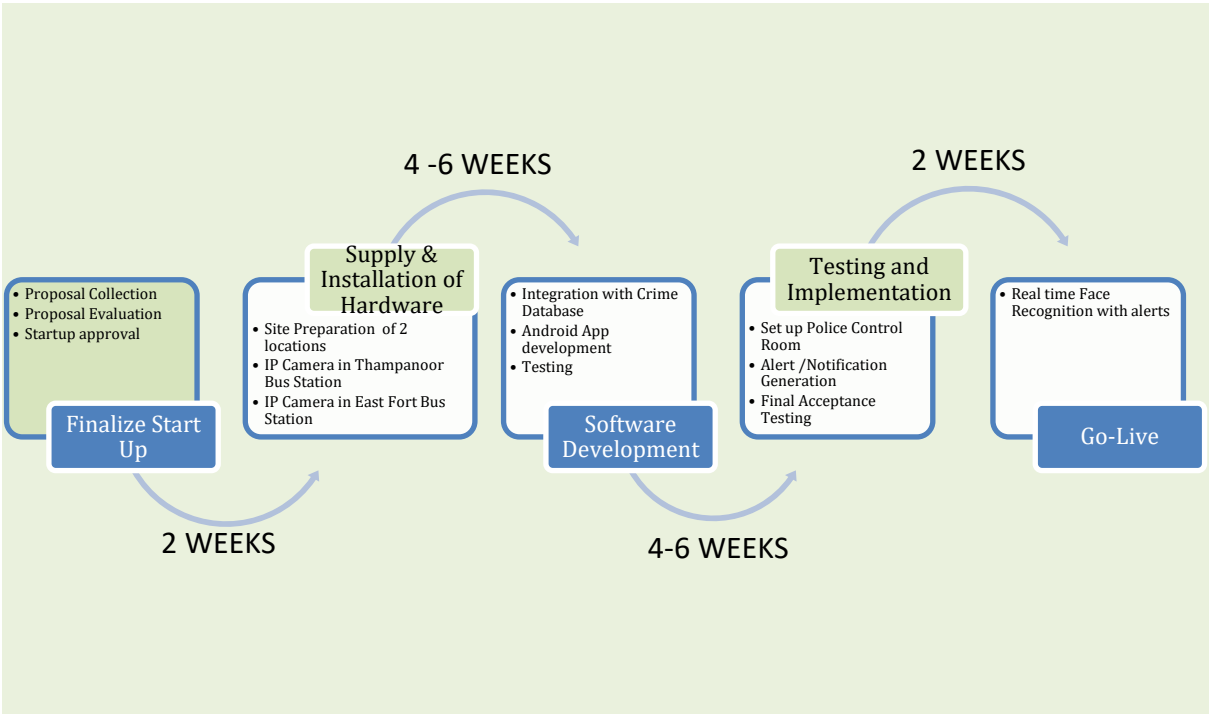
FIG 1 SCOPE OF PILOT IMPLEMENETATION

a. Install two HD IP cameras, one each at Thampanoor and East Fort bus stations.
b. The cameras shall have connectivity of 2 Mbps each to Internet/Cloud
c. On the cloud, the following would be hosted:
    i. NVR with storage for video backup
    ii. AI based Face Recognition server, uploaded and trained with photos of known criminals, wanted criminals and missing persons. The server shall continuously analyse the video feeds from both cameras using AI based algorithms and try to match with photos in the database. Once a match is found, AI server shall generate alert of match with percentage probability along with configurable duration pre and post video clips. These are sent to assigned client nodes and mobiles. Actual ground truth can be entered by authorised law enforcement personnel either thru mobile app or from client node. This can be used for retraining the AI algorithm
d. A client application would be installed on a node in Police Control room at Cantonment, Thiruvananthapuram. The application shall have following functionalities:
    i. Display in real time video feeds from Thampanoor and East Fort Bus stations
    ii. Real-time pop-up alerts on known criminals, wanted criminals and missing persons recognised
    iii. Video playback facility
    iv. Video clip playback of respective alerts
    v. Health information

vi. Reports

e. An android app shall be developed to have following functionalities:
   i. Secure login
   ii. Officer Profiles
   iii. Real time view of camera feeds
   iv. Alerts
   v. Video clips playback on alerts
   vi. Video Playback

5 Implementation Schedule



6. Support Vital from Police Department-Law Enforcement

I. To facilitate and provide necessary permissions in installing the IP Cameras in the identified locations of Pilot implementation.
II. To permit installation of Client node at the Police control room
III. To identify stakeholders on whose mobiles, the mobiles apps would be installed and feedback is taken
IV. To support K-DISC and the start-up who will be engaging with the project to interact with the concerned officials assigned for the implementation of the project.
V. To provide K-DISC with the photographs in JPG/PNG file format of known/suspect /wanted criminals/missing people and registering in the system.
VI. To permit the necessary integration with current crime database used by the department.
VII. Support the team to analyze and prepare study reports relevant to the project.