

Covid-19 Prevention Protocol Compliant System for Staff Attendance Management Using Non-Contact Techniques (CPPCSSAM)

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Abstract:- Staff attendance system is a means for organizations to justify the time in and time out of her workforce. It is used to determine the time measured in hours contributed by individual worker for daily, weekly or monthly wages processing. Biometrics refers to the automatic identification of a person based on his or her physiology or behavioral characteristics which include face, fingerprint, iris, voice, retinal scan, hand geometry, palm prints, ear, body odor, DNA. The existence of Nobel Corona Virus code named Covid-19 has poses a great danger on both health and lives of those using traditional and computerized contact based staff attendance management system, hence a contactless based biometric system is needed to replace the existing staff attendance system in compliance with social distancing, less contact with public surfaces area among others. A facial biometric technique was adopted for its ability to identify, verify and authenticate staff for attendance register system without physical contact with the system interface. This project was designed to manage staff attendance register using facial recognition biometric technique. The system was able to capture staff bio-information, facial attribute and cross matched individual identity and authentication for attendance management with conformity to Covid-19 preventive protocols. To achieve the objective, LUXDAN facial recognition SDK was adopted and modified to produce a tailor based system for efficiency, MySQL relational database for backend database, and application interface was developed within the Microsoft Visual Studio Dot Net framework. The was able to capture staff facial coordinates, identify, verify and authenticate human faces from significant distance of the camera coverage and display attendance register marked on staff cell phone using the Wi-Fi network connection available.

Keywords:- Algorithm, Facial Recognition, Covid-19, Biometric, Staff, Wi-Fi.

I. INTRODUCTION

The operation of any organization is based on the contribution of staff either from executive level or operational level. In an organization such as factory, the shop floor operation required full attendance of engineer, technical staff, and operation level staff before starting the operation. Therefore, the attendance system provides the information of the staff existing to the shop floor. Their information will help in planning the operation and effect

change in case of absence. Attendance can be defined as the action of being present at one place or event. Many researchers have implemented various types of attendance systems such as using of pen and paper attendance book [1], using database, and also fingerprint biometrics. [2]. These implementations still can cause lots of problems such as providing incorrect information to the users, manipulations of arrival and closing time by personnel, impersonation of persons, and aid transmission of communicable diseases such as Covid-19, Ebola, and Lassa fever, and other contact based communicable diseases. To reducing the mitigating effect of traditional ways of staff attendance recording system in Rufus Giwa Polytechnic, the use of biometrics is the way out. [3]

Biometric refers to the automatic identification of a person based on his or her physiology or behavioral characteristics which includes Face, Fingerprint, Iris, Voice, Facial Thermogram, Retinal Scan, Hand Geometry, Gait, Palm prints, Ear, Body odor, DNA among others. Biometric technologies are becoming the foundation of an extensive array of highly secure personal identification and verification solutions. Today, biometric is being spotlighted as the authentication method because of the need for reliable security [4]. Facial recognition has been used for identification and monitoring for over a century, more recently becoming automated due to advancement in computed capabilities. Facial reconstruction is popular because of the inherit ease of acquisition, the available for collection, and their establishment use and collection by institutions, law enforcement and immigration. According to [5], many institutions are experiencing technical advancement and changes in the mode at which they carry out their day to day business process using biometrics. With the rise of globalization, it is becoming essential to find an easier and more effective system to help institutions, organizations or companies improve their employee's productivity. In spite of this matter there are many business establishments, institutions, government agencies in Nigeria that uses the traditional method of attendance record management or finger print biometric techniques of recording employees' attendance. Both processes mentioned requires regular interaction with specific interfaces. Using facial biometrics for identification in Nigeria higher institutions have not gain much popularity rather large number of institutions in Nigeria uses finger print biometric identification system in staff attendance management system. The shortcomings of using finger print biometrics attendance management system are biological threat by

means of transmissible of communicable diseases such as COVID-19, laser fever virus, Ebola virus and others via body and material contact. The use of Covid-19 prevention protocol compliant staff attendance biometric system using contactless technique for avoidance of spreading of communicable diseases is required in Nigerian higher institutions for effective staff productivity for both current and future reality of global health safety and security.

II. LITERATURE REVIEW

Several authors have proposed various models in the field of biometric for attendance management system over the years. The area of facial biometric techniques in staff attendance management system is making more waves. [6] presented face recognition methods and applications. The objective of the research work was to describe how to develop a facial recognition system to automatically detect a human face in an image. Their research work was partitioned into three main sections, the first section of their work describes the commonly used methods like holistic matching method, feature extraction method and hybrid methods. The second part of their research work describes applications and the last section describes the future research directions of face recognition. The limitation to their publication was that it discusses theoretical issues around facial recognition and likely areas of research in the future.

[7] presented a review of face recognition. The objective of their research work was to carry out a comprehensive review of various facial recognition techniques and point out weaknesses and possible further research areas where those researches were unable to capture. Their research was able to present a theoretical review of various facial recognition methodologies while strengths and weakness of those methods were outlined for future research.

[8] presented a facial detection and recognition system for institution based attendance monitoring system. The objectives of their research work were to detect and recognize individual student's face for class attendance. The researchers used a two ways method in achieving their objectives by using Hue Saturated Value (HSV) and True Colour or Red, Green, Blue (RGB) Colour mode algorithm for facial detection and the Principal Component Analysis (PCA) for face recognition due to its simplicity. Their system was able to detect and recognize human faces. The major setback of their system was that their research consideration was focused on detecting and recognizing standalone image.

In [2] model a fingerprint biometric system was proposed for identity management with a single relational database management system for record keeping and housing of biometric miniatures. The system performance was low due to the size of extracted miniatures from staff fingerprints

[9] presented a Real-Time Face Detection and Recognition in Complex Background. Their publication used Ada Boost algorithm in a cascade classifier to train the face and eyes detector; the LBP descriptor was used to extract facial features. Haar-like descriptor was used to detect eyes to be sure it is a living facial image, while the Principal Component Analysis (PCA) algorithm was used to recognize faces in real time. However, their research work implements a standalone system which means users must be physically present at the server base.

The existing research works do not consider identifying, verifying and authentication of personnel from a minimum specific distance observable for COVID-19 prevention. Also, other researchers did not consider attendance register report on mobile handset of persons from a distance to maintain social distance. The implementation of COVID-19 prevention protocol compliant system for staff attendance management using non-contact techniques was designed to observe and enforce social distance rules of COVID-19 and other communicable diseases.

III. OBJECTIVES

The objectives of this research work is to develop a facial recognition biometrics system for staff attendance management that enforces Covid-19 preventive protocol by enforcing social distance between staff of RUGIPO during attendance registration exercise,

IV. METHODOLOGY

The methodology adopted in the research work was the modification of the models proposed by [2], [9]. In [2], biometric features were extracted and stored in the system database which made overall system performance low, however, our model will keep its biometric features extracted in a secured system directory while leaving the database for text management such as inserting, updating, retrieval and other text based operations to the database for efficient performance. The model in [9] used the gray-scale images to detect and recognize faces in real-time with high accuracy by combining Ada booster algorithm and cascade classifier with the aid of Haar-like descriptor to improve identity accuracy. Our model considered physiological facial changing on individual ranges over time by the use of the process of image swap with the last update. The system design was implemented using the Microsoft Visual Studio Dot Net frame work, and MySQL relational database for information and non-biometric factor directory storage. Wall mountable cameras was mounted at an angle of 30, 90 and 150 degrees respectively and connected to the server system, for easy identification, authentication and attendance registration recording of individuals within an organization.

A. CPPCSSAM Architecture

The system architecture show the logic used in addressing specific challenges at major Nigeria institution of learning. The facial feature of all personnel is first captured and register in CPPCSSAM. The extracted facial features are stored in a binary file format in the system database. The

extracted features are matched with respective individuals at verification stage to ascertaining the identity of individual presence at work. If facial identity is authenticating, a

message is display on such mobile handset through a Wi-Fi connection on the institution, else a notification of no recognition is show as shown in figure 1 below.

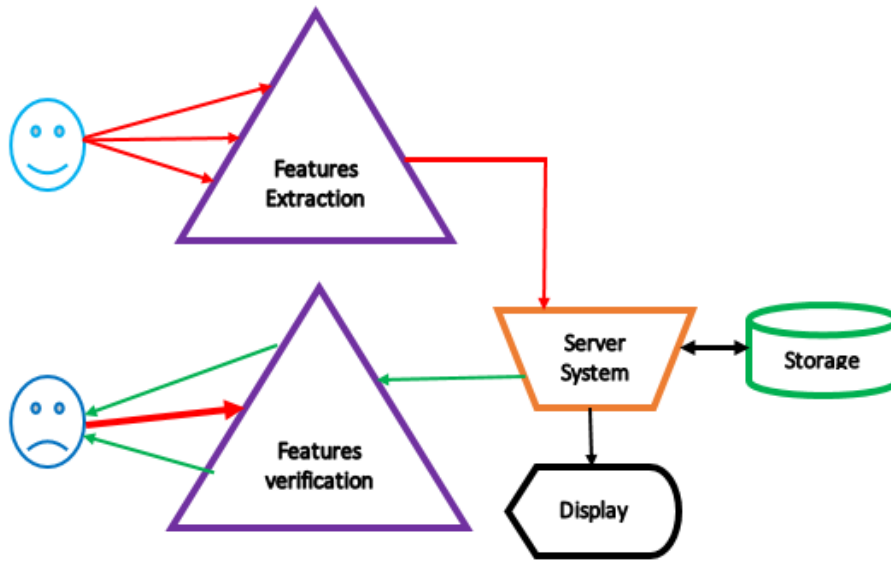


Fig 1: System Architecture for CPPCSSAM

B. CPPCSSAM System Flowchart

The system flowchart explains data collection and the logical flow of information in figure 2a and 2b respectively. Figure 2a indicates the stages in facial features extraction and atomicity principle to make sure that all data are well captured. In figure 2b, extracted features are compared with the current facial expression detected by the camera and thereafter instant report in communicated to such mobile handset to asserting attendance is marked or not. The circle in figure 2b is in constant loop until the server system is shutdown.

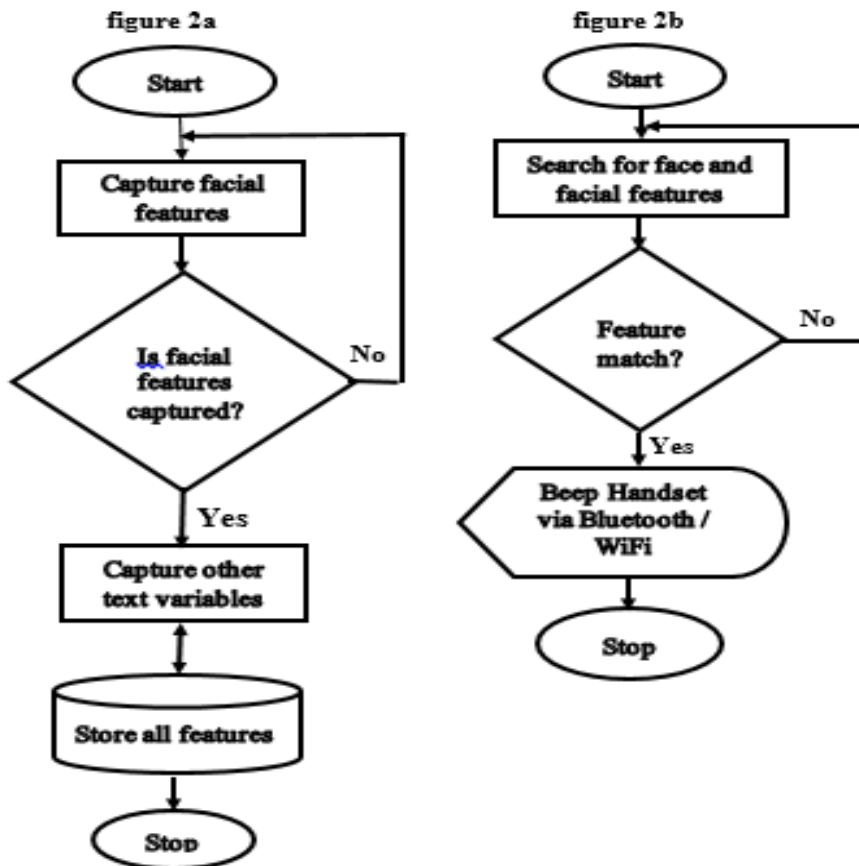


Fig 2 (a, b) CPPCSSAM facial features extraction and verification/attendance register flowchart

V. RESULTS AND DISCUSSION

CPPCSSAM was able to capture human faces at various light resolutions. It was able to verify and authenticate individuals facial look for attendance register purposes from distance of capacity of camera used. During the system testing, cameras used was of maximum focal distance length of 75 meters in various degrees of angle of elevation and depression. COVID-19 prevention protocol compliant system for staff attendance management using non-contact techniques was able to enforce social distance, enhances performance, and update staff attendance record.

VI. CONCLUSION

This paper presents a COVID-19 prevention protocol compliant system for staff attendance management using non-contact techniques (CPPCSSAM). The system was designed by using the combination of several real time facial detection and recognition algorithms. The LUXDAN facial recognition SDK was adopted in the implementation of our research project. The replacement of traditional and fingerprint attendance management system by CPPCSSAM will effectively control major challenges posed by existing attendance management systems across Nigeria higher institutions of learning. CPPCSSAM will also prevent the spreading of contact based communicable diseases, and enforcement of social distances on campuses among other when adopted.

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APPRECIATION

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