A
Mini Project Report
On

FACE DETECTION

For
Partial fulfillment of award of the
B.Tech. Degree
in
Information Technology

2023-24

Name of Supervisor

Mr. Dheerendra Kumar Tyagi

Assistant Professor

Name Team Member(s)

Mohd Faisal Ali(2101920130106)

Mohd Yasir(2101920130107)

Department of Information Technology

G. L. Bajaj Institute of Technology and Management

Plot No 2, Knowledge Park-III, Greater Noida-201306

2023

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Declaration

I/We herewith declare that the project work conferred during this report entitled "**FACE DETECTION**" , in partial fulfillment of the necessity for the award of the degree of Bachelor of Technology in Information Technology, submitted to A.P.J. Abdul Kalam Pradesh Technical University, Uttar Pradesh, is an authentic record of my/our own work distributed in the Department of Information Technology & Engineering, G.L. Bajaj Institute of Technology & Management, Greater Noida. It contains no material antecedently printed or written by another person except wherever due acknowledgement has been created within the text. The project work reported during this report has not been submitted by me/us for award of the other degree or certification.

Signature:

Name:Mohd Faisal Ali

Roll No :2101920130106

Signature:

Name:Mohd Yasir

Roll No : 2101920130107

Signature:

Name:

Roll No :

Date:23/12/2023

Place: Greater Noida

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Certificate

This is to certify that the Project Report entitled "**FACE DETECTION**" that is submitted by **Mohd Faisal Ali(2101920130106),Mohd Yasir (2101920130107)**in partial fulfillment of the necessity for the award of degree B. Tech. in Department of Information Technology of Abdul Kalam Technical University, are record of the candidate own work distributed by him below my/our oversight. The matter embodied during this thesis is original and has not been submitted for the award of the other degree.

Date: 23/12/2023

Mr. Dheerendra Kumar Tyagi

(Assistant Professor)

Dr. P C Vashist

Head of Department

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Institute of Technology & Management

Department of Information Technology

Acknowledgement

We would like to express our sincere thanks to our project supervisor **Dheerendra Kumar Tyagi** and our Head of department Dr. P.C Vashist for their invaluable guidance and suggestions. This project helped us to understand the concept of machine learning and IOT. This project enriches our knowledge and experience of working in a team and a live project. Also, we would like to express gratitude to **Dheerendra Kumar Tyagi** for his/her help in preparation and overview of our project.

Lastly, we would like to thank all the faculties for providing their valuable time whenever needed for helping us carry on with our project.

Abstract

Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class.

Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stored in the database.

Any facial feature changes in the database will invalidate the matching process.over the past few years, face recognition has received significant consideration and appreciated as one of the most promising applications in the field of image analysis.

Face detection can be a substantial part of face recognition operations. According to its strength to focus computational resources on the section of an image holding a face.
The method of face detection in pictures is complicated because of variability present across human faces such as pose, expression, position and orientation, skin colour, the presence of glasses or facial hair, differences in camera gain, lighting conditions, and image resolution.

Chapter - 1: Introduction

Face detection -- also called facial detection -- is an artificial intelligence (AI) based computer technology used to find and identify human faces in digital images. Face detection technology can be applied to various fields -- including security, biometrics, law enforcement, entertainment and personal safety -- to provide surveillance and tracking of people in real time.

Face detection has progressed from rudimentary computer vision techniques to advances in machine learning (ML) to increasingly sophisticated artificial neural networks (ANN) and related technologies.

The result has been continuous performance improvements. It now plays an important role as the first step in many key applications -- including face tracking, face analysis and facial recognition. Face detection has a significant effect on how sequential operations will perform in the application.

In face analysis, face detection helps identify which parts of an image or video should be focused on to determine age, gender and emotions using facial expressions.

In a facial recognition system -- which maps an individual's facial features mathematically and stores the data as a faceprint.

Face detection data is required for the algorithms that discern which parts of an image or video are needed to generate a faceprint. Once identified, the new faceprint can be compared with stored faceprints to determine if there is a match.

Chapter - 2: Project Aim

The aim of this project is to identify or confirm an individual's identity using their face. Such systems can be used to identify people in photos, videos, or in real-time and it is a category of biometric security.

Objectives

1. Face detection can be applied for facial motion capture, or the process of electronically converting a human's facial movements into a digital database using cameras or laser scanners.

2. The digital database can be used to produce realistic computer animation for movies, games or avatars.

3. It can be used to auto-focus cameras or to count how many people have entered an area.

4. Can display specific advertisements when a particular face is recognized.

5. Can be used as a part of software implementation of emotional inference, which can be used to help people with autism to understand the feelings of people around them. The program "reads" the emotions on a human face using advanced image processing.

6. Face detection can be used to help determine which parts of an image to blur to assure privacy.

7. Provides accurate information about the face.

Motivation:

1. Security: Face detection technology can be used in security systems to identify individuals and prevent unauthorized access to restricted areas.

2. Surveillance: Face detection technology can be used in surveillance systems to monitor public spaces and identify potential threats.

3. Marketing: Face detection technology can be used to analyse customer demographics and behaviour, helping businesses to tailor their marketing strategies.

4. Personalization: Face detection technology can be used to personalize user experiences, such as suggesting content or products based on facial expressions or emotions.

5. Healthcare: Face detection technology can be used in healthcare systems to monitor patient health and detect early signs of diseases.

Overall, face detection technology has a wide range of applications across various industries and fields, making it an interesting and useful area of study for researchers and developers

Chapter - 3 : Problem Formulation

Problem statements

The problem is to develop a face detection algorithm that can accurately detect and locate faces in low-resolution images or videos, such as those captured by surveillance cameras or mobile devices.

This requires addressing challenges such as poor image quality, motion blur, and occlusions that can make it difficult to distinguish faces from other objects or background noise.

The developed algorithm should be able to handle low-resolution images with high accuracy and efficiency, and should also be able to handle real-time video streams.

The goal is to enable the integration of the face detection algorithm into various applications and systems that require accurate face detection from low-resolution images, such as surveillance systems and forensic analysis software

Chapter - 4 : System Analysis

Software Requirements

Client Side

1. Web Browser (Chrome, Firefox, Safari, Edge, etc.)
2. Internet connection

Company Side

1. Cmake
2. Face-recognition
3. Numpy
4. Open cv

Literature Survey

"A Survey of Deep Learning-based Object Detection" by Sermanet et al. (2013)

This paper provides a comprehensive survey of deep learning-based object detection methods, including both traditional methods using convolutional neural networks (CNNs) and newer approaches such as region proposal networks (RPNs). The paper covers the history, state-of-the-art techniques, and future directions of the field.

"Object Detection in 20 Years: A Survey" by Liu et al. (2020)

This paper provides a detailed survey of object detection methods over the past 20 years, including traditional methods such as Viola-Jones, HOG, and SIFT, as well as deep learning-based approaches. The paper covers the evolution of the field, current trends and challenges, and future directions.

"A Comprehensive Survey of Object Detection Techniques" by Raza et al. (2020)

This paper provides a detailed survey of object detection techniques, including traditional methods using feature-based classifiers and deep learning-based approaches. The paper covers the evolution of the field, state-of-the-art techniques, and future directions.

"A Survey on Face Detection in the Wild: Past, Present and Future" by Yang et al. (2019)

This paper provides a comprehensive survey of face detection in the wild, covering both traditional methods and deep learning-based approaches. The paper covers the evolution of the field, state-of-the-art techniques, and future directions.

"A Survey of Recent Advances in Object Detection" by Jain et al. (2021)

This paper provides a survey of recent advances in object detection, covering both traditional methods and deep learning-based approaches. The paper covers the evolution of the field, state-of-the-art techniques, and future directions.

Contribution of each student

1. **Research and Data Collection,** focused on researching different domains and collecting data from different applications and websites. All four of the team members worked together on collecting and curating a dataset of all the information.

2. **Presentation:** – the presentation was mainly done by our team member Shweta Prabhakar, who used certain applications like Canva to complete the project presentation.

3. **The Report Work and Synopsis –** The synopsis was a shortlisted summary of the entire project summarizing all the major topics in short and with point to point information. On the second hand, the Report was a detailed summary about all the actions and activity we did in this entire project, it contains brief information of the topics and the work that is being done in the entire project. The Report Work was done by team member Shambhavi Tiwari while the synopsis was prepared by our team member Sheetanshu Porwal.

4. **Python Modules:** These were the modules used to run and for the proper functioning of our project. The modules used were Numpy, Delib, Cmake, Opencv, Face recognition. The work of managing modules was done by our team members Mohd Faisal Ali and Mohd Yasir .

SOURCE CODE

```
import cv2
import face_recognition
import numpy as np

imgElon =
face_recognition.load_image_file('ImagesBasic/Elon
Musk.jpg')
imgElon = cv2.cvtColor(imgElon,
cv2.COLOR_BGR2RGB)
imgTest =
face_recognition.load_image_file('ImagesBasic/Bill
gates.jpg')
imgTest = cv2.cvtColor(imgTest,
cv2.COLOR_BGR2RGB)

faceLoc = face_recognition.face_locations(imgElon)[0]
encodeElon =
face_recognition.face_encodings(imgElon)[0]
cv2.rectangle(imgElon, (faceLoc[3], faceLoc[0]),
(faceLoc[1], faceLoc[2]), (255, 0, 255), 2)

faceLocTest =
face_recognition.face_locations(imgTest)[0]
```

```
encodeTest =
face_recognition.face_encodings(imgTest)[0]
cv2.rectangle(imgTest, (faceLocTest[3], faceLocTest[0]),
(faceLocTest[1], faceLocTest[2]), (255, 0, 255), 2)

results = face_recognition.compare_faces([encodeElon],
encodeTest)
faceDis = face_recognition.face_distance([encodeElon],
encodeTest)
print(results, faceDis)
cv2.putText(imgTest, f'{results} {round(faceDis[0], 2)}',
(50, 50), cv2.FONT_HERSHEY_COMPLEX, 1, (0, 0,
255), 2)

cv2.imshow('Elon Musk', imgElon)
cv2.imshow('Elon Test', imgTest)
cv2.waitKey(0)
  src:
url(https://img1.wsimg.com/gfonts/s/librebaskerville/v14
/kmKnZrc3Hgbbcjq75U4uslyuy4kn0qNXaxMICA.woff2
) format('woff2');
  unicode-range: U+0100-024F, U+0259, U+1E00-1EFF,
U+2020, U+20A0-20AB, U+20AD-20CF, U+2113,
U+2C60-2C7F, U+A720-A7FF;
}
```

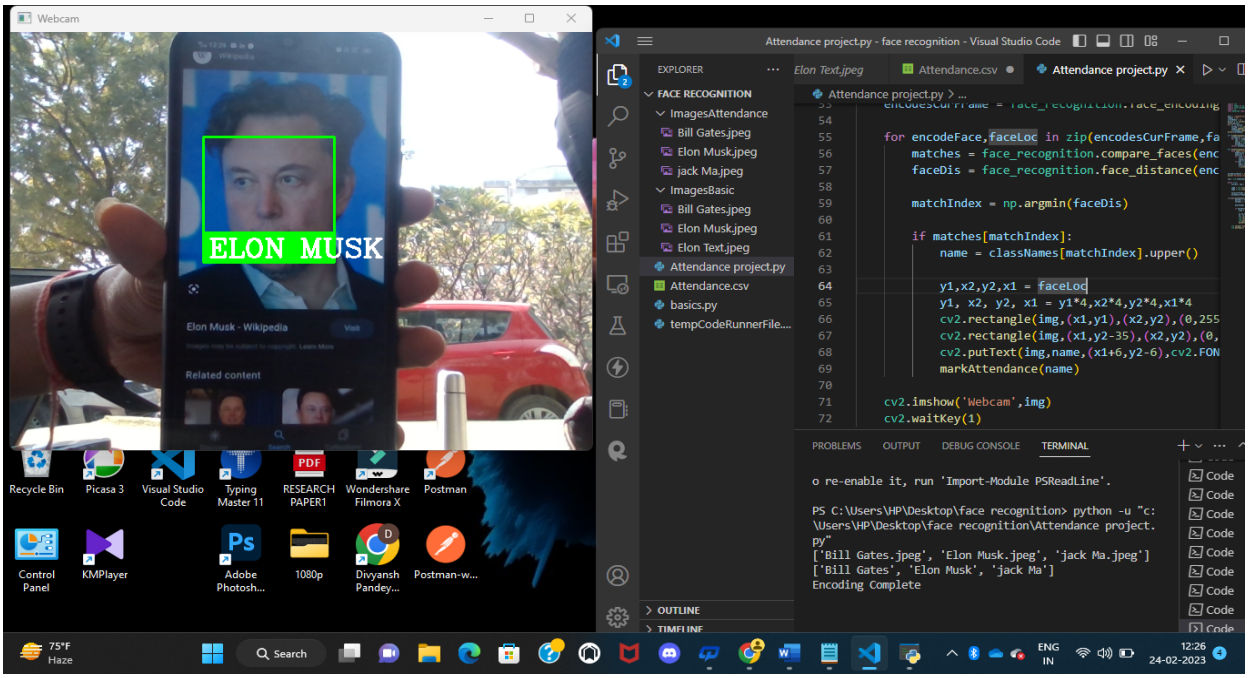
```
/* latin */
@font-face {
  font-family: 'Libre Baskerville';
  font-style: normal;
  font-weight: 400;
  font-display: swap;
  src:
url(https://img1.wsimg.com/gfonts/s/librebaskerville/v14
/kmKnZrc3Hgbbcjq75U4uslyuy4kn0qNZaxM.woff2)
format('woff2');
  unicode-range: U+0000-00FF, U+0131, U+0152-0153,
U+02BB-02BC, U+02C6, U+02DA, U+02DC,
U+2000-206F, U+2074, U+20AC, U+2122, U+2191,
U+2193, U+2212, U+2215, U+FEFF, U+FFFD;
}

import cv2
import numpy as np
import face_recognition
import os
from datetime import datetime


path = 'ImagesAttendance'
images = []
```

```
classNames = []
myList = os.listdir(path)
print(myList)
for cl in myList:
    curImg = cv2.imread(f'{path}/{cl}')
    images.append(curImg)
    classNames.append(os.path.splitext(cl)[0])
print(classNames)

def findEncodings(images):
    encodeList = []
    for img in images:
        img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
        encode = face_recognition.face_encodings(img)[0]
        encodeList.append(encode)
    return encodeList

def markAttendance(name):
    with open('Attendance.csv','r+') as f:
        myDataList = f.readlines()
        nameList = []
        for line in myDataList:
            entry = line.split(',')
            nameList.append(entry[0])
        if name not in nameList:
```

```
            now = datetime.now()
            dtString = now.strftime('%H:%M:%S')
            f.writelines(f'\n{name},{dtString}')



encodeListKnown = findEncodings(images)
print('Encoding Complete')

cap = cv2.VideoCapture(0)

while True:
    success, img = cap.read()

    imgS = cv2.resize(img,(0,0),None,0.25,0.25)
    imgS = cv2.cvtColor(imgS, cv2.COLOR_BGR2RGB)

    facesCurFrame =
face_recognition.face_locations(imgS)
    encodesCurFrame =
face_recognition.face_encodings(imgS,facesCurFrame)

    for encodeFace,faceLoc in
zip(encodesCurFrame,facesCurFrame):
```

```
        matches =
face_recognition.compare_faces(encodeListKnown,enco
deFace)
        faceDis =
face_recognition.face_distance(encodeListKnown,encode
Face)

        matchIndex = np.argmin(faceDis)

        if matches[matchIndex]:
            name = classNames[matchIndex].upper()

            y1,x2,y2,x1 = faceLoc
            y1, x2, y2, x1 = y1*4,x2*4,y2*4,x1*4
            cv2.rectangle(img,(x1,y1),(x2,y2),(0,255,0),2)

cv2.rectangle(img,(x1,y2-35),(x2,y2),(0,255,0),cv2.FILL
ED)

cv2.putText(img,name,(x1+6,y2-6),cv2.FONT_HERSHE
Y_COMPLEX,1,(255,255,255),2)
            markAttendance(name)

    cv2.imshow('Webcam',img)
    cv2.waitKey(1)
```

Model Working Check



Future Goals:

Expansion to other regions: Trace could aim to expand its services to other regions or countries, reaching more women who may benefit from its resources and support. This could involve partnering with local organizations and activists to better understand the needs of women in different areas and adapt its services accordingly.

Artificial Intelligence (AI) integration: Trace could explore the potential of AI to improve its services and provide more personalized and efficient support to its users. For example, AI-powered chatbots could provide instant assistance to users who are in distress or need help navigating the website.

Partnerships with law enforcement and emergency services: Trace could work to establish partnerships with local law enforcement agencies and emergency services to facilitate quicker responses to incidents and emergencies reported through the website. This could involve providing them with real-time location data and other relevant information.

Continued education and awareness: Trace could aim to increase awareness and education around women's safety issues through campaigns, workshops, and online resources. This could help raise public awareness and drive social change around issues related to gender-based violence and harassment.

Research and data analysis: Trace could conduct research and analysis on user data to better understand trends, patterns, and areas for improvement. This could involve analyzing incident reports, user feedback, and website usage data to inform future development and expansion of services

References:

- https://www.freecodecamp.org/news/tag/facial-recognition/
- https://www.geeksforgeeks.org/opencv-python-program-face-detection/
- https://www.techtarget.com/searchenterpriseai/definition/face-detection
- https://firebase.google.com/docs/ml-kit/detect-faces

Conclusion:

In conclusion, face detection can have multiple uses in domains like biometric security, animations, movies, games, avatars, advertisements, etc.
It can be utilised as part of software implementation of emotional inference.
which can be used to help people with autism in understanding feelings of people around them. It can be used as a security check in people's mobile phones, laptops and also in companies to identify their employees.