EasyChair Preprint

№ 10193

Face Detection Using Open-CV

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May 17, 2023

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Abstract:

Face detection in unrestricted conditions has been a trouble for years due to various expressions, brightness, and coloration fringing. Recent studies show that deep learning knowledge of strategies can acquire spectacular performance inside the identification of different gadgets and patterns.

This face detection in unconstrained surroundings is difficult due to various poses, illuminations, and occlusions. Figuring out someone with a picture has been popularized through the mass media. However, it's miles less sturdy to fingerprint or retina scanning. The latest research shows that deep mastering techniques can gain mind-blowing performance on those two responsibilities.

INTRODUCTION

In this paper, I recommend a deep cascaded multi-venture framework that exploits the inherent correlation among them to boost up their performance. In particular, my framework adopts a cascaded shape with 3 layers of cautiously designed deep convolutional networks that expect face and landmark region in a coarse-to-fine way. Besides, within the gaining knowledge of the procedure, I propose a new online tough sample mining method that can enhance the performance robotically without manual pattern choice.

PURPOSE

The purpose of this report is to follow up on a 10-week project on face detection and detectionand give insight on how feasible it is to use a face detectionattendance system in

a university environment.

SCOPE

The system should be built to be used for a prolonged period of time anywhere in the university campus where attendance would be tracked.

METHOD

Building such a system from scratch using the Scala programming language helped achieve a better understanding of the field as well as its advantages and disadvantages compared to other biometric authentication methods.

After some research, the decision to do face detection using an OpenCV library for Scala and face detectionusing Microsoft's Face API was unavoidable due to not having a system that could reliably do both detection and detectionin the project's circumstances.

FACE DETECTION IN OPENCV

OpenCV (Open-Source Computer Vision) is a library of programming functions for real-time computer vision. The face detection part of the project was made using an OpenCV Library for Scala.

The reason was that most Face APIs are restricted to doing detection on pictures only, whereas the project was required to have face detection done on a live video footage to speed up the process of checking student attendance and prevent queues before lectures.

The OpenCV library proved to be flexible enough for the project as it can accurately

detect a face in real time and highlight it by drawing a rectangle around the faces of the students by This all happens in a window separate from the face detectionso the lecturer can keep track of both students passing by while having their faces detected and the feedback fromthe detection part of the system. While faces are being detected, the application takes asnapshot of the live footage every second and then sends it to the detection system.

Some benefits of face Detection :

Efficient security

Facial detectionis a quick and efficient verification system. It is faster and more convenient compared to other biometric technologies like fingerprints or retina scans. There are also fewer touchpoints in facial detection compared to entering passwords or PINs. It supports multifactor authentication for additional security verification.

Improved accuracy

Facial detectionis a more accurate way to identify individuals than simply using a mobile number, email address, mailing address, or IP address. For example, most exchange services, from stocks to cryptos, now rely on facial detection to protect customers and their assets.

Easier integration

Face detection technology is compatible and integrates easily with most security software. For example, smartphones with front-facing cameras have built-in support for facial detectionalgorithms or software code.

some practical applications of a face Detection system:

Fraud detection

Companies use facial detectionto uniquely identify users creating a new account on an online platform. After this is done, facial detectioncan be used to verify the identity of the actual person using the account in case of risky or suspicious account activity.

Cyber security

Companies use facial detectiontechnology instead of passwords to strengthen cybersecurity measures. It is challenging to gain unauthorized access into facial detectionsystems, as nothing can be changed about your face. Face detectionsoftware is also a convenient and highly accurate security tool for unlocking smartphones and other personal devices.

Airport and border control

Many airports use biometric data as passports, allowing travellers to skip long lines and walk through an automated terminal to reach their gate faster. Face detectiontechnology in the form of e-Passports reduces wait times and improves security.

Banking

Individuals authenticate transactions by simply looking at their phone or computer instead of using one-time passwords or two-step verification. Facial detectionis safer as there are no passwords for hackers to compromise. Similarly, some ATM cash withdrawals and checkout registers can use facial detectionfor approving payments.

Healthcare

Facial detectioncan be used to gain access to patient records. It can streamline the patient registration process in a healthcare facility and autodetect pain and emotion in patients.

Facial detection works in three steps: detection, analysis, and recognition.

Detection

Detection is the process of finding a face in an image. Enabled by computer vision, facial detectioncan detect and identify individual faces from an image containing one or many people's faces. It can detect facial data in both front and side face profiles.

Computer vision

Machines use computer vision to identify people, places, and things in images with accuracy at or above human levels and with much greater speed and efficiency. Using complex artificial intelligence (AI) technology, computer vision automates extraction, analysis, classification, and understanding of useful information from image data. The image data takes many forms, such as the following:

- Single images
- Video sequences
- Views from multiple cameras
- Three-dimensional data

Analysis

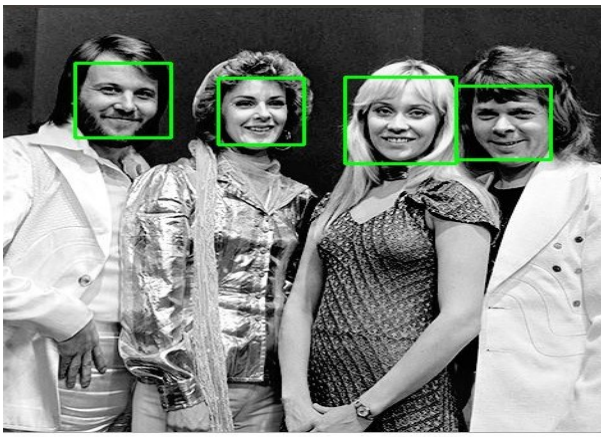
The facial detectionsystem then analyses the image of the face. It maps and reads face geometry and facial expressions. It identifies facial landmarks that are key to distinguishing a face from other objects. The facial detectiontechnology typically looks for the following:

- Distance between the eyes
- Distance from the forehead to the chin
- Distance between the nose and mouth
- Depth of the eye sockets
- Shape of the cheekbones
- Contour of the lips, ears, and chin

The system then converts the face detectiondata into a string of numbers or points called a faceprint. Each person has a unique faceprint, like a fingerprint. The information used by facial detectioncan also be used in reverse to digitally reconstruct a person's face.

Recognition

Facial recognition can identify a person by comparing the faces in two or more images and assessing the likelihood of a face match. For example, it can verify that the face shown in a selfie taken by a mobile camera matches the face in an image of a government-issued ID like a driver's license or passport, as well as verify that the face shown in the selfie does not match a face in a collection of faces previously captured.

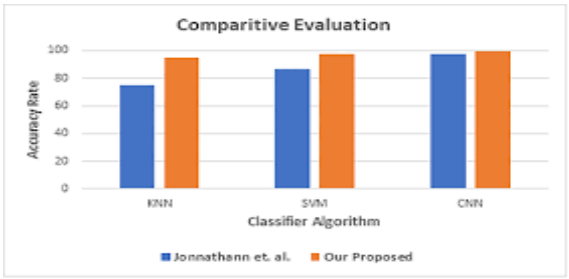


Facial detection algorithms have near-perfect accuracy in ideal conditions. There is a higher success rate in controlled settings but generally a lower performance rate in the real world. It is difficult to accurately predict the success rate of this technology, as no single measure provides a complete picture.

For instance, facial verification algorithms matching people to clear reference images, such as a driver's license or a mugshot, achieve high-accuracy scores. However, this degree of accuracy is only possible with the following:

- Consistent positioning and lighting
- Clear and unobstructed facial features
- Controlled colours and background
- Camera quality and image resolution

Another factor that impacts error rates is aging. Over time, changes in the face make it difficult to match photos taken years earlier.



CONCLUSION

A face detection and detectionsystem would certainly speed up the process of checking student attendance in comparison to other biometrics authentication methods and in the right circumstances it would be able to match their accuracy. Nowadays there are a wide variety of software, whether it is a Face API like Microsoft's or a library like OpenCV, that makes face detection and

detectionaccessible and reliable and is constantly improving.

Each softwareimposes various restrictions, such as the limited number of calls you can make to Microsoft's Face API. However, using more than one software can reduce these restrictions and lead to better results.

REFERENCES

[1] B. Yang, J. Yan, Z. Lei, and S. Z. Li, "Aggregate channel features for multi-view face detection," in IEEE International Joint Conference on Biometrics, 2014, pp.

[2] P. Viola and M. J. Jones, "Robust real-time face detection. International journal of computer vision," vol. 57, no. 2, pp. 137-154, 2004.

[3] M. T. Pham, Y. Gao, V. D. D. Hoang, and T. J. Cham, "Fast polygonal integration and its application in extending hear-like features to improve object detection," in IEEE Conference on Computer Vision and Pattern Recognition, 2010, pp. 942-949.

[4] Q. Zhu, M. C. Yeh, K. T. Cheng, and S. Avidin, "Fast human detection using a cascade of histograms of oriented gradients," in IEEE Computer Conference on Computer Vision and Pattern Recognition, 2006, pp.