

CHAPTER 1

INTRODUCTION

Computer vision is the field of science that deals with the automatic extraction, analysis, and understanding of useful information from a single image or a sequence of images. Analysis are some of the many features of computer vision and would help in addressing the issue of school security. This program will be able to send an early warning to the school's guidance counsellor if a student is showing prolonged signs of sadness or anger. Through these features, teachers may utilize face recognition to save time spent on current attendance methods and familiarize themselves and their students with computer vision and computer learning software. With this software providing motivation and a launching point, teachers can build curriculum and investigatory projects for students on Computer Vision and Machine Learning. Facial recognition and emotion analysis can help teachers monitor the changes in their student behaviors to increase productivity and student achievement.

Computer vision would enable schools to take attendance electronically with a facial recognition program. Not only will this save teachers precious time, it will also aid in educating teachers and their students about coding and the variety of applications possible with computer vision.

Although many schools have security cameras installed, their function is rarely anything more than recording video footage. These cameras can be used to implement computer vision in school settings. Teachers and staff can then use the data collected to monitor student engagement and emotion. The system should be built to be used for a prolonged period of time anywhere in the school campus where attendance would be tracked.

The camera that would be used for the face recognition should be placed in front of the lecture theatre door at a distance of 3 feet and a height of 65 inches. This would assure a better accuracy from the face recognition system. The pictures that are added to face lists should ideally be the same as the pictures used for student IDs since they are guaranteed to contain only one face. The application should be hosted on the schools servers to ensure consistency with the folders corresponding to each face list created and with the pictures in each folder corresponding to what faces each face list contains.

CHAPTER 2

LITERATURE SURVEY

Python was selected as the primary software language for this projects as it is very human-readable and accessible to beginner and intermediate coders. The most important dependency for this program is Open Source Computer Vision Library (OpenCV) which is commonly utilized for facial recognition purposes. OpenCV was used to implement proven facial detection and recognition methods like Haar features and Local Binary Pattern Histogram (LBPH) classification. Haar features are digital image features used in object recognition and face detection. First, the image taken from the video feed is made grayscale. Then, the program scans the face to compare the shadows and highlights on the image to the Haar features. Haar features are vital for the program to detect faces and an essential step in this facial recognition pipeline. LBPH is a method used for facial recognition, along with Eigenfaces and Fisher Faces. LBPH is well-adapted for feature extraction because it examines the texture and structure of an image in small, local neighborhoods of pixels. The main focus of LBPH is on the details rather than the big picture, defining image features in relative terms that make the algorithm less sensitive to changes in lighting in training and test images. This makes the program's ability to recognize a person more robust in varying lighting conditions.

Finally, in order to analyze student emotion, Microsoft Azure Face was used. Microsoft Azure is a growing collection of cloud services for building, deploying, and managing intelligent applications through a global network of data centers. Although it has many different fields and applications, this project only utilized the emotion analysis feature of the FACE application programming interface (API). It is this team's hope that this software tool will be further developed to include proprietary ML algorithms for emotion recognition that will eventually replace the Azure Face API query. In the meantime, the Azure Face API accomplishes our emotion analysis. In order to keep the code accessible to high school teachers and students who may be beginner or intermediate coders, the program balances the trade-off between implementing state of-the-art algorithms and maintaining a software architecture that is friendly to users of all levels of coding experience. The OpenCV library was used because it offers many beginner friendly tools and ways to incorporate proven computer vision algorithms. In future stages of development, more low-level control over classifiers and other machine learning algorithms used in facial detection and recognition will be introduced.

CHAPTER 3

SYSTEM ANALYSIS

3.1 Existing System

Biometrics is the technical term for body measurements and calculations. It refers to metrics related to human characteristics. Biometrics authentication (or realistic authentication) is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance.

Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioural characteristics. Physiological characteristics are related to the shape of the body. Examples include, but are not limited to fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition, retina and odour/scent. Behavioural characteristics are related to the pattern of behaviour of a person, including but not limited to typing rhythm, gait, and voice. Some researchers have coined the term behaviour metrics to describe the latter class of biometrics.

More traditional means of access control include token-based identification systems, such as a driver's license or passport, and knowledge-based identification systems, such as a password or personal identification number. Since biometric identifiers are unique to individuals, they are more reliable in verifying identity than token and knowledge-based methods; however, the collection of biometric identifiers raises privacy concerns about the ultimate use of this information.

Multimodal biometric systems use multiple sensors or biometrics to overcome the limitations of unimodal biometric systems. For instance, iris recognition systems can be compromised by aging irises and finger scanning systems by worn-out or cut fingerprints. While unimodal biometric systems are limited by the integrity of their identifier, it is unlikely that several unimodal systems will suffer from identical limitations. Multimodal biometric systems can obtain sets of information from the same marker (i.e., multiple images of an iris, or scans of the same finger) or information from different biometrics (requiring fingerprint scans and, using voice recognition, a spoken passcode).

CONCLUSION

There have been other implementations of computer vision attendance in school settings, but this software tool is unique in that it can do face detection, face recognition, and emotion analysis – all at levels accessible to beginner and intermediate coders. Although there are many potential applications of this program, the focus is in a school setting. On average, a teacher takes about 4.53 minutes to complete attendance and if it is assumed that a school has 180 school days with seven fifty minute classes, then each teacher spends 5,707 minutes yearly on attendance alone. In addition to being a viable time-saver, this software can be used to collect valuable data on student engagement and emotions. This program can utilize the cameras in schools if they're already installed, and if not, they need to be purchased and installed. Another possible future application of this program is to increase the security levels in schools.

If an unknown face enters the building, then the facility's administration will receive a notification stating that there is an intruder, along with a photo of the person's face. Without much modification, the code can be used as a visitor log in addition to an attendance and emotion analysis system. This software tool was designed by and for high school students and educators, with the help of university researchers. It is the authors' hope that other students, teachers, and researchers will join in further developing this open-source tool. As students download, implement, modify, and extend the code presented, they will develop knowledge and skills in computer vision, machine learning, and python programming while increasing the efficiency, quality, and safety of their own classrooms.

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