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The impact of Artificial intelligence on surveillance camera system "Facial recognition growth"

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ABSTRACT :
The fields of application of machine learning algorithms have no limits thanks to the focus of scientific research and its great impact on comfort in our daily life. Basically, with Artificial Intelligence (AI), the computer has become able to do tasks that were impossible in the past. The image processing strength and performance of the computer combined with Artificial Intelligence has contributed to the emergence of a new intelligence called facial recognition which contributed to the development of surveillance camera technologies and made them more effective.If, for example, When a company installs a surveillance camera without linking it to high-tech, its performance will still be limited in case the lighting level decreases , Blackout , Gradual change of lighting. Sudden change of lighting, shadows falsely detected as objects , and so on .
This is the aspect that our paper deals with: the importance of Developing intelligent software that allows a camera to learn the faces of employees of a company in order to note their entrance hours , tracking their movements in crowd .The paper will be divided as fellow : first General introduction about camera de surveillance system. Second, we are going to highlight how the Artificial intelligence develops facial recognition Third, presenting the impact of facial recognition in video, Fourth ,presenting of web application based on AI in order to enhance the system of camera de surveillance.
Key words: *object detection, camera de surveillance, AI, video ,facial recognition system,* Real-time analysis.

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I. INTRODUCTION

Intelligent video surveillance systems can monitor and respond to the situation in real time has increased as a result of the high cost and low efficiency of the existing surveillance system. Tracking objects with the aim of obtaining a recording of the moving object one or more targets in time and space. By locating and tracking moving objects in a real-time video sequence, we can develop a real-time alert system to improve ongoing monitoring system.

In addition , Computer vision is a branch of artificial intelligence, aims to enable a machine to understand what it "sees" when it is connected to one or more cameras. It can be used, among other things, for pattern recognition, which is to recognize a shape in an image after having saved it.

With the widespread use of digital images, motion analysis in videos has proven to be an indispensable tool for applications as diverse as video surveillance, video compression, medical imaging, robotics, etc. human-machine interaction, analysis of sports sequences, etc. In fact, the areas of movement in a sequence of images often correspond to events on which a vision system must focus.

1.1**The video surveillance system:**

Fig.1 Video surveillance system

Video surveillance is a system of cameras arranged in a space to be monitored. These cameras are linked to a computer system that allows the processing and analysis of the data received. The first video surveillance system was designed in Germany in 1942 by Siemens AG for the purpose of observing rockets. Since then, video surveillance systems have evolved considerably. Data analysis and integration is becoming more automated and requires less human intervention.

There are three types of video surveillance:

Observation video surveillance: it aims to monitor movements in a given location, without recording and processing personal data. This is particularly the case with cameras that control traffic and allow precise analysis of traffic in places where they can be placed.

Deterrent video surveillance: its aim is to prevent the endangerment and disturbance of the legal peace by acts involves using devices that record visual signals and make it possible the identification of the various people whose image was recorded.

Invasive video surveillance: which tends to monitor a particular person, without his knowledge, in the context of a police investigation. It can only be ordered by legal proceedings. The rules applicable to this type of situation are part of criminal procedure in general and are not dealt with in the Regulations

Structure of the video surveillance system:

A video surveillance system is generally composed of three modules :

The detection module: The objective of detection is to locate the individuals in the foreground in the scene for later analyzes. The detection operation can be performed on each image in the sequence or at the start of the sequence to initialize the tracking mechanism.

• The recognition module: a process consists in recognizing a target among a set of objects in a scene.

• The tracking module: The purpose of tracking is to determine the position of a target continuously and reliably throughout the video stream.

This generic model works under ideal conditions, but fails miserably in real life. The main challenges to be met by this model are: Blackout , Gradual change of lighting, Sudden change of lighting ,Shadows falsely detected as objects and An object that remains fixed for a certain time is treated as a background.

If stationary objects are moved from one place to another, Amiens places in which the objects have existed are falsely detected as objects.

The reason why scientists and camera surveillance experts decided to implement AI technology on Camera surveillance system in order to overcome these limits ,especially the face recognition technologies , because in crowded areas, nights , changing of lights camera won't be able to track faces and recognize them.

II. ARTIFICIAL INTELLIGENCE DEVELOPS AND FACILITATES FACIAL RECOGNITION :

When Artificial intelligence and deep learning technologies have arrived. They allow us to change the voices and faces on a video. So we won't be surprised that they also allow an unprecedented improvement in facial recognition technologies. So far, facial recognition has worked well with static faces. With artificial intelligence, surveillance cameras learned how to recognize individuals in motion, walking or driving their vehicle, on videos as well as on photos. The Chinese are at the forefront in this area. Last April, the young Chinese start-up Sense Time announced a fundraising of 600 million dollars (521 million euros) thus becoming

the most valued artificial intelligence company in the world. It did so again this summer with the announcement of the injection of a billion dollars by the Japanese Softban.

By the time Face recognition using artificial intelligence saw another achievement at the Stanford Research Institute, where the innovation demonstrated to outflank people as far as the precision of acknowledgment.

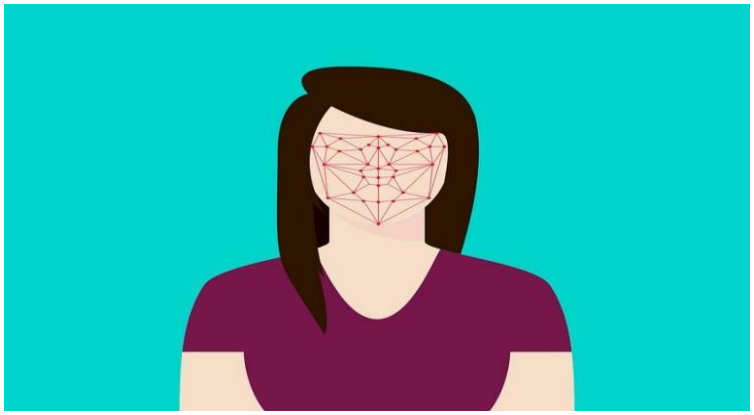

Fig 2 An illustration of face normalization (Photo credit: Pixabay

Table 1 ,Timeline of Face Recognition Feature and AI

Year	**AI Face Recognition Feature and AI :**
1960	Woodrow Wilson Bledsoe makes first manual estimations utilizing electromagnetic heartbeats.
1970	Researchers :Goldstein, Harmon, and Lesk set up 21 purposes of facial estimation.
1988	Kirby and Sirovich set up standardized face pictures utilizing less than 100 purposes of facial estimation.
1991	Turk and Pentland's design first rough programmed face discovery from pictures.
1993	Advanced Research Projects Agency (DARPA) makes the main fundamental information base of facial pictures.
2002	A face acknowledgment information base of 856 individuals is utilized at Super Bowl XXXV. The trial comes up short.
2003	DARPA information base moves up to 24-digit shading facial pictures.
2004	National Institute of Standards and Technology makes the NIST test.
2009	Pinellas County Sheriff's Office makes a criminological information base.
2010	Facebook makes picture personality auto-labeling utilizing face acknowledgment.
2011	Panama Airport introduces the first face acknowledgment reconnaissance framework.
2013	Face First arrives at compelling continuous versatile match alarms over cell association.
2014	Automated Regional Justice Information System (ARJIS) sends a cross-organization framework in southern California, sharing criminal face acknowledgment information across nearby, state, and government offices.
2016	U.S. CBP conveys leave face acknowledgment at Atlanta Airport.
2017	IPhone X turns into the world's top-selling telephone with face acknowledgment access control.
2018	Face First accomplishes 150,000 facial purposes of estimation, including the capacity to decide character from 90-degree profile pictures.
2018	Japan reports that it will utilize face acknowledgment to confirm the character of competitors at the 2020 Olympic Games

III. FACIAL RECOGNITION IN VIDEO :

Facial recognition is a technology combining biometric techniques, artificial intelligence, 3D mapping and deep learning to compare and analyze a person's face in order to identify it.

It owes its recent development to advances in the fields of Big Data, neural networks and GPUs. Currently it is considered to be one of the three most powerful biometric technologies for identifying an individual, facial recognition is also the fastest growing biometric technology.

The IA function enables cameras to automatically detect the scene and automatically optimize the settings accordingly to improve the detection capability of video frames. The camera automatically detects moving objects, speed of movement, faces and light intensity (day, night, vehicle headlights) in the video. These elements are generally difficult to perceive due to movement and exposure. The camera optimizes the settings in real time to get the best images of the subjects.

First, an individual's face is located on a photo or video. His facial features are then converted into data, and that data can then be compared with the facial features entered into a centralized database.

Typically, current facial recognition software analyzes around 80 facial features, also known as nodal points. These characteristics include the distance between the eyes, the length of the nose, the shape of the cheeks, the depth of the eye sockets, or the width of the jaw.

Second , These traits differ on each individual, which is why facial recognition can accurately recognize a person. The points collected in this way are measured by creating a digital code called a faceprint, allowing the face to be represented in a database. The most recent new technologies are based on the texture of the skin, specific to each individual, for even more precise results.

To be able to instantly detect a face, facial recognition systems are based on artificial intelligence. Thanks to Deep Learning, algorithms are trained to recognize human faces from numerous photos and videos. Many companies train their neural networks on the billions of photos of faces stored on the internet by Flickr, Instagram, Facebook or even Google.

How is facial recognition used around the world?

It is now estimated that facial recognition systems deployed at US airports and other processes have captured and stored the facial data of more than half of US citizens. This information, stored in a centralized database, can be explored freely by the authorities. In more than half of the big cities, the police are equipped with body cameras allowing facial recognition in real time.

In Europe, outside of businesses and private businesses, facial recognition is used significantly less than in other developed countries. For good reason, the GDPR in force since May 2018 protects the biometric data of citizens. This is not the case in the United States, where there is currently no law governing the collection and use of such data.

Benefits of AI:

Facial recognition has several advantages. First of all, this technology helps increase the level of security in society when coupled with video surveillance. While cities are increasingly denser and more populated, this innovation helps maintain a level of security that peacekeepers can no longer provide on their own. It also helps simplify the authentication process on electronic devices such as smartphones, while increasing the level of security compared to other methods such as passwords or fingerprints. This is undoubtedly the main tangible benefit for the average consumer.

IV. DEVELOPING A WEB APPLICATION BASED ON AI IN ORDER TO ENHANCE SURVEILLANCE CAMERA SYSTEM :

These kind off applications are useful in work places when leaders , managers ,security it facilitate their tasks . for this case we applied this new technology in a camera de surveillance of company. And we have deduced the usefulness of this technology in facilitating the knowledge of movements, recording them and linking them to the working hours of the employees without relying on reception staff, as happens in traditional institutions.

This new application essentially enable to learn unfamiliar faces through a camera and store them in its database so that it can be recognized at any time. When recognizing an employee's face, she must immediately associate it with her personal and professional identity. It must also keep track of the time of its passage on the occasion of an entry or exit. The hours worked by an employee in the enterprise may be subject to overtime, which in certain grades must be paid in addition to the official salary. Unsuccessful and unjustified hours of work should also be counted. A personnel manager or human resources manager whom we consider administrator must be able to manage these reports using a dashboard via a web interface. Likewise, an employee must be able to track their absence or overtime status via a mobile interface .In short, the Check- in application will be requested by an administrator and an employee.

Regarding the administration:

Authenticate: The administrator can access his account with a specific email address and password.

• Manage employee accounts:

- Add an employee: the administrator will have the possibility to add a new employee. If an employee is absent the day the admin adds it to the database, they can add the text data without including the required photos. He will have the possibility to capture the photos soon.
- Delete an employee: the administrator will have the possibility to delete an employee permanently from the list of employees.
- Consult employee profile: the administrator will be able to consult the profile of each employee.
- Profile management: the administrator will have the possibility to update all the data of the employees apart from the number of the national identity card and the advance history. essence / absence of each.

Add employee images: The administrator must capture three images (front, right, left) for each employee to make it easier for the camera to get to know the employees.

• Manage statistics: The administrator will have the possibility to:

- Consult the attendance records and individual or departmental absence records.
- View the list of employees present or absent in real time.

- View the percentages of employee attendance and absence by period and by department.
• Manage employee salaries: The administrator will have the ability to:
- Consult the salary of each employee.
- Add bonuses.
- Modify Salary.
• Manage services: The administrator will have the ability to:
- Add a service.
- Consult the departments with the percentage of employees assigned to the department.
- Delete a service.
- Modify a service.

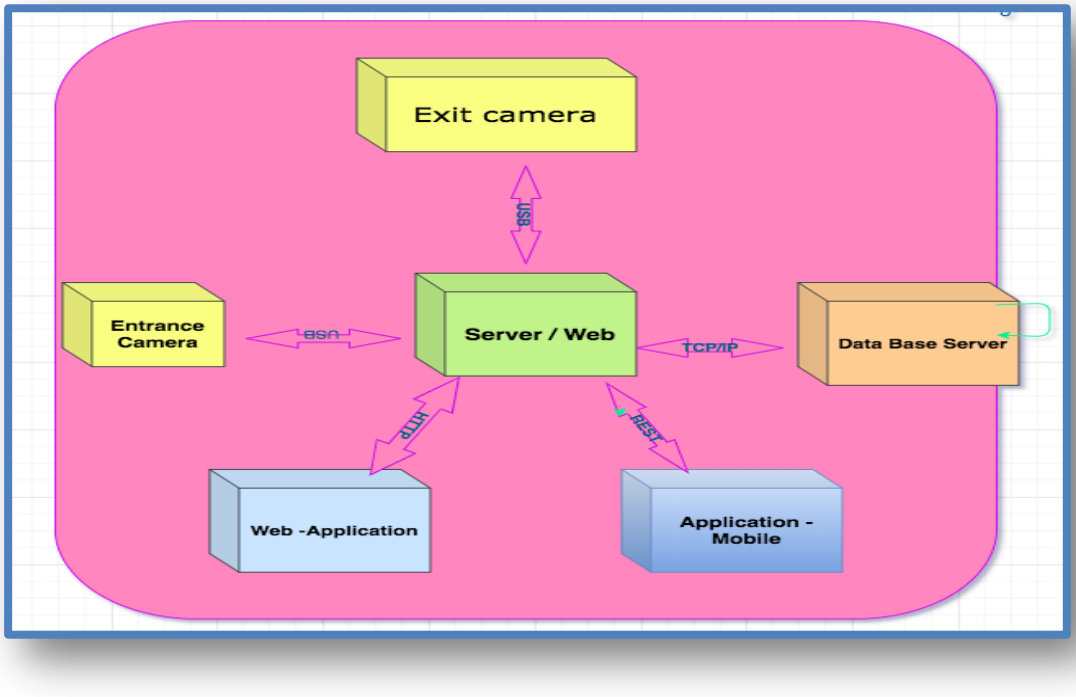

Fig 3 : Overall software architecture

Training the camera :
• **Open cv** to capture images from cameras.
• **Dlib face** detector to detect faces in an image.
• **Dlib face** recognition to extract the descriptor of a face.
• **Euclidean distance** to find the face closest to the target face.

Feeding the Camera:

Image capture: In order to open our camera and capture images, we must use Open Cv (Open computer Vision). OpenCV is an executable library that facilitates the recognition of moving images. It provides an interface for Python to capture video streams, and also to extract the images so that we can process them later .

Face detection: After reading the stream images, we need to detect the faces in each image in order, to identify them later. This task is quite difficult due to the complexity of its calculations, researchers are always trying to optimize its performance. This is where we come to using the Dlib Detector. Face-Detection-DataBase of dlib is a database created by David King the creator of the Dlib model. It encompasses millions of images from the many image databases available to the public such as VG, WIDER, ImageNet, VOC, AFLL ,. . . to properly train his model on facial detection .

Descriptor extraction: The facial recognition model of Dlib is a ResNet-34 network version or ResNet is a CNN-based deep learning model specified for image classifications . This network is trained on a data set of about 3 million faces, which makes the Dlib model well-functioning even on poor quality or low light images. This model will allow us to extract the descriptor from an image of the human face. The descriptor is none other than a 128-dimensional vector where the images of the same person are close to each other and the images of different people are very far apart. We must after its retrieval send this vector later to a database to calculate the Euclidean distance.

Fig 4 , Possible face positions

The position takes the form of 68 landmarks. These are points (X and Y coordinate) on the face such as the corners of the mouth, along the eyebrows on the eyes, etc.

Euclidean Distance: Having reached this level of computation Dlib has already helped us to define a 128-dimensional vector for a newly captured image.

We must now proceed to the similarity calculation between this vector and another vector image recorded in the database during the phase of learning the camera and recording employee personal data for the very first time. The similarity calculation is based on the calculation of the Euclidean distance between the vectors of the images recorded in the database and the image vector captured by the camera, in a space vector of 128 dimensions, then compare the Euclidean distance to a fixed distance threshold of 0.6. So if the Euclidean distance is small enough and less than 0.6 the threshold distance, then these two vectors are not for the same person otherwise they are for the same person. The Euclidean distance is calculated as follows:

$$\mathbf{AB=}\sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

With A (xA, yA) and B (xB, yB) are two points in the plane. In our case the Euclidean distance formula is predefined in python so we invoke the computation as follows:
distance.euclidean (V1, V2) With V1 and V2 are the two vectors containing the face descriptors.

V. CONCLUSION

Artificial intelligence techniques related to the field of image and video not only simplify the process of monitoring people and workers and identifying them, but it contributed to facilitating work, raising productivity, ensuring safety and quality, and these technologies have the ability to develop and reduce the cost of monitoring operations and Calculation of working hours in the occurrence that we have adopted as a "check in "system.

REFERENCES

[1]. https://www.scienceabc.com/innovation/facial-recognition-works.html
[2]. https://www.centrasecurity.co.uk/wp-content/uploads/sites/11/2010/12/thermal-network-diagram.png
[3]. https://accurascan.com/blog/detail/how-face-recognition-evolved-using-artificial-intelligence
[4]. http://www.securitysa.com/8841rSurveillanc/gphandlahdpffmccakmbngmbjnjiiahp/https://carnegieendowment.org/files/WP-Feldstein-AISurveillance_final1.pdf

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