

Advance Intelligent Video Surveillance System Using OpenCV

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Abstract: *In today's society, video surveillance for observing a particular area which includes hospitals, establishments, public parks, and buildings has become a need, where in each person desires to keep their belongings safe and relaxed. The growth in the urban population has ended in an increase in crime. For citizens, video surveillance has had a tremendous influence. Closed-circuit television (CCTV) is the most extensively used machine, but it's miles extra expensive and makes use of more strength and a garage. To address this trouble, we developed a complicated wise video surveillance device for places where human presence is abnormal. It isn't important to constantly screen the area with cameras in such situations. This consumes both the electricity and the storage space required for the footage. Open CV, a device gaining knowledge of software library, is used to put in force this gadget. The proposed gadget operates in such a manner that it captures video then processes frame by frame and starts recording whilst it detects human presence. The surveillance device can be activated if the cameras hit upon any movement. The counseled system gathers information and stores it in a neighborhood database. The video that becomes captured and stored can be utilized to identify the intruder and aid in his seizure. It could be useful in places where human presence is irregular, which includes bank vaults and houses.*

Keywords: Surveillance; Intruder; Open CV; Face Recognition

I. INTRODUCTION

In today's weather, everybody wants their valuables to be safe and relaxed. The improvement in the city populace has coincided with an increase in crime. The use of video surveillance to display a particular region, including hospitals, establishments, public parks, and buildings, has grown to be necessary. Residents had been substantially impacted by video monitoring. Video surveillance is required for preventing thefts, tracking day-to-day sports, protecting belongings, employee safety, public safety, occasion video surveillance, visitors monitoring, and so on. Sunlight hours and nighttime video cameras are to be had in shade, monochrome (with or without IR lighting), LLL intensified, thermal IR, analog and virtual, easy and complete featured. Cameras with built-in VMD can tell protection employees, improving their potential to discover and locate humans as well as be notified to interest at the scene. All of these forms of video cameras continuously reveal and document footage by specs, which consumes extra storage space and electricity. The value of preserving those structures up to date is extensively better. There's no want for continual tracking in some locations where individuals are abnormal, like homes and financial institution vaults. To cope with this problem, we advanced a complicated sensible video surveillance device for regions where human presence is abnormal. Our system changed into constructed using OPENCV. It has facial detection fashions that have been pre-educated. For detecting human beings, we carried out haar cascade classifiers. Those classifiers are a part of Open CV, which we can load into the assignment by way of calling a few strategies. The proposed gadget works by way of taking pictures and video, processing its body via the body, after which beginning recording whilst it identifies human presence. If the cameras discover any movement, the surveillance machine could be activated. The proposed system collects facts and saves them locally in a database. The intruder can be recognised and apprehended by the use of the video that became amassed and saved.

II. LITERATURE SURVEY

For protection functions, a smart monitoring device has been developed. The goal of the undertaking is to expand a machine that video displays units in the location in which its miles are mounted.[4] it can be used to detect movement in places where no person is permitted to enter. The movement has detected the use of a combination of a PIR sensor and a virtual digital camera. If movement is detected, the digicam will take pix. It suits the face in photographs with the information within the database through the use of the neighborhood binary sample histogram (lbph). If the face does not suit the database, he is considered unauthorized, and the buzzer starts evolved to ring, as well as the message/mail offerings to the proprietors.

This machine improves the security components of a domestic, allowing it to become a smart domestic.[1] to conform to all of those tendencies, the internet of things (IoT) and the raspberry pi are used. This protection mechanism signals the person to the difficulty, giving them a clean photograph of what's going on. The fireplace sensor detects any temperature increase within the dwelling room and updates the reputation in the URL provided to the consumer, resulting in the activation of a buzzer. The fuel sensor detects the presence of any gas leakage based totally on the intensity of the gas within the air. A dc motor turns on the auto door locking device. Between the sensors and the user, all statuses are transmitted through IoT. Paper three low-value smart protection digicam with night imaginative and prescient capability using raspberry pi and OpenCV

Context: the purpose of this system turned into to increase and build a low-value smart protection camera with night time vision competencies utilizing a raspberry pi (RPI) and a PIR sensor.[2]t has individual detection and smoke detection abilities, and for that reason, it may prevent crimes and fires. Raspberry pi (RPI) with a passive infrared sensor (PIR sensor) manages the shifting body, controls the alarm systems, and communicates the gathered photos to the person's e-mail address through BlueTooth. When an outsider is detected, the speech sounds: intruder may be performed as a part of the alarm gadget. This examination examines a smart surveillance monitoring gadget primarily based on the raspberry. In today's world, video surveillance is vital for protection. High-cease cameras are required in commercial locations, colleges and hospitals, warehouses, and different annoying indoor and out of doors environments. Modern-day answers use RFIDs, which might be pricey, and as a result, the safety enterprise as a whole grows extra pricey, forcing extra research.

III. PROPOSED SYSTEM

The proposed system is applied using OpenCV, which is an open-supply pc imaginative and prescient library. It handiest monitors data when a human is identified, lowering each strength usage and storage requirement

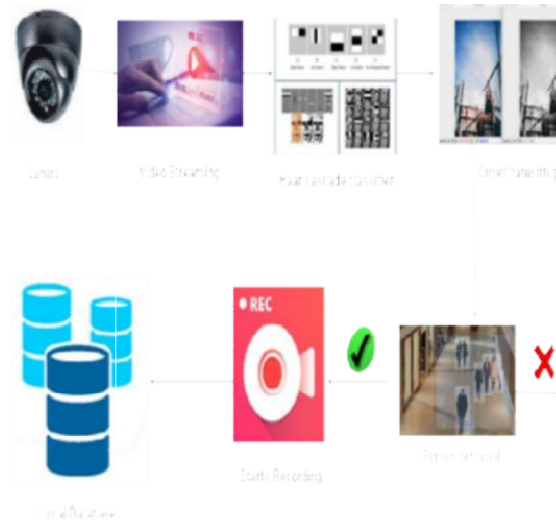
Method model of the mission

1. The camera is initially initialized.
2. The camera begins to look at the encircling area
3. If the camera identifies someone, the recording will begin
4. If the person is not detected for some seconds, the recording could be stopped.
5. The video recordings are saved to a local drive.

Architectural Diagram

The architectural diagram depicts the overall shape of the software device, in addition to the relationships, restrictions, and obstacles that exist between every element.

1. The digicam is, to begin with, initialized.
2. The digital camera starts to evolve to observe the encompassing location.
3. Load the haar cascade classifier
4. Convert the video frames into gray-scale photographs.
5. If the digicam identifies someone, the recording will start.
6. If the man or woman isn't always detected for some seconds, the recording could be stopped.
7. The video recordings are saved to a neighborhood force.



IV. EXPERIMENTAL METHODOLOGY

Face Detection Algorithms

Eigenfaces (pca set of rules)

Turk and Pentland proposed a face reputation technique in 1991 that depended on dimensionality discount and linear algebra ideas. This technique is computationally less pricey and easy to implement, therefore it changed into employed in a selection of packages at the time, together with handwriting popularity, lip studying, clinical photo evaluation, and so on. Pearson proposed PCA (main thing evaluation) as a dimensionality discount technique in 1901. It makes use of eigenvalues and eigenvectors to reduce dimensionality.

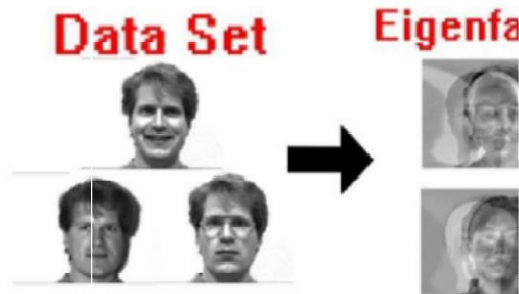


Fig 1: Eigen faces

Fisher faces

Fisher faces the development of the eigenfaces. This approach is primarily based on the idea that no longer all factors of the face are similarly great or beneficial for facial recognition. While we look at someone's face, we search for the areas with the most variance so that we can realize them. While paired with the PCA technique on the pre-processing step, the fisher faces set of rules has been reported to be ninety-three percent correct



Fig 2: Fisher faces

KERNEL METHODS: PCA AND SVM

PCA

PCA (the most important issue analysis) tries to reduce the number of source records while keeping the maximum applicable records while hiring inside the face reputation manner. It generates a set of weighted eigenvectors, which in flip generate eigenfaces, which might be big collections of various human face photos. Each picture within the education set is represented with the aid of a linear combination of eigenfaces. The PCA is used to extract those eigenvectors from an education picture set's covariance matrix. The vital additives of every picture are calculated (from five to two hundred). The closing components represent tiny distinctions between faces and noise. The important element of the unknown photo is compared to the components of all other pictures as part of the recognition technique.

SVM

A help vector system (SVM) is a system getting-to-know approach that distinguishes faces from "now not-faces" using a two-organisation type idea. An SVM version makes use of a labelled training information set for each class to categorise new take a look at the information. For face recognition, researchers use each linear and non-linear SVM training model. The non-linear training machine has a greater margin and superior identification and category consequences, in keeping with recent findings

LBPH Algorithm

Lbph (neighbourhood binary patterns histograms) is a facial recognition algorithm that uses lbp. The local binary sample (LBP) texturing operator labels pixels in a picture by using threshold each pixel's neighbourhood and treating the result as a binary variety.[4] on some datasets, it turned into additionally discovered that combining lbp with the histograms of oriented gradients (hog) descriptor boosts detection overall performance appreciably. An easy facts vector may be used to symbolise the facial snapshots.

Because lbp is a visual descriptor, it can be used for face identification.

Professionals

1. Expanded precision.
2. Simple to apprehend.

Cons

1. There may be nonetheless a loss of acknowledgment.
2. The time it takes to be acknowledged is substantial.

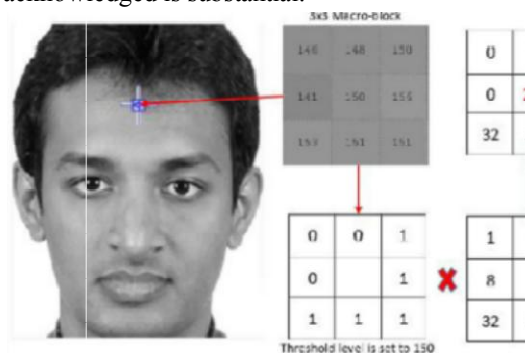


Fig 3: Facial Recognition through LBPH

Paul viola and Michael jones proposed an effective object popularity method primarily based on the haar function based on cascade classifiers in their 2001 paper "rapid item popularity with a boosted cascade of easy features." it's a system-learning-based method that uses a large wide variety of tremendous and terrible photographs to research a cascade feature. It is then carried out to different snapshots so one can locate gadgets. Face detection might be our focus here. To train the classifier, the algorithm requires a large wide variety of high-quality (face-related) and negative (non-face-associated) pics. Then we'll discern what features we can get out of it. Haar traits just like the ones offered underneath are hired for this. The image beneath indicates to us the kind of haar capabilities like edge capabilities, line functions, and four rectangle functions. These capabilities are used whilst detecting the faces of someone

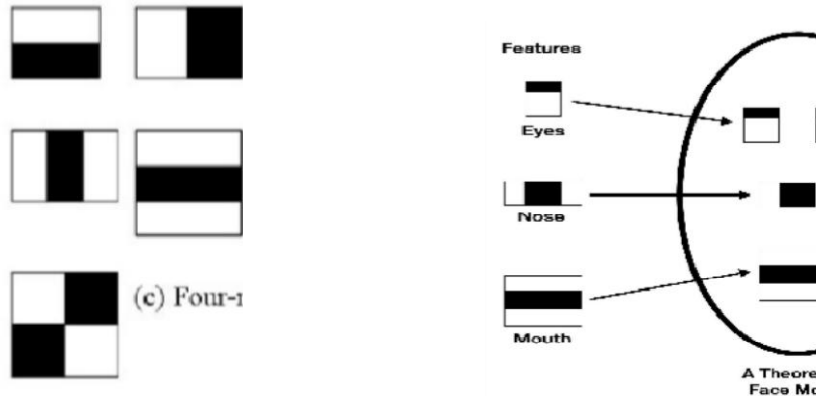


Fig 4: Theoretical Face Model

The non-face vicinity of a photograph makes up most people in the picture. As a result, having a simple technique to test if a window isn't always a face vicinity is a higher technique. If it isn't, toss it out in a single pass, and don't hassle processing it again. Alternatively, give attention to regions in which a face might appear. We can spend extra time checking possible face regions this way.

They got here up with the idea of a cascade of classifiers to do that. As opposed to making use of all 6000 capabilities in a single window, they may be divided into stages of classifiers and implemented one after the other

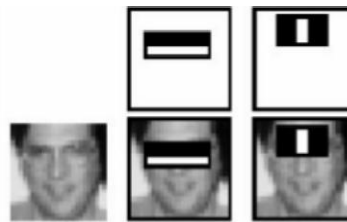


Fig 5: Detecting Facial Features Using Haar

If a window fails the primary check, it ought to be discarded. The last features aren't taken into consideration.

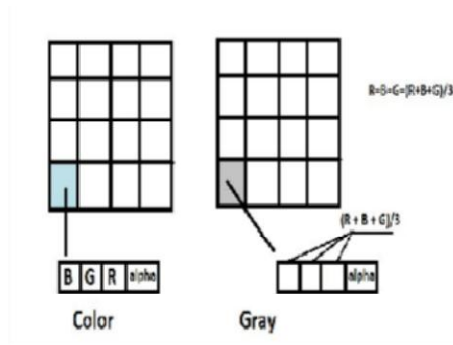
Due to using necessary pix, haar cascades are extremely brief for computing haar-like functions (also called summed location tables). They're additionally pretty exact at function choice due to the fact of the AdaBoost set of rules. They can stumble on faces in photographs independent of their function or scale, which is maybe the maximum vital function.

Gray Scaling Images

The method of remodeling a photograph from some other coloration space to grayscale is known as grey scaling.

Importance of grey scaling

- Reduced dimensionality: RGB pics, for an instance, have three color channels and three dimensions, whereas grey scale photos are single-dimensional.
- Reduces version complexity: use RGB images of 10x10x3 pixels to teach neural articles. There will be three hundred enter nodes within the input layer. For greyscale images, however, the same neural community will simplest require one hundred input nodes.
- For other algorithms to work: many algorithms, for example, are tailored to characteristics totally with grayscale pics. The pre-applied canny facet detection characteristic inside the OpenCV library only works on grayscale pictures



.Fig 6: BGR to Gray Conversion



Fig 7: BGR to Gray Image

V. CONCLUSION

The device makes use of a haar cascade classifier to locate faces. It's easy to position into motion. This approach is particularly beneficial in conditions where humans are abnormal but the place should be monitored. It can significantly lessen storage use, power consumption, and maintenance costs. To function properly, the whole device best required the setup of OpenCV. It's by far a value- effective era that is easy to put in force. This approach may be used by everybody, and it facilitates lessening the amount of storage space important for the pictures.

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