

Motion Detection and Multiple Faces Identification using Webcam

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Abstract – The Surveillance Cameras are the currently best-known security due to storing of live video stream into physical drive. By using Machine Learning and Deep Learning models and use of Database, we can make the surveillance camera security more advanced. In this project we built the system “Motion Detection & Multiple Faces Identification using Webcam”, where we use Webcam as Surveillance Camera and Machine Learning models like OpenCV, and Face Recognition for detecting motion and recognizing of multiple faces. For detecting motion of an object, the Gaussian-Blur method is used and for detecting and recognizing multiple faces with help of previously stored Facial data on Database. Haar-Cascade Classifier method is used. For storing Facial data, a MySQL database is used to get efficiency in recognizing faces. This system helps to provide an automated, and advanced security with less human interface by using the system’s Webcam.

Key Words- Machine Learning, Artificial Intelligence, OpenCV, Haar-Cascade Classifier, Gaussian-Blur, Face Recognition, MySQL Database, Deep Neural Network, Grey Level colour combination, RGB (Red, Green, Blue) colour combination.

1. INTRODUCTION

Nowadays, security becomes most important factor. When it comes to security everyone never compromises. They will always seek for security to protect their family members, home, company, etc., As technology become most interested topic, we can use technology to provide security. By using technology, we can use Voice Recognition, Fingerprints, Retina Scan, or Surveillance Camera System which can give best security. But the Surveillance Camera Security is the more strong and safest security, where it captures video frames and store them in hard drive, which can be accessed when there where a security breach.

As technology advances, the newly generated models of Artificial Intelligence and Machine Learning, which gives more accurate result than the traditional one. By using these models, we can provide more accurate, automated, and the more advanced security. The Machine Learning models like OpenCV,

and Face Recognition, which are used to detect motion and recognize the faces respectively. By using those models, we can provide the advanced security known as “Motion Detection and Multiple Faces Identification using Webcam” to home or organization. We can also use Surveillance Cameras rather than Webcam for better results. Also, by using these models, we are going to automate the system to detect and recognize faces on its own by taking help of MySQL database.

The rest of the article is structured as follows: in the next section the Literature Survey is given and afterward the conclusion is given.

2. LITERATURE SURVEY

M. Khan, S. Chakraborty, R. Astya and S. Khepra. [1] In this paper, the authors used Haar-Cascade Classifier to detect the multiple faces in single frame of a live video stream along, and Eigen Faces Recognizer method for recognition of faces using training dataset present in a hard drive. They use the training dataset in the Eigen Faces Recognizer to recognize the faces in live video stream. The Eigen Faces Recognizer takes lots of images to train the model and then starts to recognize the faces from it, which takes lots of physical storage and requires high performance computer to execute it effectively.

Shubham Mishra, Mrs. Versha Verma, Dr. Nikhat Akhtar, Shivam Chaturvedi, Dr. Yusuf Perwej. [2] This paper studies, the authors compared the first frame from live video stream of Webcam with authors frames using Gaussian-Blur method of an OpenCV. They use Gaussian-Blur method to reduce noise from the frames to make it easier for Image Segmentation and Background Subtraction methods. Image Segmentation method is used to divide the image into segments into its own set of properties with help of Thresholding Segmentation, to find the foreground objects and the background objects. Then Background Subtraction is used to compare background image with current image. The comparison is check with threshold value, were if threshold value is greater then motion is detected else no motion is taken. Here, it requires Threshold for both Image Segmentation and Background Subtraction method, which must be choose correctly and carefully otherwise, will rise an error in the system and overall result.

Ankita Rameshwar Mahajan and Vinod Agrawal. [3] In the cited paper, the authors used Background Subtraction method to detect the motion of an object by comparing current image frame with background image frame, where the Threshold value is taken to compare the images frames for detecting motion in live video stream. Where the Threshold value is much more important and must be choose correctly and carefully to avoid error in detecting the motions.

Diyasa G, Fauzi A, Idhom M, Setiawan A. [4] In this research paper, the authors used Haar-Cascade Classifier method to detect multiple faces using Haar-like Features, which makes it easier to detect multiple faces by converting colour RGB image (Red, Green, Blue, colour combination of an image) to Grey Level colour. The converted Grey Level images are in the binary value (0 or 1) so it helps to detect the multiple faces efficiently. Also, they used Convolutional Neural Network (CNN) a Deep Neural Network model to recognize the faces by taking the training dataset to train the model and recognize the faces in an image captured by the Webcam on basis of trained model. The CNN uses a lot of images for training, where it reduces the image size by taking kernel for filtering the image and a max pool layer to reduce the dimensions of image. This makes it easier to recognize faces more efficiently than any other method. The CNN is a Deep Neural Network, which is used to process the images and give the result according to the validation dataset and requires lots of computation power and a higher physical storage, high performance computer, and a high-end Graphical Processing Unit (GPU). Lots of computation power is required to run CNN model and only on a image frame not on the live video stream.

3. PROPOSED SYSTEM

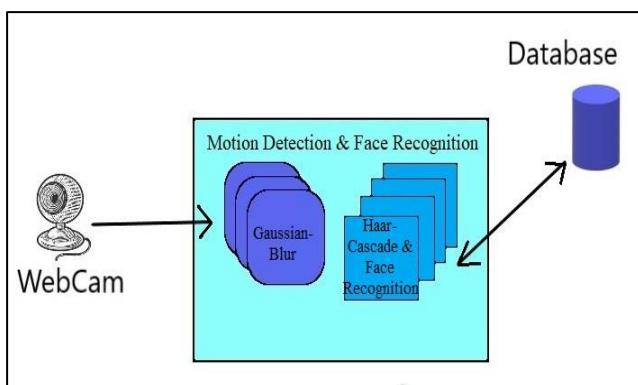


Fig -1. System Architecture

In the above Figure 1, the basic system architecture is shown, where the detection of motion and multiple faces detection and recognition is done simultaneously. The whole system is automated using Machine Learning models and takes less human interface. The system is divided into four parts:

- 1) Webcam
- 2) Motion Detection and Multiple Faces Identification System
- 3) Database

1) Webcam:

The Webcam is used to capture live video stream, so that system can detect motion, multiple faces and their recognition. Here, we can use Surveillance Camera as Webcam to capture the live video stream.

2) Motion Detection and Multiple Faces Identification System:

In this system, the input of Webcam is given, where frames are generated from the live video stream. Those frames are then converted from RGB (Red, Green, Blue colour combination) image frame to Grey Level image frame. The Grey Level images are binary images which can give better result when detecting the motion.

For the Multiple Faces Detection, a Haar-Cascade Classifier is used, where RGB frames are converted into Grey Level for better detect. Face Recognition method is used to recognize the faces by taking current detected face encodings and previously stored data into database.

3) Database:

For storing the facial data in to database, we use MySQL database for better manipulation and connectivity. The facial data is nothing but the encodings of facial detail like eyes, nose, and mouth shapes. MySQL database gives simple query structure and better manipulation and connect easily.

CONCLUSION

According to literature survey, we conclude that using the CNN model or the Eigen Faces Recognizer requires lots of training dataset and requires more execution time, computation power and a high-end computer with GPU enabled, just for recognizing the faces. For detecting the motion of an object, the Image Segmentation and Background Subtraction methods requires lots of computation power with high-end computers. It also takes more execution time than the Gaussian-Blur method.

In our project, we use Gaussian-Blur to detect the motion of an object rather than Image Segmentation, Background Subtraction or Thresholding. Gaussian-Blur method uses binary image i.e., Grey Level images to detect motion. Also, by using Haar-Cascade Classifier method, we had detected multiple faces at same time using Grey Level of image frames. For the Multiple Faces Recognition, we use Face Recognition module and MySQL database to recognize faces using previously stored data in database. This database can be upgraded using User Interface provided to register newly detected face. By using

Database and Face Recognition module, the recognition of multiple faces works smoothly and efficiently.

Overall, usage of Gaussian-Blur, Haar-Cascade Classifier, Face Recognition and MySQL database, the system works smoothly and also takes less execution time. Motion Detection model, Multiple Faces Detection Model, and Multiple Faces Recognition model works simultaneously and gives better performance. It doesn't require any type of training dataset or need to train the model. It doesn't store images having higher resolution, but stores images having lower resolution, which takes less physical storage than the Eigen Faces Recognizer or CNN model training dataset. Also, it stores the time of motion detected by the system into an Excel sheet in CSV file format.

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