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# SMART SECURITY SURVEILLANCE

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*Abstract* — **The whole global health system is currently crippled by the COVID-19 pandemic outbreak. It is now crucial to halt the illness from spreading. Wearing a mask, washing our hands often, and avoiding social interaction have all become top considerations throughout the world. The World Health Organization (WHO) strongly advises against spreading the new coronavirus by using a mask that covers the mouth and nose. The primary objective of Smart Security Surveillance is to detect face masks, Motion detection, and Name Detection of a person. The performance of these systems is insufficient for many applications. Face mask identification is more challenging when dealing with a variety of restrictions, such as environmental changes, which is one of the primary causes. After Face detection, Face masks detection is a process that is improved upon and made more reliable with the aid of OpenCV. OpenCV comes with a variety of helpful methods for item recognition and counting. Numerous industries, including transportation, health care, and environmental science, use object counting.**

*Keywords:* **Face Mask Detection**, **Motion Detection, Name Recognition, OpenCV, Image Processing.**

## I. INTRODUCTION

With the growth of technology, there is a growing worry for safety and security everywhere nowadays. The number of security cameras has lately grown in order to address this problem. Despite this, it is challenging to manually store and monitor data [1] continuously. Unexpected effects of the coronavirus vary among people. Mild to severe sickness will be experienced by the majority of infected persons. and recuperate outside of the hospital. Fever, a dry cough, and fatigue top the list of usual symptoms[2]. Therefore, using masks and hand sanitizers has proven to be successful in preventing the transmission of the virus. As a result, a face mask detection system is needed, which will inform the public and aid in the fight against the epidemic. In this research, we investigate real- time face mask detection with deep learning and OpenCV. Deep learning is a branch of machine learning that uses algorithms with human brain-inspired design. In many domains, deep learning aids in the breakdown of issues. Convolutional neural networks, image detection, and picture classification are all provided by deep learning (CNN). Computer detection and classification tasks primarily utilize convolutional neural networks (CNN). In this study, deep learning algorithms are utilized to distinguish between faces wearing masks and those who are not. To incorporate the optimal amount of Convolutional Neural Layers for precise detection, Convolutional Neural Networks (CNN) are utilized. A programming function library called OpenCV is primarily focused on real-time security system, machine learning, and image processing. The primary objectives of computer vision are to manipulate and extract data from a real-time source. It is applicable to automobiles with autonomous driving. The detection of faces, objects, and handwriting is done using OpenCV. It is crucial for both mask- and face-mask detection.

Many different persons name identification methods have been described in recent years by using databases. In contrast to human vision, a machine security system's artificial method of detecting motion was based on statistical backdrop modeling. Our strategy was to periodically take a photo using the camera (make it the current picture), compare it to a prior picture, and keep both if there was a noticeable difference; otherwise, we would release memory from the old picture and make the new picture the current picture.

Motion detection encompasses the recognition and documentation of the complete movement procedure. Automatically detecting movement in a certain area is the aim of motion detection [3]. Finding movement in a certain region is the aim of motion detection. In-camera geometry, this area is always represented by a zone of awareness known as the field of vision. It is also known as an environment that is monitored. In this instance, the environment with its moving objects and activity is the focus. A zone of interest, which is referred to as a moving object, might include a person, an animal, or an object.

## II. RELATED REVIEW ON LITERATURE

Many different moving object identification methods have been described in recent years. A strategy based on statistical background modelling was recommended by Mahbub et al. [4]. To find moving objects, this technique compares each edge segment of the current frame with each edge segment of the backdrop. However, this method is unable to identify a moving edge segment that crosses a background edge segment. The goal of Geetha Priya S et al[5] .'s You Only Look Once (YOLO) approach

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for object detection is to find things. This methodology offers a lot of benefits over other object detecting strategies. While other algorithms, like Convolutional Neural Network and Fast Convolutional Neural Network, only partially examine the image, YOLO does so by using convolutional networks to predict the bounding boxes and the class probabilities for these boxes. As a result, YOLO detects the image more quickly than other algorithms.

The authors demonstrated the results of adding several filters to a picture, such as colour conversion, grey scale, and dilation. To gauge how long the algorithms required to finish, the authors tested the features on three distinct smartphones. An instructional manual on how to use OpenCV for image recognition was written by the authors in [6].

The author in Atlm University's Mechatronics Engineering Department has built, constructed, and tested a facial recognition system. The system combines approaches for face detection and recognition in two areas[7].

For crucial industries like banks and enterprises, the authors want to create a good motion detection system. In order to determine the difference between the sampled photos, they start by extracting samples from a webcam that is capturing images. A counter is increased when they detect movement, and A beep and a message alerting a mobile phone that movement has occurred are sent when it reaches a specific level..

The Gaussian Mixture Model, a probability density function, served as the foundation for the authors' strategy to achieve this (GMM). The scientists changed the Gaussian parameters and component count of the traditional GMM method to shorten processing time. Each pixel in each frame was subjected to the authors' GMM method to create foreground-background segmentation. After defining the foreground and background, the authors transform the frame to binary, where the foreground (moving items) turns white and the background (still objects) turns black (none moving objects).The binary pictures are then subjected to filters by the authors to remove noisy elements as wind, light, and shadows.

## III. COMPUTER VISION

Computer vision (CV) is a subfield of computer science that focuses on giving computers the ability to understand visual data. Gerald Jay Sussman was given the task by Martin Minsky in the early 1970s or late 1960s to connect a computer to a camera and have the device report what it saw.

The field of research known as "computer vision" (CV) strives to develop methods that will enable computers to "see" and decipher the content of digital images such as photos and videos. It appears to be simple since everyone, even very young toddlers, can figure out the computer vision issue. Despite this, the issue is still largely unresolved due to both a lack of knowledge on biological vision and the intricacy of visual perception in a dynamic physical universe that is practically infinitely changing.

### 3.1 Relationship between computer vision and AI

As seen in figure 1, computer vision is a field of study that focuses on helping computers see. It is a multidisciplinary discipline that falls under the umbrella of machine learning and artificial intelligence, and it may make use of both specialised methods and generic learning algorithms.

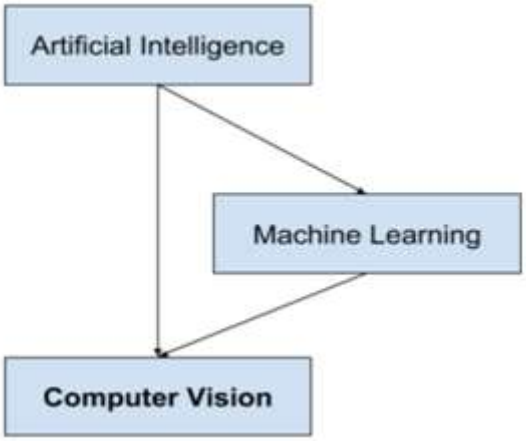


Figure 1 The Relationship between Computer Vision & AI

### 3. 2 Image processing

Computer vision is not the same as image processing. Image processing is the act of transforming an existing image into a new one, typically by streamlining or improving the information. It is a type of digital signal processing that is not focused on deciphering the content of the images. For some computer vision systems, image processing, such as picture pre-processing, may be necessary.

Motion detection can be used to automatically carry out a job when motion is detected. Motion detection, for instance, can be used in security systems to identify illegal activity or to illuminate a room when people enter it.

Human bodies emit infrared radiation when they produce heat, which an infrared sensor can detect. Image processing can identify motion by comparing two pictures [6] to one another. By comparing pixels in the same positions in the two photographs, this is done. There is no difference between two pixels if the photographs are identical. The pixel difference between certain pixels will be more than zero if the photographs are

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not identical. Differences in the pixels where the people arein the image will be visible when comparing an image of a room that is empty to an image of the same room with people inside.

## IV. OPENCV

The infrared radiation that human bodies release is detected using an infrared sensor. A free software library for computer vision and machine learning is called OpenCV (Open Source Computer Vision Library). Computer vision is essential to artificial intelligence or serves as its main foundation. Computer vision is vital to robots, self-driving automobiles, and image editing software. For taking, processing, and analysing photos, an Android application subsystem called OpenCV was used.

Additionally, these algorithms have MATLAB, Java, and Python bindings. It primarily concentrates on face identification, image processing, and video capture. The hardware acceleration of the underlying heterogeneous computing architecture benefits Open CV. Nearly 2,500 algorithms for various computer vision methods are available through Open CV. Because Open CV is a cross-platform library, it can run on any OS.

The library, which comprises a thorough blend of both traditional and cutting-edge computer vision and machine learning approaches, has more than 2500 optimised algorithms. For the purpose of processing images, OpenCV was developed. Each function and data structure was created with the image processing programmer in mind. Contrarily, Matlab is a fairly open-ended programming language. We can get just about anything in the world in the form of toolboxes. To do video tracking, an algorithm analyses successive video frames and outputs the movement of targets between the frames.

## V. MASK DETECTION METHODOLOGY

The detection of a face mask may be broken down into the following two steps: Face recognition and mask detection arethe first two. Viola-Jones method, a machine learning object identification approach, and Haar feature-based cascade classifiers are used with OpenCV to accomplish face mask recognition. Rapid Object Detection Using a Boosted Cascade of Simple Features, a 2001 study by Paul Viola and Michael Jones, introduced the face detection technique. We must carry out face detection for each frame of the video in order to achieve real-time face identification in a video. In figure2, face detection is displayed.

The image is now preprocessed and reduced in size to 224x224 pixels when the face is detected in it. Additionally, OpenCV spretrainedHaar course classifiers are used to identify the mouth and nose, which determines if a person is wearing a cover. If the person's lips and nose can be clearly seen, they are not wearing a veil, hence it is not certain whether they are covered.

**Figure 2**: Face detection.

## VI. EXISTING PROBLEM

This paper's major objective is to enable a basic camera attached to a general-purpose computer to identify the mask moving through it and to determine how long the face mask remained in the region where the camera is placed. Consequently, this program may be used for monitoring. Figure 2 illustrates how to take the first frame using a camera. This frame will serve as the initial reference. To detect motion, the phase difference between the new frame with the item and the baseline frame will be computed. The brand-new frames will be called Delta frames. Your delta frame will then be adjusted using pixel intensity. The improved frame will be called the Threshold. Then, to capture significant elements on the Threshold frame, you'll employ complex image processing techniques like Shadow Removal, Dilation, Contouring, and others. Here is anillustration of what you will achieve. The timestamps of the face mask entering and leaving the frame can be recorded. You'll be able to calculate the duration of screen time as a consequence.

**Figure 3.** The Detected mask

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## VII. PROPOSED METHODOLOGY

In our project, we aimed to develop a surveillance system that, in addition to motion detection, could alert the user of an incursion, record video from the instant the motion was detected, and send SMS messages to the user's mobile device.

### 7.1 Comparing phase

We compare the webcam's live photos to one another in order to detect changes in these frames and predict the presence of motion in order to determine whether any motion is present inthe live Images.

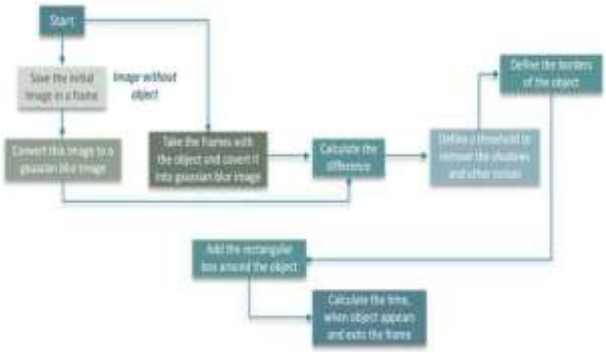


**Figure 4.** Flow Diagram

### 7.2 Image segmentation

The process of splitting a picture into parts, each with their unique set of attributes, in order to extract the target of interestis referred to as "image segmentation." The image segmentation technique used in this work is threshold segmentation. To put it another way, the foreground and background of an image are divided into two groups depending on the results of comparing a range in the picture to the threshold. The threshold segmentation procedure consists of two basic.

If we can locate a suitable threshold, we can modify the image for segmentation. An intelligent video surveillance system maybe used to identify moving targets in a variety of different ways, such as frame difference and background removal techniques. Threshold segmentation is composed of two basic procedures. First, establish the threshold. The second step, which is the mostcrucial one in partition, compares the pixel value to thethreshold value T to determine the threshold value.

Using the difference between the current picture and the background image, the background subtraction method is a method for identifying moving objects.

After subtracting the current image fk from the previously saved background image B, if the pixel difference above the bound threshold, the background pixel or the pixel to pixel on the moving target is identified. The background subtraction threshold must be properly selected in order to successfully identify motion. Motion detection's precision is crucial.

### 7.3 System indicating phase

The program contains an alarm mechanism because when motion is detected, the user may wish to get an SMS alert immediately away informing them that the software has detected an intrusion. This alarm system quickly creates an auditory alert signal in wav file format whenever any type of motion is detected. This helps at the moment to avoid any kind of security compromise. When motion is detected, the user is provided a location with photos of the trespasser, and at the same time, an SMS is delivered to the user's mobiledevice.

## VIII. NAME DETECTION

One type of biometric data processing that is easier to use and has a wider application than others, such as fingerprint, iris scanning, signature, etc., is face recognition. Face detection and identification are two areas where the system combines approaches. Face detection is carried out on real-time captured photos with no specific purpose in mind. The system employs the following procedures: white balance adjustment, skin-like area segmentation, facial feature extraction, and face picture extraction on a face candidate[7].

The initial stage in face detection and recognition system applications is transferring pictures from the sensor and computational media (environment) to the computer using a frame grabber. A face detection technique in a piece of software is used to extract each face from the input image, which is supplied as digital data.

Preprocessing the face picture, vectorizing the image matrix, creating the database, and classification make up the facerecognition phase. FeedForward Neural Network is used to classify the data (FFNN). Figure 5 illustrates the method for face recognition.

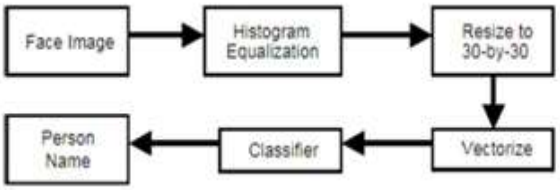


**Figure 5.** Algorithm for Face detection part.

## IX. RESULTS AND DISCUSSION

### 9.1 Motion detection

A home or business security system that may be very helpful in circumstances when security is a worry is the "Smart webcam motion detection surveillance system." The development of technology in the modern world has significantly increased the techniques employed by thieves and criminals to steal. As a result, surveillance

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systems need to develop in order to keep up with the world's changing needs. The most current tools used in the war against theft and devastation are video surveillance and monitoring.

The most important feature of digital video surveillance systems is motion detection. It enables the camera to just capture when necessary rather than constantly, which significantly reduces storage space. An alert may sound when unexpected motion is discovered. As a result, personnel are no longer necessary to constantly monitor. The motion detector satisfies the need for an inexpensive, minimal security system in daily life. The future holds great potential for computerised home security. Future is bright and made simpler with new technology.

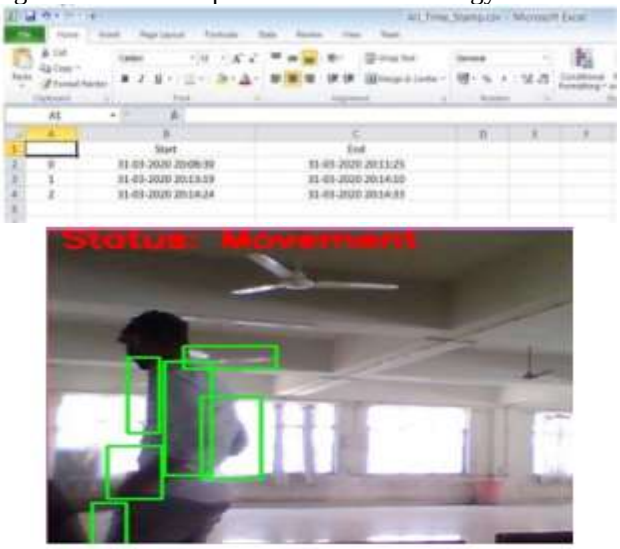


**Figure 6.** The Output Format

9.2 Mask detection

Using the Python computer language, real-time face mask identification with 98% validation accuracy was implemented. After a number of testing with a batch size of 32 and 20 repeatsof the epoch, this is the rate that stands out the most. The results show how well the trained model performs in terms of accuracy and loss.


**Figure 7**: Training loss and accuracy during model training.

9.3 Name detection

The creation of humanoid robots with more specific uses, such as Guides, Guards, Office, etc., is the ultimate objective of the Name detection project. The created system has been put through testing using a variety of live obtained pictures, and the outcomes are encouraging given the department's pioneering efforts. For improved performance, adjustments are needed. This chapter talks about the system's description and potential upgrades. We get the required results as shown in figure 8.

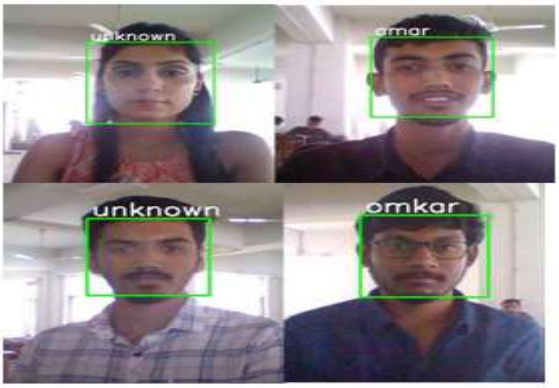


**Figure 8.** The Output of Name Detection

## X. CONCLUSION AND FUTURE WORK

The most modern technologies used in the struggle against theft and destruction are video monitoring and surveillance. With the help of technology, it is possible to see and record every square inch and passing second of the area of interest. The most important feature of digital video surveillance systems is motion detection. It enables the camera to just capture when necessary rather than always, which significantly reduces storage space. An alert may sound when unexpected motion is discovered. This frees up staff from ongoing supervision. The motion detector satisfies the need for anaffordable, basic security system in daily life. The future of computerized home security is quite promising. With new technology, the future appears promising and simpler.

This application may be used for surveillance to secure any location or significant item from illegal access and to track how long an unauthorized person or object tries to breach the perimeter or enter the protected region. Additionally, more beneficial techniques and algorithms might be used to enhance the processes, such as those that track the object that generatesthe motion events or those that employ optical flows, also known as image flows. There are indications of human movements here. However, in the future, it could be desirable to recognize the human body posture or gesture that the prototype system's algorithm captured.

Based on the findings of the study presented in this article, real-time face mask identification using OpenCV

and deep learning algorithms is a remarkable solution for straightforward facemask recognition. There are, however, a relatively small number of restrictions that may be readily solved in future work. The suggested approach is especially helpful for real- time applications that need face mask recognition, particularly in heavily crowded areas like schools, airports, and public areas. utilising a variety of IOT applications and deep learning approaches.

Face detection and identification techniques are used to achieve the aim. To discover, locate, and extract faces in obtained pictures, knowledge-based face detection techniques are applied. Skin tone and face characteristics are used as implementation techniques. Face recognition uses a neuralnetwork.

We can also use contactless temperature monitoring and mask detection, which can determine whether the mask is being worn properly and grant access only if both factors are met. If neither of these conditions is met, or if the body temperature is above normal, they can alert us, allowing us to take the necessary precautions to stop the spread of the Covid-19 virusindoors.

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## XII. REFERENCES

[1]. Real-Time Face Mask Detection using OpenCV and DeepLearning, Department of ECE, KoneruLakshmaiah Education Foundation, Andhra Pradesh, India.

[2]. An Intelligent Motion Detection Using OpenCV. International Journal of Scientific Research in Science, Engineering and Technology Print ISSN: 2395-1990

[3]. Y. You, S. Gong, C. Liu, "Adaptive moving object detection algorithm based on back ground subtraction and motion estimation", Int. J. Advancements in Computing Technology, vol. 5, no. 6, pp. 357-363, 2013 Conference,WWW2019,2019.

[4]. 9M. Murshed, A. Ramirez, O. Chae, "Statistical Background Modeling: An Edge Segment Based Moving Object Detection Approach", Proc. of IEEEInternational Conf. on Advanced Video and SignalBased Surveillance, pp. 300-305, 2010

[5]. Geethapriya. S, N. Duraimurugan, S.P. Chokkalingam, "Real-Time Object Detection with Yolo", International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958,Volume-8, Issue-3S, February 2019.

[6]. Marengoni and Stringhini. High Level Computer Vision using OpenCV. 2011. Universidade Presbiteriana Mackenzie.

[7]. Design a face recognition system , The 15th International Conference on Machine Design and Production June 19 – 22, 2012, Pamukkale, Denizli,Turkey.