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Suspicious Activity Detection Using Deep Learning In Secure Assisted Living

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Abstract — In 2019, Corona virus Disease (COVID-19) spread seriously in more than 180 countries, causing a global crisis. The lack of immunity to COVID-19 in the absence of aggressive treatment increases the vulnerability of the population. Due to the lack of vaccines, social distance (suspicious activity against COVID-19) is the only way to combat this pandemic. Motivated by this concept, this article describes a deep learning-based framework for automating social distance tasks with surveillance videos. The generated boundary box helps identify clusters or groups of people that meet the neighborhood properties calculated using the pair wise vectorization method.

Keywords—suspicious activity, deep learning

I. Introduction

Corona viruses are a large group of viruses that are harmful to humans and animals. Covid-19 is known as a member of a family of corona viruses that first spread to Wuhan, China, in December 2019. The epidemic has since rapidly affected several countries around the world and has been recognized by the Foundation. The World Health Organization (WHO) has declared: global epidemic of infectious diseases. Many countries are still suffering from COVID-19, but this pandemic has swept the world and social distancing has made the situation even worse as it has become one of the best ways to stop the spread of COVID-19. As its name suggests, it refers to social distancing and keeping people at a physical distance from each other. As the number of infected people is increasing rapidly around the world, maintaining social distancing is very important. According to WHO information, the corona virus is transmitted from person to person through sprays from the nose and mouth. In other words, social distancing is the best way to minimize physical contact with anyone who may have corona virus by maintaining a distance of at least one meter from each other. Relevant to measures to combat the spread of social distancing virus, suitable for those who minimize, avoid and maintain congestion, physical contact with people, including the public in public places (shopping malls, parks, staff, schools, airports, workplaces, streets, etc. Social distancing is essential, especially for those at high risk of serious illness caused by COVID-19. By reducing the risk of a viral infection from a sick person to a healthy person, the spread of the virus and the severity of the disease can be significantly reduced. The practice of maintaining social distancing at an early stage can play an important role in overcoming the spread of the virus and preventing its peak. In this way, maintaining social distancing can reduce the number of sick patients and reduce the load on medical facilities. It also reduces mortality by ensuring that the number of infected people (patients) does not exceed public health allocations. Over the past decades, computer vision, machine learning, and deep learning have shown promising results in many problems in everyday life. Recent improvements in deep learning have made object detection tasks more efficient, and these methods are often used to measure social distance between people in a moving frame. Grouping and distance-based methods are used to determine the distance between people. You will notice that most of the methods are developed using video footage from the front or the side. Second, the top-down approach, i.e. if a top-down approach is assumed, it can also be calculated to seek to improve the distance estimate and cover a large stage. This work used bird's-eye views to provide an effective framework for monitoring social distancing. Head view angle plays an important role in social distancing monitoring to calculate distance between people to provide better visibility and overcome congestion issues. Calculated telecommunications charges can help overcome energy consumption, human resources, and installation costs. This work aims to present a deep learning-based social distance monitoring framework for public campus environments from an aerial point of view. The current model (pre-trained for face-to-face or general display datasets) is first tested on the aviation dataset. Transfer learning is also used to improve the efficiency of detection models. As far as we know, this task may be seen as the first attempt to use an aerial perspective to monitor social distance for transitional learning. The detection model detects a person and provides information on the bounding box. After human detection, the Euclidean distance between each pair of centroids found is calculated using the detected bounding box and its centroid information. A predefined minimum threshold for social distance violation is specified using an assumption between pixels. To check if the calculated distance is less than the defined violation level or if the estimated information matches the violation threshold. The color of the bounding box was previously initialized to green. If the bounding box is located under the offending assembly, its color changes to red. Additionally, centroid tracking algorithms are used to track people who violate social distancing thresholds.

Therefore, artificial intelligence can play an important role in facilitating social distancing monitoring. As a subfield of artificial intelligence, computer vision has been very successful in solving many complex medical problems, showing great promise in chest CT scans or X-ray-based COVID-19 identification. and can contribute to social distancing. supervision too. Deep Neural Networks also allow you to extract complex features from your data so that you can analyze and classify these features to better understand your images. Examples include diagnosis, clinical management, treatment, prevention, and control of COVID-19. One possible challenge in the field is the importance of achieving a high level of accuracy in handling varying lighting conditions, congestion, and real-time performance. This work aims to provide a solution that addresses the challenges mentioned above. The main contribution of this analysis is highlighted as follows.

• This study aims to help reduce the spread of the corona virus and its economic costs by providing an AI-based solution that automatically tracks and detects violations of social distance between individuals.

• We are developing a powerful deep neural network (DNN) model to detect, track and estimate distances of people, called deep social. Achieve faster and more accurate results than modern field work.

• Performs dynamic real-time risk assessments to track people's movements and behaviors, analyze social distancing violation rates against all people in the field, and detect high-risk areas.

• Safeguard the validity of test results by performing extensive testing and evaluation on a variety of indoor and outdoor datasets beyond modern capabilities.

• The developed model is not limited to social distance monitoring, but acts as a general human detection and tracking system and can be applied to different applications around the world such as pedestrian detection in autonomous vehicles, recognition of human behavior and detection of anomalies and security system.

II. LITERATURE SURVEY

Related studies have proposed various methods for detecting human behavior in video. The goal of this task is to detect anomalies or suspicious events in video surveillance.

An Advanced motion detection (AMD) algorithm was used to detect trespassing in no-entry areas [1]. The first step is to extract objects from the image sequence in which they are found using background difference. The second step is to detect suspicious activity. The advantage of the system is that the algorithm works with real-time video processing and has low computational complexity. However, the system can also be run using advanced video recording in the surveillance area, which is limited in terms of storage services.

The semantic approach was proposed in [2]. The resulting video data was processed and the foreground object was determined by removing the background. The subtracted object is classified as alive or inanimate using a Haar-type algorithm. Object tracking is performed using a real-time blob matching algorithm. Fire detection was detected in this article.

Suspicious activity was detected in [3] based on the characteristics of movement between subjects. A semantic approach was used to identify suspicious events. An object tracking entity discovery and correlation technique has been used. Events are classified based on motion characteristics and time information. The computational complexity of the particular framework is low.

The university anomalies were detected by dividing them into zones, and the optical flow in each area was estimated using the Lucas-Kanade method. Next, they created a histogram of the amplitude of the optical flow vector. Software algorithms are used to analyze the video's content and classify events as normal or abnormal [4].

You can track people and detect anomalous events in your video scene. Detect people on video with background subtraction. Features were extracted using CNN and provided to DDBN (Discriminatory Deep Belief Network). Video with a specified tag Suspicious events are also proposed to DDBN Functions are also extracted. Features extracted using CNN and various suspicious features detected in the given video with features extracted from samples of classified videos for classified suspicious acts performed using DDBN. The activities are compared [5].

A real-time violence detection system using deep learning has been developed, and collective violence and athlete. In the Spark environment, images are extracted from video in real time. When the system detects something Soccer Violence Warns Security Guards. To prevent violence, the system detects video motion in real time and alerts security forces. The VID data set was used to achieve 94.5 accuracy in the detection of violence in football stadiums. [6]

By using a deep space approach to understand crowd behavior, we categorize videos into predicting future pedestrian routes, estimating destinations, and complete crowd behavior. There are three categories. Spatial information within the video frame is extracted using composite layers. The LSTM architecture is used to learn or understand dynamic time series behavior. The data sets used in the proposed system are PWPD, ETH, UCY and CUHK. The accuracy of the system can be improved by using a deeper architecture [7].

Daily human activities are recorded on video, and these videos are categorized as home, work, long-term care and support. Sports are made with deep learning. CNN is used for collecting input characteristics and RNN is used for classification purposes. They used the Inception v3, UCF101, and Activity net models as datasets. The level reached was 85.9% in UCF101 and 45.9% in Activity net [8].

A system has been developed that uses neural networks and Gaussian distributions to monitor student behavior during exams. It consists of three stages: face detection, suspicious state detection and anomaly detection. The trained model determines if the pupil is in a suspicious state, and the Gaussian distribution determines if the pupil is behaving abnormally [9]. The accuracy achieved is 97%.

Intelligent video surveillance for crowd analysis is discussed in [10]. This is a review of the relevance of CCTV analytics, the various deep learning models, algorithms, and datasets used in CCTV analytics in today's world.

Therefore, effective mechanisms are needed to alert security when suspicious behavior occurs.

III. PROPOSED SYSTEM

A. System Architecture :

The architecture consisting of different phases like obtaining camera frames, detecting pedestrians, Bird eye view, the distance between the people, and Calculate and display social distancing parameters

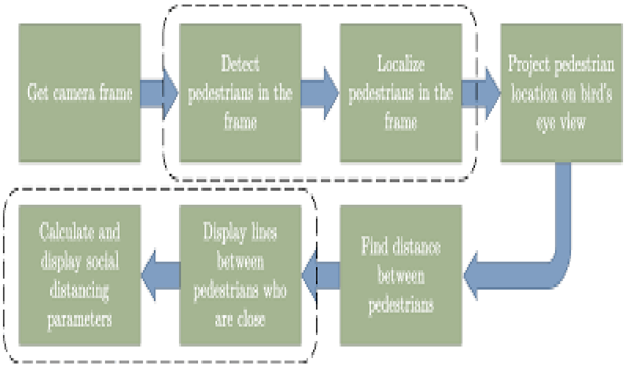


Fig-1

B. Video capture:

Installation of CCTV camera and monitoring the footage is the initial step in a video surveillance system. Various kinds of videos are captured from different cameras, covering the whole area of surveillance. The processing in our implementation is carried out using frames, so the videos are converted to frames.

C. Proposed Algorithm:

Step 1: Capturing the video and divided it into frames.
Step 2: For every frame detect the persons using trained CNN model
Step 3: Find distance from the camera to the midpoint of the person in the frame
Step 4: Calculate the distance between the persons
Step 5: If the calculated distance is less than required to be maintained then the alarm is ringed

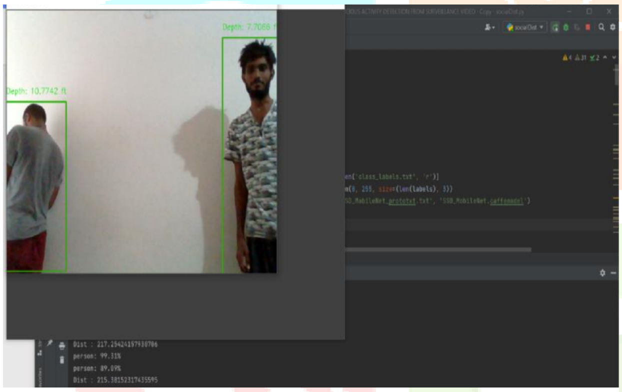
D. Person Detection:

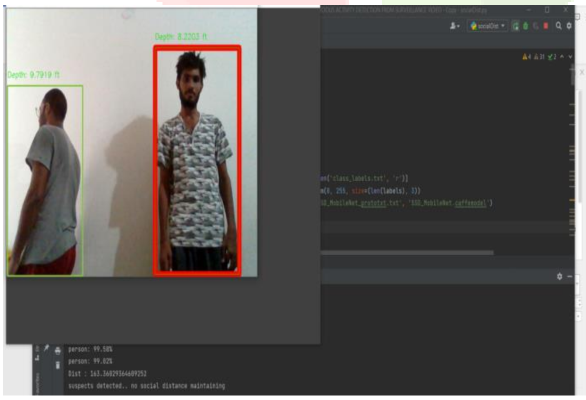
The goal is to develop a model that detects people (humans) with different types of challenges. To achieve this, we harness the power of cutting-edge research. Modern DNN-based detectors consist of two parts: a backbone for feature extraction and a head for object class and position prediction. Feature extractors tend to encode model input to reveal specific characteristics that help learn and discover related models associated with query objects. The DNN head classifies objects (people, bicycles, chairs, etc.) and calculates the size of the object and the coordinates of the bounding box. In general, there are two types of headers: single and double. The two-level detector uses local suggestions before applying the classification. First, the detector extracts a set of suggested objects (candidate boundary boxes) by selective search. Then resize it to a fixed size before converting it to the CNN model. This is similar to a detector based on R-

CNN50-52. The two-stage detector uses the area recommendations before the classification is applied. First, the detector uses an optional search to extract the proposed set of objects. Then resize it to a fixed size before feeding it to the CNN model. This is similar to an R-CNN based sensor. Despite the accuracy of the two-stage detector, these methods are not suitable for systems with limited computational resources. These detectors use regression analysis to calculate the size of the bounding box and interpret the class probabilities. It maps to a grid containing the pixels of the image and determines the probability that an object exists in each cell of the grid. This approach greatly improves speed and efficiency.

IV. RESULTS

The project aims to monitor the suspicious activities on campus using CCTV footage and alerts the security alarm when any suspicious event occurs. This was done by extracting features from the frames using CNN.





We've been detecting and tracking static and dynamic people in public places and tracking social distancing metrics since the COVID-19 era, a human detection model based on a network deep neural network called Deep SOCIAL. Many of the most modern spine, neck and head types have been evaluated and studied. We used CSPDarkNet53 backbone, SPP/PAN and neck SAM, YOLO head and Mish trigger features. Apple has been improved by applying full IoU loss functionality and Mosaic data extensions to MS COCO and Google Open Image Scientific multi-view datasets 2020, 10, 7514 24/29 The training steps that ultimately lead to efficient and accurate human detection equipment can be applied to a variety of environments using any type of surveillance camera. The proposed method is evaluated on the Oxford City Center dataset of 7,530 frames to detect and estimate distances of around 150,000 people. The system fixes many issues including shading, lighting changes, and partial visibility and has taken a huge step forward in terms of accuracy (99.8%) and speed (24, 1 fps) against the three proven states. The system operates in real time using a native GPU platform or a 10th generation or higher multi-core / multithreaded CPU platform. We apply geometric reverse perspective maps and SORT tracking algorithms to our applications to estimate distances between people, trajectories of people, assess risk of infection and analyze in favor of government and health authorities. I followed him. Deep SOCIAL provides an opinion-independent classification algorithm. Therefore, regardless of camera angle and position, the detection applies directly to the community of many researchers, not only in the fields of computer vision, AI and medicine, but also in public applications. other industries, especially in other industrial applications like pedestrian detection for driver assistance systems, Self-driving cars, public and crowd anomaly detection, security monitoring systems, sports, shopping malls, behavioral awareness in public places. In general, all applications discovered by humans are the center of attention.

V. CONCLUSION AND FUTURE SCOPE

The need for self-responsibility is evident in the aftermath of the global pandemic caused by the novel corona virus (COVID-19) infection. Scenarios mainly focus on accepting and complying with precautions and rules imposed by WHO. Social distancing is of paramount importance as COVID 19 spreads through close contact with infected individuals. Whether or not this study is focused on them, effective solutions are critical to monitoring large crowds and financial resources. Authorities can use CCTV cameras and installed drones to monitor human activity, manage and gather large crowds, and prevent illegal activity. As long as people keep a safe distance, they will be marked with a green light, and as the CCTV catches more and more crowds, a red light will appear, alerting the police assigned to the area and causing the situation. There is a possibility. Take the initiative right away. Controlling a large crowd is no easy task. This investigation will help you deal with the situation before it gets out of hand. Therefore, the implementation of this idea can reduce police efforts and allow full focus on monitoring the situation only in the poorest areas, allowing time to be used wisely and for a fair deal. You can save energy.

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