AIP Conference Proceedings

RESEARCH ARTICLE | SEPTEMBER 05 2023

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AIP Conf. Proc. 2754, 160002 (2023)
https://doi.org/10.1063/5.0167058

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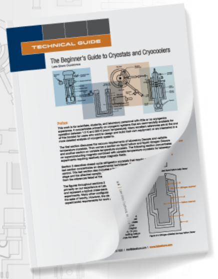

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Color Coded Social Distance Detector

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Abstract. The happening COVID-19 flare-up has caused a worldwide debacle with its dangerous growth. In the battle against the virus, social distancing (SD) has shown to be an extremely successful step to telephone back the growth of the infection. Because of this, medical experts and scientists are urging the population to reduce the physical contact between them to make sure that the odds of contacting the infection is reduced to its lowest without any major effects.To guarantee social distancing in open places and work terrain, we have created social distancing (SD) discovery aid that can check if individualities are staying down from one another by assaying live video courses from mosaic. For the case where people working in the surroundings, product lines, shops can incorporate this software to their surveillance camera fabrics and can screen whether individualities are staying down from one another or not. The system utilizes the YOLOv3 object acknowledgement worldview to fete people in video groupings. Our work identifies people using detected bounding box information. The distancing method used in our work is the Euclidean distance, which makes use of the bottommost centroid point of the detected people's bounding box to calculate the distance between two people. After the distance has been calculated and estimated accurately, we set a threshold after approximating this estimated distance to pixel. The threshold used in calculating the violation of the distance between persons is 6 feet (approx. 180cm). This violation limit is setup to check if the distance between the individuals is within the distance guidelines set by the government.The significant factors of our task are Detect people with the frame YOLOv3, Calculate distance between each mortal linked in the frame and show the number of individualities at high, low and at no danger.

Keywords. Social distancing, Risk factor, Deep neural framework.

25 January 2024 14:17:28

INTRODUCTION

With the upsurge of the new virus called COVID-19, social distancing (SD) is playing an important role to fight against it [8, 10]. Following distance among people in public areas such as railway stations, bus stations, universities, colleges, schools, and stationary shops are significant to help or reduce the spread of the dangerous viral disease [8, 10]. Following social distancing (SD) may continue in the future until the spread of the contagion is fully eradicated [10].Our work focuses mainly on identifying people who don't follow social distancing i.e., who don't maintain 2 feet distance among them, and also estimates the risk factor associated with it. Not only estimating risk for recorded videos, but our work also includes live streaming as an input to the machine for easy monitoring of people in the present scenario. With this added feature, the observer can actually guide people in red bounding boxes to maintain social distancing while monitoring the output video itself. The output video can also be recorded and stored for further usage.The epidemic covid19 caused huge goods to people and spread infection from one person to another. The symptoms of covid19 are veritably severe like severe cough and fever, which may transmit from one person to another causing trouble to everybody. Besides Vaccine, there's only one way with which we can stop transmission is Social Distancing [8, 10]. To maximize or control further we've to keep distance of 180 cm. Anyway, there's a drug like vaccine but we've to stop this chain of spreading covid19. It isn't possible to check on every person every time whether they're maintaining social distance or not. So, there's a necessity of a software which automatically checks whether a person is maintain social distance or not. Our design is a social distancing

International Conference on Materials, Processing & Characterization
AIP Conf. Proc. 2754, 160002-1–160002-5; https://doi.org/10.1063/5.0167058
Published by AIP Publishing. 978-0-7354-4634-2/$30.00

system grounded on artificial intelligence using the yolov3 algorithm. It's used to calculate the distance between people to calculate the threat factor and it'll indicate in colors who are at high, low and with no threat

EXISTING APPROACHES

This disease spreads from person to person via droplets generated when an infected person coughs or sneezes, which in turn make the other person also get infected with this disease. So, maintaining distance with others is really important. Presently, computer vision [3,12]; machine knowledge [7]; deep knowledge [7,11,12]; feature extraction [2,4,7]; object detection [13,14]; convolutional neural networks [5,7,14]; Artificial intelligence has shown exceptional results to several quotidian- life problems. To predict the distance between people, distance- predicated algorithms are used. Several developed countries are using GPS, technologies like WIFI, Bluetooth to cover the distance between two people. Some researchers are also using drones and other surveillance cameras to descry crowd gathering.

PROPOSED SYSTEM ARCHITECTURE

In the Proposed system, the work is developed using deep learning [7, 12], YOLO model [4, 6, 9], python to fetch the space among people. Here we will use the YOLOv3 (you only look once) model based framework [1, 11, 13]. From the result of these algorithms only, people class is filtered by ignoring object classes [7, 11, 13]. A centroid tracking system issued for tracking people in the scene. For implementation we will use Open CV. So, finally the result is based on training and testing of data. When a person crosses a particular threshold value, it indicates with red (High Risk) and when the person is in a safe distance, it indicates with green (No Risk). As the output, the model displays the information about the social distancing (SD) restrictions of the identified population by drawing bounding boxes and lines between the humans indicating the risk factor.

The below figure 1 describes the overall flow of the implementation in the form of flowchart which will help in understanding the architecture of the proposed system better.

25 January 2024 14:17:28

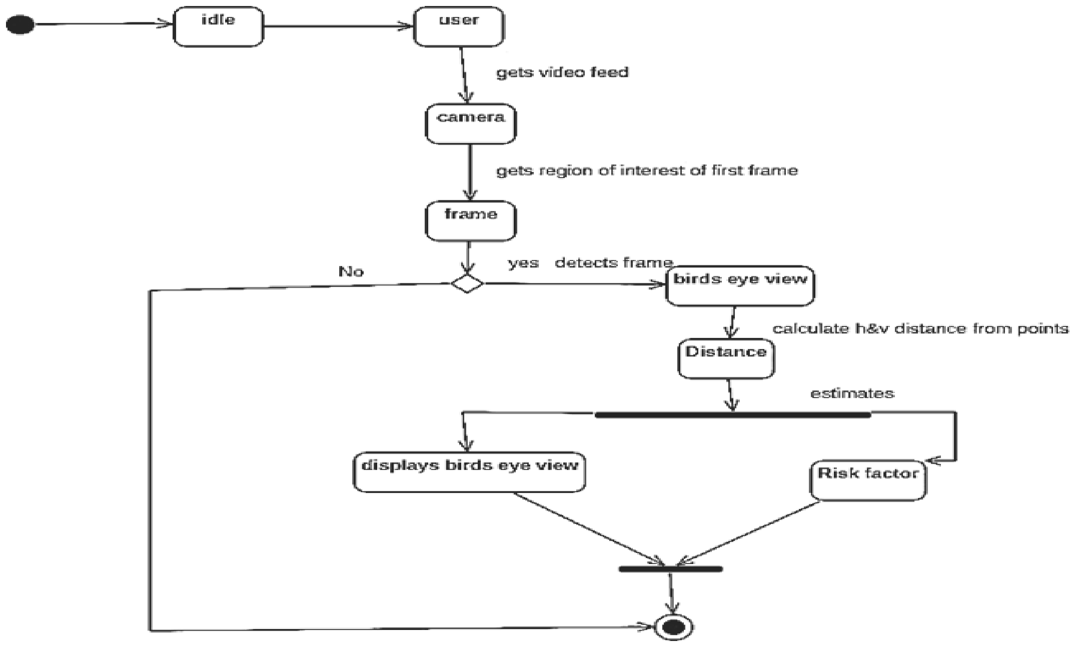
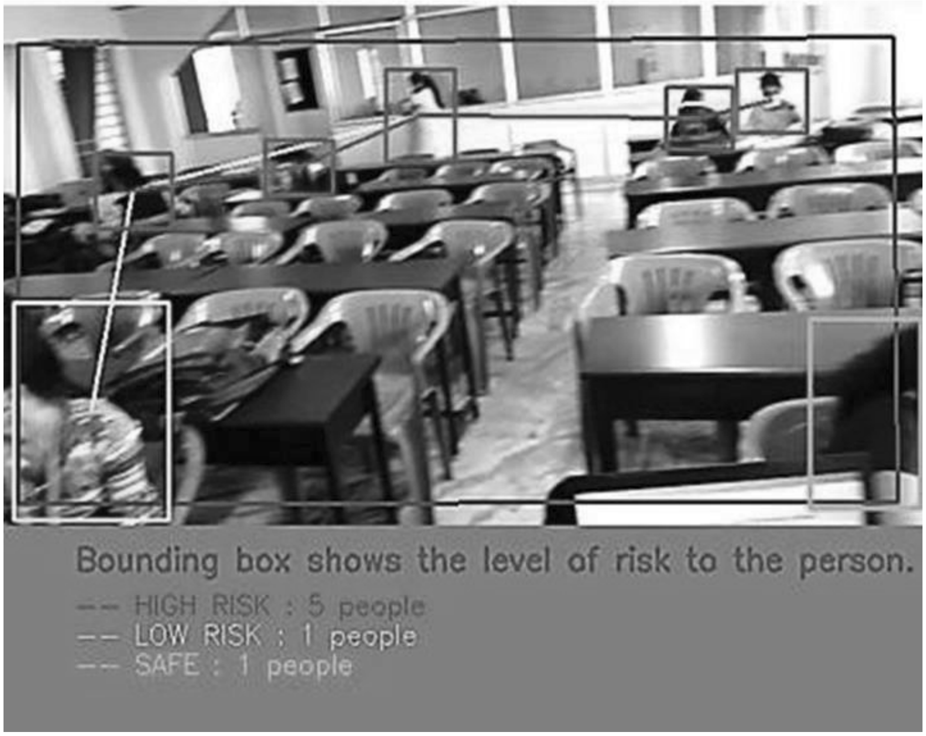


FIGURE 1. Flowchart of proposed system

EXECUTION

The execution of our work started with getting a video feed or enabling the camera for live streaming, which is given as input to the machine. Later, this camera video input is transformed to a bird eye view which is also known as the top-down view to make sure that the people to be detected in the video are consistent from all angles. This was followed by detecting the pedestrians in the input video and drawing a bounding box around each individual using an open-source framework based on Yolov3 architecture [11]. Afterwards, the distance among people is estimated by selecting the bottom most middle point of each person's bounding box. After computing the distance and scaling it by using the scaling factor in both horizontal and vertical direction, the risk factor for the detected people is estimated. The final result of our work is a live video of both the bird eye view of the input dataset and a video with color based bounding boxes for detected humans along with color based estimated lines according to risk factor between each pair of people. The color coding is as follows – red for high risk, green for no risk, and yellow for low risk.



Bounding box shows the level of risk to the person.
-- HIGH RISK : 5 people
-- LOW RISK : 1 people
-- SAFE : 1 people

FIGURE 2. Sample video output frame

25 January 2024 14:17:28

TABLE 1.Test Strategy and Approach

S.NO	Action	Expected Output	Output
1	Installation of Python version 3.8	Successful installation of Python.	Successful Installation of Python.
2	Installing and importing Open(CV2) 4.2.0, numpy1.14.5, argparse, yolov3.weights, yolov3.cfg files (for human detection)	Successful installation of all packages and files.	Successful installation of all packages and files
3	Getting the recorded video feed or the live video.	Successful dataset download.	Video Dataset successfully downloaded.
4	Executing the main python file.	Successful execution.	Executed successfully
5	Selecting 4 points on the initial frame of the input video to capture the Region of Interest (ROI).	4 points selected successfully.	Selected 4 points in pre-defined order without any error
6	Choose 3 more points to define 2 meters distance in 180 and 90 degrees such that: 1. Out of 3, 2 points should form 180 degrees line and 2. Remaining one point should form 90 degrees linewith the first point 3. Both these lines should be inparallel to ROI.	3 points selected successfully.	Selected 3 points in accordance to the conditions without any error.
7	Bird eye view and the final video with the risk factor should be displayed.	Successful display of bird eye view and the output video with the risk factor.	Successful display of the bird eye view of the input video and the final video with the risk factor

RESULTS

The test strategy and approach of the framework is associated with actions, expected output and the actual output associated with experimentation. The table 1 illustrates each test case along with their expected outcome and the final outcome after execution of the modules.

25 January 2024 14:17:28

CONCLUSION AND FUTURE SCOPE

Since, social distancing (SD) has proved to be an extremely successful step to reduce the growth of the contagious COVID-19 infection, our main goal is to help in decreasing the same by installing the developed software in CCTV cameras in front of small shops, theaters and temples within the range of areas covering the queue facilities etc.., to make sure that the individuals maintain at least 6 feet (approx. 180cm) distance between them at all times. The security or any related head manager who oversees the 24/7 security footage can monitor the individuals near their respective surroundings by warning them if they cross the violation threshold through mikes and speakers. The risk factor shown in the output video will help in recognizing the danger between different people and monitoring them will help in reducing the spread of the infection any further. The technologies and the architecture used will be able to give an accurate detection of the pedestrians and thereby concluding the risk factor between them by drawing colored bounding boxes representing the danger associated with the individuals. Last but not the least, the main motto of our work is to detect people with the framework YOLOv3, calculate distance between each human identified in the frame and ultimately show the number of individuals at high, low and at no danger.

The scope of the proposed system is to install the developed software in areas of low population density like local shops, gyms etc.., for easy monitoring of the individuals at risk. But the future scope of this work can include installing the same in areas with high population with added features like voice for warning the individuals to help in easy monitoring of the people.

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25 January 2024 14:17:28