

DEEP LEARNING BASED SOCIAL DISTANCING DETECTION USING YOLO AND ARDUINO

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Abstract— A methodology for social distancing detection exploitation deep learning to gauge the space between individuals to mitigate the impact of this coronavirus pandemic. The detection tool was developed to alert individuals to take care of a secure distance with one another by evaluating a video feed. The video frame from the camera was used as input, and also the ASCII text file object detection pre-trained model supported the MobileNetSSD algorithmic program was used for pedestrian detection. Later, the video frame was remodeled into top-down read for distance activity from the 2nd plane. the space between individuals may be calculable and any noncompliant combine of individuals within the show are going to be indicated with a red frame and line. The projected methodology takes input video from the user exploitation openCV and performs someone detection exploitation YOLOv4 algorithmic program. Later, the individuals detected are classified into safe and risk relying upon the center of mass distance between person-to-person exploitation geometrician distance. If the space is a smaller amount than the minimum threshold the person may be an aforementioned to be at a better risk else at lower risk. the chance count information is distributed to Arduino Uno (Micro-Controller) so as to supply Associate in Nursing alert system for higher violations within the frame. the chance count is that the main component for initiating Associate in Nursing alert system, if the chance count exceeds the minimum threshold, then the alarm starts to buzz showing a “VIOLATING RULES” message on liquid crystal display, else if but minimum

threshold then shows a “LOW RISK” message on liquid crystal display. Later, it provides a dashboard to show the findings from every frame, wherever it includes of a chart (Safe Vs Risk) and total detections at the side of low and insecure numbers. The result shows that the projected methodology is in a position notice the violations Associate in Nursing conjointly give an alert system to caution the individuals out there at public places.

Keywords—
YOLOv4, MobileNetSSD, OpenCV,
Arduino Uno, LCD.

INTRODUCTION

The World Health Organization (WHO) has declared Covid-19 as a pestilence thanks to the rise within the variety of cases reportable round the world. To contain the pandemic, several countries have enforced a internment wherever the govt enforced that the voters to remain reception throughout this essential amount. the foremost effective thanks to cut down the unfold of Covid-19 is by avoiding shut contact with others. To flatten the curve on the Covid-19 pandemic, the voters round the world are activephysical distancing. In fact, it's been ascertained that there are many folks United Nations agency are ignoring public health measures, particularly with relation to social distancing. it's apprehensible that given the people's excitement to begin operating once more, they generally tend to forget or neglect the implementation of social distancing. Hence, this work aims to facilitate the social control of social distancing by providing machine- driven detection of social distance violation in workplaces and public areas employing a deep learning model. within the space of machine learning and pc vision, there are completely different ways which will be used for object detection.

1. RELATED WORK

Yew Cheong Hou, et. al. proposed the Social Distancing Detection with Deep Learning

Model[1]. YOLOv3 algorithm was used to detect the pedestrian in the video frame. From the detection result, only pedestrian class was used and other object classes are ignored in this application. Hence, the bounding box best fits for each detected pedestrian can be drawn in the image, and these data of detected pedestrians will be used for the distance measurement.

Afiq Harith Ahamad, et al. proposed the Person Detection for Social Distancing and Safety Violation Alert based on Segmented ROI[2]. MobileNet Single Shot Multibox Detector (SSD) object tracking model to detect the people. Considering the accuracy and the time taken for the execution, SSD MobileNet V1 COCO is better for the proposed idea in detecting object as we want the system to be accurate as possible with a good time rate for the execution.

Savyasachi Gupta, et al. proposed the SD-Measure: A Social Distancing Detector [3]. The literature used the Mask R-CNN as it extends and improves Faster R- CNN by adding a mask branch and using Region of Interest (RoI) Align instead of RoI Pooling. RoI Align overcomes the issue of location misalignment existent in RoI Pooling. It achieves this by dividing the input proposals from the Region Proposal Network (RPN) into 'bins' using bilinear interpolation. Mask R- CNN is able to create masks for the detected object allowing the authorities to distinguish individual persons in a frame more easily.

Abdalla Gad, et al, proposed the Vision-based Approach for Automated Social Distance Violators Detection [4]. The approach utilizes the concept of inverse perspective mapping (IPM) together with the camera's intrinsic information to produce a bird's eye view with real- world coordinates of the frame being processed from a video source. The process starts with image enhancement, foreground detection using Gaussian Mixture Model (GMM) background subtraction, tracking using Kalman filter, computing real-world distance measurements between individuals, and detecting those who have been in less than 2 meters apart as they are considered to be in contact.

2. METHODOLOGY

2.1 PROPOSED ARCHITECTURE

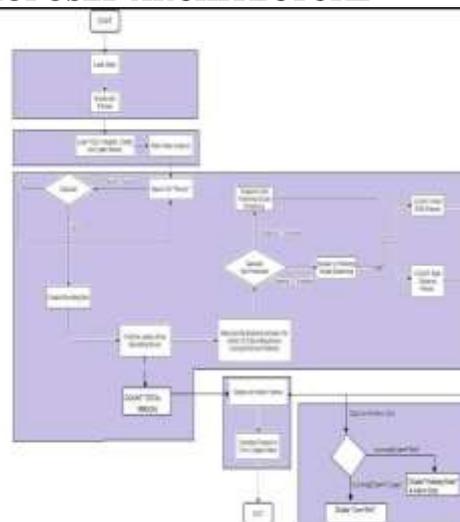


Fig. 1 Proposed model architecture

2.2 PROPOSED SYSTEM

Social Distancing Violation Alert System is a proposed methodology to caution people regarding violation of norms.

- The system loads the live footage or recorded footage as an input.
- People detection throughout the frame is performed (YOLOv4 Architecture).
- Calculating Centroids and append them into a centerList[].
- Finding Euclidean distance between centroids.
- If distance is less than Minimum Threshold then respective centroids are appended to closePairList[].
- The people close to each other are connected to each other by means of a line to highlight the violation.
 - The data of people at risk is transmitted to Arduino Uno (Micro-controller) by means of a serial port.
 - If risk is low the LCD Crystal display “LOW RISK”.
 - If risk is high the LCD Crystal display “VIOLATING RULES” and an alert alarm is initiated.
 - If risk is null the LCD Crystal display

“NO VIOLATION”.

2.3 PROPOSED ALGORITHM

```

/*Read Input Video*/
- cap=cv2.VideoCapture(filename)
/*Image Preprocessing*/
-image=imutils.resize(img,w,h)
/*Load Model*/-
SDASetup(yolopath,assets,videoshape)
/*Person & Distancing Detection*/
- SDAProcess(img)
- isClose(p1,p2)
- findDistance(p1,p2)
- if isClose is True:
  append 2 centroids to
  ClosePairList[] StatusList
  of 2 centroids to True
  totalPeople =
  len(centerList) safePeople =
  statusList.count(False)
  riskPeople =
  statusList.count(True)
  - if riskPeople
  == 0: i="blue"
    elif
  riskPeople < 10
  : i="green"
    else: i="red"
  erialcomm.write(i.e
  ncode())
/*Alert System*/
- incomingByte =
  Serial.readStringUntil('\n')
- if (incomingByte ==
  "red"):
  lcd.print("Violating
  Rules") ;
  digitalWrite(Buzzer,
  HIGH);
- if (incomingByte ==
  "green"): lcd.print("
  Low Risk ");
- if (incomingByte ==

```

```

"blue"): lcd.print("
NO Violation ");

```

/*Final Output*/

```
-SDADisplay()
```

RESULTS

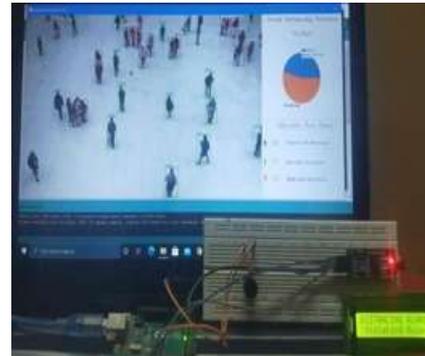


Fig. 2 High number of Violations

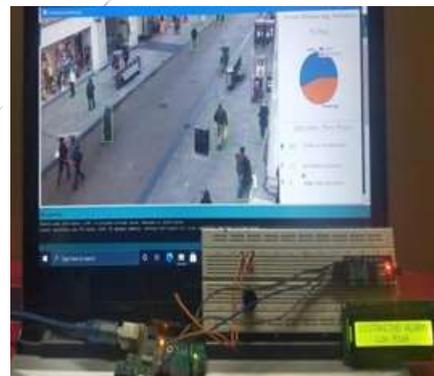


Fig. 3 Low number of Violations

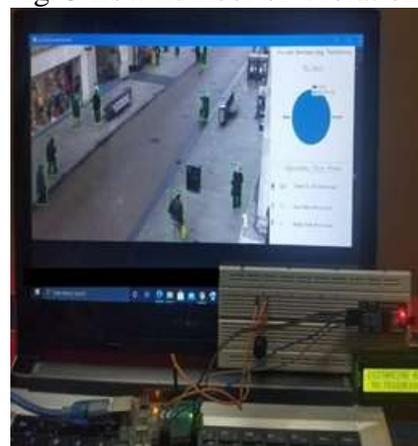


Fig. 4 No Violations

3. CONCLUSION

The projected system “Full Frame Social Distancing Violation Alert System” provides a social distancing violation alongside AN alert system. The experimental results show that this rule provides higher Federal Protective Service and accuracy for characteristic folks. it's nice significance to supply a security alert for the folks at public places thereby reducing the police investigation management.

4. REFERENCES

- [1] Yew Cheong Hou, Mohd Zafri Baharuddin, Salman Yussof, Sumayyah Dzulkifly “Social Distancing Detection with Deep Learning Model” 2020 8th International Conference on Information Technology and Multimedia (ICIMU).
- [2] Afiq Harith Ahamad, Norliza Zaini, Mohd Fuad Abdul Latip “Person Detection for Social Distancing and Safety Violation Alert based on Segmented ROI” 2020 10th IEEE International Conference on Control System, Computing and Engineering (ICCSCE).
- [3] Savyasachi Gupta, Rudraksh Kapil, Goutham Kanahasabai, Shreyas Srinivas Joshi, Aniruddha Srinivas Joshi “SD-Measure: A Social Distancing Detector” 2020 12th International Conference on Computational Intelligence and Communication Networks (CICN).
- [4] Abdalla Gad, Gasm ElBary, Mohammad Alkhedher, Mohammed Ghazal “Vision-based Approach for Automated Social Distance Violators Detection” 2020 International Conference on Innovation and Intelligence for Informatics, Computing and Technologies (3ICT).
- [5] “Arduino-Button-Piezo Buzzer” – Available:
<https://arduinogetstarted.com/tutorials/arduino-button-piezo-buzzer>
- [6] “Arduino LCD I2C” – Available:
<https://arduinogetstarted.com/tutorials/arduino-lcd-i2c>