INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

Implementation of Social Distancing Detector Using Machine Learning

Vivek Lakade[1], Mustafa Bookwala[2], Aditya Bartakke [3], Prof. Mrs. Lata Sankpal[4]

Student, Dept. of Computer Engineering, Sinhgad Academy of Engineering, Pune, Maharashtra, India

Student, Dept. of Computer Engineering, Sinhgad Academy of Engineering, Pune, Maharashtra, India

Student, Dept. of Computer Engineering, Sinhgad Academy of Engineering, Pune, Maharashtra, India

Assistant Professor, Dept. of Computer Engineering, Sinhgad Academy of Engineering, Pune, Maharashtra, India

ABSTRACT: During an epidemic, it is very important to follow the instructions issued by the official authorities. One big step at this point is Social Distancing. It is very difficult for the authorities to keep a detailed look at whether social distancing norms are being followed or not. We meet situations where instead of following these rules patiently, people become frightened and often crowd the space. Therefore, for simple monitoring for the authorities (e.g. police officers) we propose a solution using the Deep Learning process that will notify them as soon as a public violation occurs i.e., if the number of people is above the specified limit (the limit on the number of people that are allowed to be in one place at a time, specified by the government) or if the distance among two people is less than the specified limit. This program will not only reduce the effort and effort required to manually inspect each and every nearby location, but also help in saving time with the help of fast analysis in simple terms, CCTV cameras will help simultaneously monitor each public places.

KEYWORDS: You Only Look Once; World Health Organization; Closed-Circuit Television; Artificial Intelligence; Graphics Processing Unit

I. INTRODUCTION

For Centuries, pandemics have not only affected the population globally but also ruined the economies of numerous countries. The BBC has recorded the history of catastrophic epidemics in the whole world. According to the BBC, in the 6th century, the Justinianic Plague caused the death of approximately 50 million people i.e., about half of the global population at that time. The "Black Death" pandemic, which spread in the 14th in the Asian and European continents is responsible for the deaths of around 200 million people. This is not the end, in the 20th century the Smallpox disease killed around 300 million people despite the fact that its effective vaccine was available since 1796. And to add to that, it the year 2019 the novel corona virus pandemic, also known as COVID-19 has proven to be disastrous to not only the globally interconnected economy but also taken millions of lives around the globe.

The outbreak of this pandemics has led to some precautionary measures countries should take as a whole. One of the major safety measures that should be taken in these situations is Social Distancing and Quarantining. Social Distancing certainly plays an important role in these situations. Authorities are assigned to check for any unnecessary public gatherings. However, manual checking by visiting every public place is not possible because it is time consuming and being omnipresent for checking any violations is impossible. By using the CCTV Cameras, we can automate the detection of any social distancing violations and then alert the authorities if people gather in large groups or if people do not maintain a precautionary distance between them. This can really help the authorities to accomplish the goal of social distancing during the lockdown in this dangerous pandemic.

We hereby propose a solution for social distance monitoring. Real time detection is very important for such kind of applications. We used various Deep Learning Techniques like OpenCV and YOLO Object Detection to detect and track human bodies. To detect any social distancing violations distance between two bodies has to be calculated. It is done using the traditional Euclidean Distance formula given below.

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

II. APPLICATION

This application can be used in public places where the risk of virus transmission is greater such as Hospitals, Shopping Malls, Banks, Religious Places, Airports, Educational Institutes, etc.

III. PROPOSED METHODOLOGY

Our proposed system is an innovative AI driven solution relying on Real Time Image recognition and Video Processing and is capable of detecting any violations of Social Distancing and detecting if the number of people at a place is more than the threshold value. It will provide much needed live feedback and alerts to public to stay at a minimum of 6 feet distance from each other at public places thus help in maintaining Social Distancing.

Our proposed system consists of two aspects:

1. Detection of violation of Social Distancing

    (a) No of people greater than threshold in each video frame. (crowd detection)
    (b) The distance between two people is less than the specified threshold.

2. Alert System

    (a)   Alert system that gets triggered whenever there is violation of social distancing.

1.   Detection of violation of Social Distancing:

This can be considered as real time object detection tool in where the object is an individual(person) and we need to count the number of objects being detected in the input source. There are various deep learning approaches that have achieved the results for the given task. One must strike a balance between accuracy and speed in this real-time application. We will compare the various models and evaluate them based on various factors such as speed, accuracy, feature extractor, extractor output stride, input image resolution, NMS(Non Max Suppression), mAP(Mean Average Precision), and IoU(Intersection Over Union) threshold.

Definition of terms used in our application:
• Non-Max Suppression:
Non max suppression is a technique used mainly in object detection that aims at selecting the best bounding box out of a set of overlapping boxes. Many proposals for the next stage, the classification process, are created during the object detection process. The idea is an area bounded around the object that needs to be detected. Processing a large number of proposals across classification networks is slow and inconvenient. As a result, a time-saving strategy is used to exclude some of the ideas based on particular parameters. This technique is known as the Non-Max Suppression.

3. Alarm System:

Alarm is an action that is triggered when some individual does not follow social distancing norms.
    a)   Sound alert system is an alarm sound made e.g. a sound will be made by the application when Social Distancing guidelines are violated.
    b)   Display message alert is an alert which is a popup flashed onto the screen by the application in case of any violations.
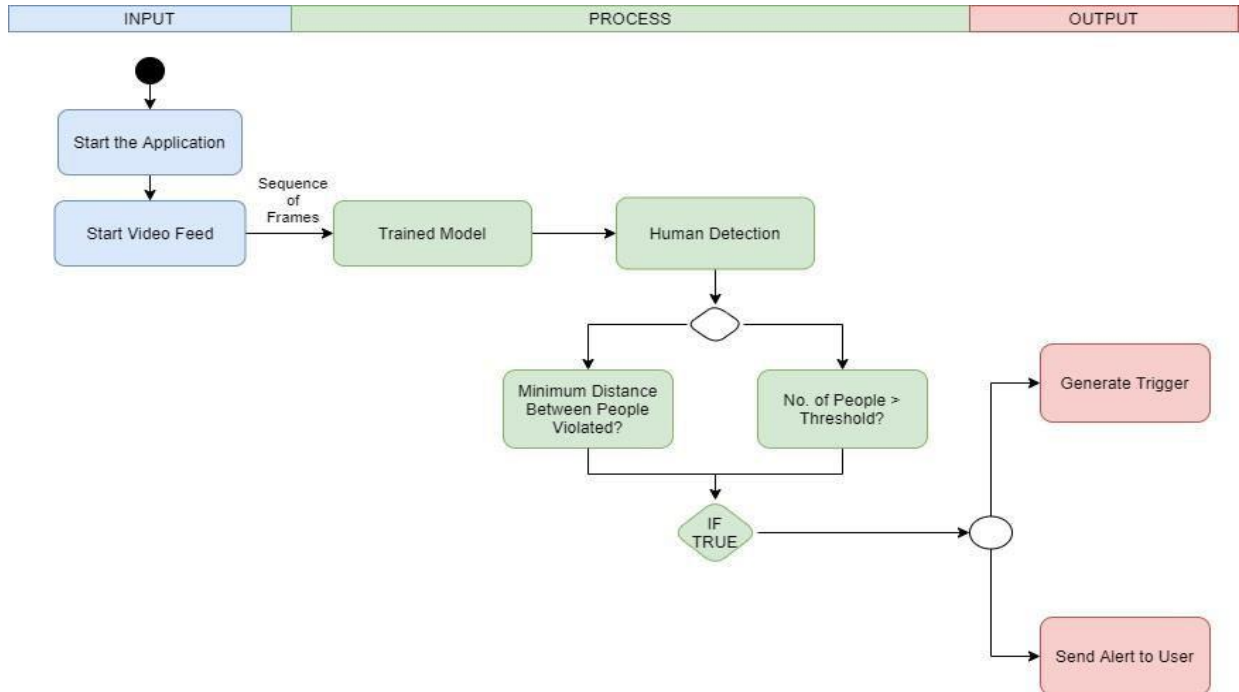
IV. **ACTIVITY DIAGRAM**

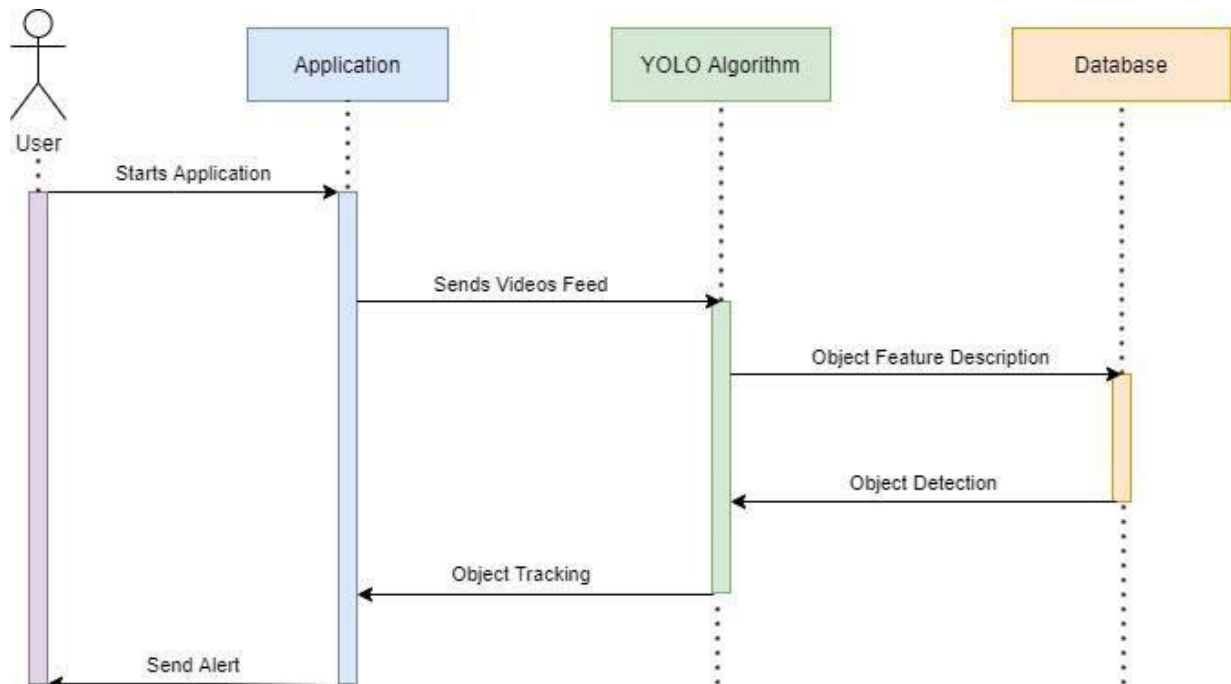Fig. 1: Activity Diagram

V. **SEQUENCE DIAGRAM**

Fig. 2: Sequence Diagram

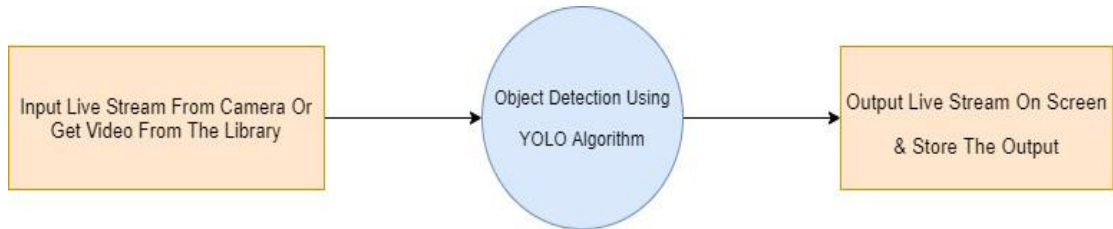## VI. **DATAFLOW DIAGRAMS**
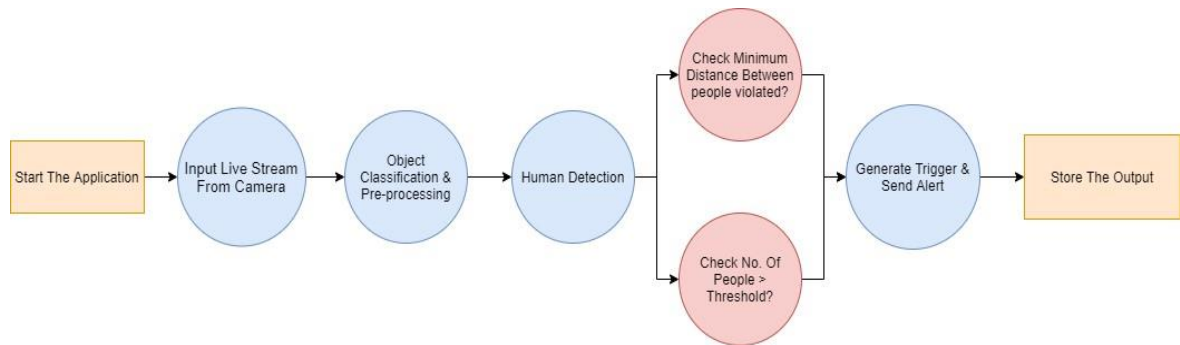
1. DFD Level 0:

Fig. 3: DFD Level 0

2. DFD Level 1:

Fig. 4: DFD Level 1

VII. **USE CASE DIAGRAM**
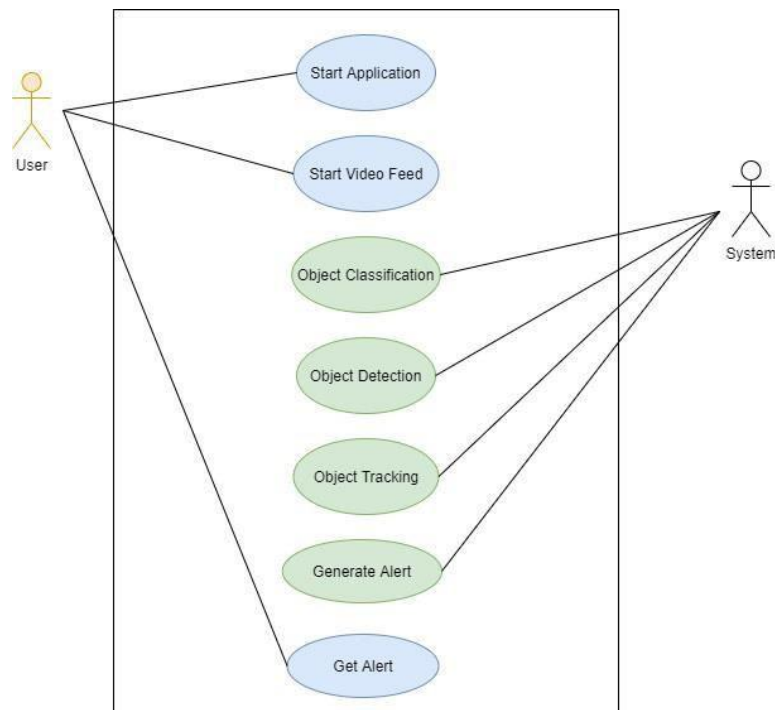

Fig. 5: Use Case Diagram

VIII.   **SYSTEM REQUIREMENTS**

1.   Software Requirements:
        Windows 7 or 10
        Mac OS X 10.11 or higher
        Linux: RHEL 6/7, 64-bit (almost all libraries also work in Ubuntu)

2.   Hardware Requirements:
        Processor – PC with minimum 4 cores @ 3.1GHz
        RAM – 8GB.
        Graphics Card – At least 2GB

IX. **ASSUMPTIONS AND DEPENDENCIES**

- The user should have all the available hardware required to support the system.
- Camera must be intact and in working conditions, also it must be connected to system
- System should be able to access and capture live camera feed
- System should be able to process captured data, for that a proper GPU is integrated as per requirement
- Whenever a violation of social distancing norms is observed system should be able to generate alert and inform user
- In some case after generating alert alarms must be triggered

X. **USER INTERFACE**

Fig. 6: Login Window

Fig. 7: Detection Window

XI. CONCLUSION

Social Distancing is the key to end the spread of the virus. With that in mind, our paper proposes a digital solution to enforce Social Distancing. The paper proposes the use of YOLO Algorithm for the detection, tracking and calculating the distance between humans. It can alert the authorities in case of any violations. This solution can prove to be very helpful in enforcing Social Distancing.

REFERENCES

1. Cong T. Nguyen, YurisMulyaSaputra, Nguyen Van Huynh1, Ngoc-Tan Nguyen, Tran Viet Khoa, Bui Minh Tuan, Diep N. Nguyen, Dinh Thai Hoang, Thang X. Vu, ErykDutkiewicz, SymeonChatzinotas, And Björn Ottersten. "A Comprehensive Survey of Enabling and Emerging Technologies for Social Distancing — Part II: Emerging Technologies and Open Issues" ISSN: 2169-3536, 2020
2. Mahdi Rezaei, Mohsen Azarmi, "DeepSOCIAL: Social Distancing Monitoring and Infection Risk Assessment in COVID-19 Pandemic" ISSN: 2076-3417, 2020
3. Senjaliya, N., & Tejani, A. (2020). Artificial intelligence-powered autonomous energy management system for hybrid heat pump and solar thermal integration in residential buildings. International Journal of Advanced Research in Engineering and Technology (IJARET), 11(7), 1025-1037
4. Arnab Ghorai, Sarah Gawde, DhananjayKalbande, "Digital Solution for Enforcing Social Distancing" ssrn.3614898, 2020
5. B.Vijayalakshmi, R.Sugumar, Rough set theory based feature selection and FGA-NN classifier for medical data classification, International Journal of Business Intelligence and Data Mining, Volume 14, Issue 3, pp.322-358, Feb 2019.
6. Dongfang Yang,EkimYurtsever, Vishnu Renganathan,KeithA.Redmill, U ṁitO žgu ňer, "A Vision-based Social Distancing and Critical Density Detection System for COVID-19" arXiv:2007.03578, 2020
7. GLV Prasad, T Nalini, R Sugumar, Mobility Aware MAC Protocol for Providing Energy Efficiency and Stability in Mobile WSN, International Journal of Networking and Virtual Organisations, Volume 18, Issue 3, May 2018.
8. Imran Ahmed, Misbah Ahmad, Joel J.P.C, Rodrigues, Gwanggil Jeon, Sadia Din, "A deep learning-based social distance monitoring framework for COVID-19" j.scs.2020.102571, 2020

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462   6381 907 438   ijircce@gmail.com

Scan to save the contact details