NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 7, ISSUE 5, May. -2021

REAL TIME ANALYTICS OF SOCIAL DISTANCING USING ARTIFICIAL INTELLIGENCE ENABLED INTERNET OF THINGS GADGET

Vijaya Karthik S. V.
Mail: visitvijay88@gmail.com

ABSTRACT:

The years 2020 and 2021 will be known with the panic threat to human life because of COVID19 and huge numbers of casualties are going on globally including in India. Millions of people have been infected with the Corona Virus, and thousands of people have died as a result. Some of the world's most powerful nations, such as Italy and the United States, have been severely impacted, with more than 500 lives lost every day. Corona has wreaked havoc on the global economy, enslaving countries such as India, France, Germany, Spain, and Iran. This crippling disease has wreaked havoc across the globe. Since there is yet to be a remedy, after the lockout restrictions are removed, it is essential to ensure that social distancing is exercised at the locations. Countries like India, where less number of cases were registered during the targeted lockout, have seen an increase in cases since the restrictions were lifted. The study focuses on the implementation of a social distancing framework that keeps track of the distance between people in real time using specialized libraries available for real-time implementations. The presented work proposes the use of open source hardware with the integration of OpenCV so that the real time analysis of social distancing can be done. OpenCV is free and open source framework for image and video processing with the flavor of Artificial Intelligence and is presented in this manuscript.

Keywords: Community Spread, COVID19, OpenCV for Real Time Social Distancing, Social Distancing

INTRODUCTION:

The COVID-19 outbreak began in December 2019 in Wuhan, China, and has since spread to several countries around the world [1]. COVID - 19 was declared a pandemic by the World Health Organization (WHO) in June 2020, affecting the entire world. More than 10,021,000 people have been affected by the pandemic; more than 499,900 people have died because of the virus (www.who.int) [2, 3]. Many countries have implemented social distancing steps to reduce virus exposure by closing public places where people congregate in large numbers, such as schools, retail outlets, and restaurants [4].

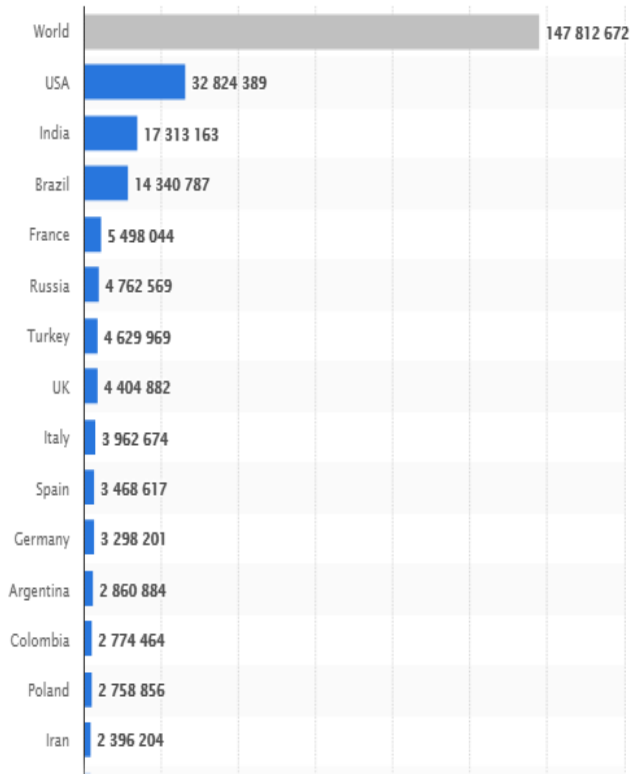

Figure 1: Elevation of COVID-19 Cases as on 26 April 2021 (Source : Statista.com)

The major measures against COVID19 is associated with "social distancing" and is a very successful to control the disease which has a direct impact on the isolation factors. Several countries around the world have implemented social distancing [5] policies such as lockout, while others, such as the Netherlands, Sweden, the United Kingdom, and the United States of America, have taken less stringent measures to separate from society. Until now, it has been difficult to determine how long social distance approaches would last. Interventions to reduce social isolation have a significant impact on event attendance. People also fear social contact, influencing behaviour, and outing attendance when social distancing measures are not implemented [6].

LITERATURE REVIEW:

Social Distancing:

As a result of increased trends such as work from home, online learning, and limited public gatherings in events, the need for travel may decline. This could result in less traffic and crowding during peak hours. Consumers are more likely to order goods online and have them delivered to their homes, resulting in fewer shopping trips. Of course, social distance can have an impact on the mode of transportation chosen. People can stop taking public transportation since it can be used as a vector for virus transmission [7].

Social Distancing Against Community Spread:

In a wider community where individuals might be infectious but have not yet been identified and therefore not isolated 'social distancing' is meant to reduce people-to-people interactions. People's social distancing will reduce the transmission of respiratory droplet-borne illnesses, which require some human interaction. Social distancing is particularly useful in situations where group transmission is suspected but the relationships between cases are uncertain, and where limiting exposure to only those who have been exposed is deemed inadequate to avoid further transmission [8, 9, 10].

Since they are used to keep the population from being contaminated by the virus, social distancing methods provide direct benefits to a person's health. However, because people engage in physical exercises or out-of-home activities such as exercise and

sports, social distancing can result in substantial decreases in physical activity. Since it is recommended that adults engage in at least 150 minutes of physical activity per week to avoid weight gain, regular, recreational, or practical walking and cycling must be maintained [11, 12].

Social distancing techniques are most effective when the disease spreads through one or via droplets, direct physical contact, or indirect transmission (if the microorganism can survive in the air for long periods). When an outbreak is spread mainly by infected water or food, or by infected mosquitoes or other insects, the precautions are less successful. During the COVID-19 pandemic, authorities facilitated or ordered social distancing because it is an effective method of preventing COVID-19 transmission. COVID-19 has a much higher chance of spreading over distances than it does over long ones. In confined, poorly ventilated spaces and with extended exposure, it can disperse over distances of more than 2m (6 ft).

By minimizing interaction between infectious materials individuals and psychiatric disorders, or between subject groups (Example - Rates of dissemination and subject groups with no or low rates of transmission, social distancing helps to reduce or disrupt COVID-19 transmission in a population) [1].

Studies on infectious disease outbreaks, such as the flu, show that psychological distancing is an important way to minimize the number of individuals affected if the interventions are comprehensive and implemented over a long enough period. The benefits of social distancing were shown in studies comparing various states in the United States during the 1918 influenza epidemic.

As cities reopen and people go out more, the term "physical distancing" (rather than "social distancing") is being used to emphasize the importance of staying at least 6 feet away from others and wearing face masks. In the past, social distancing was often used to refer to physical distancing, which is established further down. Social distancing, on the other hand, is a technique distinct from physical distancing.

If such steps are deemed inadequate, 'community-wide containment' might be required. Community-wide containment is a technique that applies to an entire city, state, or region with the goal of reducing personal interactions to a bare minimum while ensuring vital supplies are maintained. This is a loop that starts with social exclusion and ends with a community-wide quarantine with extreme restrictions on everyone's movement. Because of the larger number of people involved, applying community-wide mitigation strategies is far more complicated [13, 14, 15].

METHODOLOGY:

By manual monitoring, anybody cannot guarantee the implementation of social distancing in all places; therefore, technology or a device that can track social distancing and highlight the individual in the camera when it is not being implemented is needed. This work proposes a system that can recognize an individual or a group of people in any location using a camera and

deep learning-enhanced computation using OpenCV. After the computation results are formed using the input picture, the device displays the exact findings on when and where social distancing is not observed.

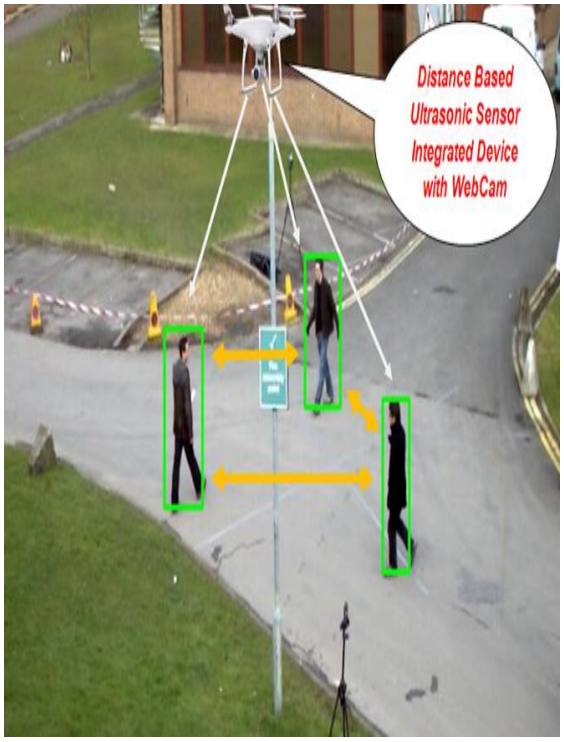

Figure 2: Projected OpenCV based Integration for Social Distancing

An input image data frame is inserted into the device as an input, as shown. Objects are detected and stored in a class called "law abiding" or "violation of social distancing" using machine learning and open source hardware like Arduino, Raspberry Pi or any other. The distance between the pairs of centroids is then determined. The results can be validated with distance between persons using certain validation parameter once the distance between centroids has been measured successfully. The device generates the results after good validations.

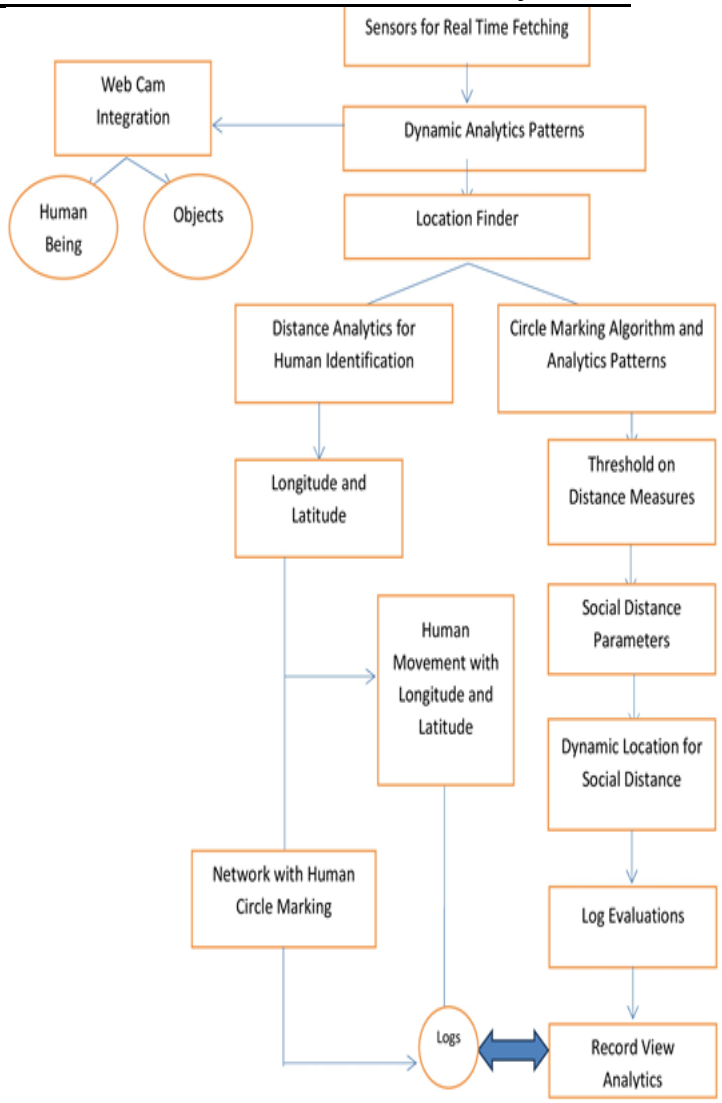

Figure 3: Flow of Social Distancing Analytics

Figure 3 depicts the flow of social distancing analytics with the real time evaluation patterns from the IoT based implementation. Following are the key segments involved in the proposed work whereby the IoT based web cam analytics with OpenCV is done for machine learning and dynamic view of social distancing encircle based view on the longitude and latitude.

- Sensors for Real Time Fetching
- Dynamic Analytics Patterns

- Web Cam Integration
- Location Finder
- Circle Marking Algorithm and Analytics Patterns
- Distance Analytics for Human Identification
- Longitude and Latitude
- Threshold on Distance Measures
- Social Distance Parameters
- Human Movement with Longitude and Latitude
- Dynamic Location for Social Distance
- Network with Human Circle Marking

RESULTS:

Once the integration of code in open source hardware like Arduino or Raspberry Pi is done, the social distancing via webcam can be analyzed in real time. OpenCV is integrated for the key analytics patterns for the social distancing based encircle on machine learning based approach. The web cam is fetching the dynamic objects and identifying the human beings.

In addition, the dynamic movement is associated with the longitude and latitude so that the exact coarse location of human objects can be analyzed. The real time view is done so that the distance matrix can be done, and social distancing circle can be marked.

Key Segments in the Implementation Patterns include the following

- Real Time Web Cam based Video Fetching
- Identification of Human Being
- Object Detection with Valid Objects
- Logging of Longitude and Latitude
- Implementation of Distance Matrix for Gap between Objects
- Marking of Objects with Virtual Circle on Screen
- Identification of Objects violating the social distancing

Figure 4: Dynamic View of Social Distancing

According to the results, the centroids with red centroids and circles specifically represent people who are not adhering to the social distancing steps. The green centroid and circles in the findings illustrate the application of social distancing steps. The figure shows a diagrammatic view of the social distance calculation with real-time objects in neighboring locations. With this method, anyone approaching from a distance greater than the threshold value is detected and labelled. In terms of social distancing measurement and analytics, the proposed method is very successful.

DISCUSSIONS:

OpenCV is one of the powerful platforms with integration of digital image and video analytics that is used for the evaluation and depiction of social distancing.

Figure 5: Real time analysis of Dynamic Social Distance Measurement

The work depicts a real-time study of complex social distancing steps that would be extremely beneficial to consumers or authorities. According to the results, the method measures the amount of head counts that do not adhere to the social distance. Such centroids will be labelled in red and the authorities will be alerted if the social distancing is not followed.

CONCLUSION:

There is need to use the advanced technologies for depiction of social distancing against community spread using machine learning and Artificial Intelligence. The key problems like failing to observe social distancing will result in the mass extinction of human life and the government agencies need to have focus on it. Government regulations, on the other hand, can impose a cap on those in the society who do not adhere to social distancing using such algorithms and programming platforms. The manual monitoring of humans cannot achieve sure shot accuracy in social distancing measures and therefore needs the integration of platforms like OpenCV and open source hardware with real time web cam. This flaw can be solved by using a social distancing control framework that includes real-time centroids monitoring. The framework eliminates reliance on manual monitoring systems, in which an authority delegate physically controls social distancing in exposed areas, with minimal effort. The system is adaptable to changing requirements, and only minor adjustments are needed during maintenance procedures. The engineered system's code can be stored on a centralized computer or server, and the results can be retrieved and viewed using a traffic camera. This removes the need for additional hardware resources, making it more cost-effective.

LIMITATIONS OF STUDY:

The present work is having the predictive approach towards the social distancing and its implementation in social life. The present work makes use of the wireless technologies and sensor-based environment that needs resources. The limited resource-based environment can be elevated with the advanced technologies specifically in the rural areas where resources will be the major concern.

REFERENCES:

1) Stein, R. A. (2020). COVID-19 and rationally layered social distancing. International Journal of Clinical Practice, 74(7), e13501.
2) Mahase, E. (2020). Covid-19: UK starts social distancing after new model points to 260 000 potential deaths.
3) World Health Organization (WHO) URL: https://www.who.int/docs/default-

source/coronaviruse/situation-reports/20200327-sitrep-67-covid-19.pdf?sfvrsn=b65f68eb_4

4) World Health Organization (WHO) URL: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200626-covid-19-sitrep-158.pdf?sfvrsn=1d1aae8a_2
5) Singh, R., & Adhikari, R. (2020). Age-structured impact of social distancing on the COVID-19 epidemic in India. arXiv preprint arXiv:2003.12055.
6) Greenstone, M., & Nigam, V. (2020). Does social distancing matter?. University of Chicago, Becker Friedman Institute for Economics Working Paper, (2020-26).
7) Thomson, G. (2020). COVID-19: Social distancing, ACE 2 receptors, protease inhibitors and beyond?. International journal of clinical practice.
8) Chudik, A., Pesaran, M. H., & Rebucci, A. (2020). Voluntary and mandatory social distancing: Evidence on covid-19 exposure rates from chinese provinces and selected countries (No. w27039). National Bureau of Economic Research.
9) Cicala, S., Holland, S. P., Mansur, E. T., Muller, N. Z., & Yates, A. J. (2020). Expected Health Effects of Reduced Air Pollution from COVID-19 Social Distancing (No. w27135). National Bureau of Economic Research.
10) Barrios, J. M., Benmelech, E., Hochberg, Y. V., Sapienza, P., & Zingales, L. (2020). Civic capital and social distancing during the covid-19 pandemic (No. w27320). National Bureau of Economic Research.
11) Woody, S., Tec, M. G., Dahan, M., Gaither, K., Lachmann, M., Fox, S., ... & Scott, J. G. (2020). Projections for first-wave COVID-19 deaths across the US using social-distancing measures derived from mobile phones. medRxiv.
12) Dowd, J. B., Andriano, L., Brazel, D. M., Rotondi, V., Block, P., Ding, X., ... & Mills, M. C. (2020). Demographic science aids in understanding the spread and fatality rates of COVID-19. Proceedings of the National Academy of Sciences, 117(18), 9696-9698.
13) Ganem, F., Mendes, F. M., Oliveira, S. B., Porto, V. B. G., Araujo, W., Nakaya, H., ... & Croda, J. (2020). The impact of early social distancing at COVID-19 Outbreak in the largest Metropolitan Area of Brazil. MedRxiv.
14) Ganem, F., Mendes, F. M., Oliveira, S. B., Porto, V. B. G., Araujo, W., Nakaya, H., ... & Croda, J. (2020). The impact of early social distancing at COVID-19 Outbreak in the largest Metropolitan Area of Brazil. MedRxiv.
15) Adolph, C., Amano, K., Bang-Jensen, B., Fullman, N., & Wilkerson, J. (2020). Pandemic politics: Timing state-level social distancing responses to COVID-19. medRxiv.

Biography of the Author

Vijaya Karthik S V (corresponding author) was born in India. He received his Bachelor of Engineering in Electronics and Communication Engineering from Anna University in the year of 2009 and Master of Engineering in Embedded and Real Time Systems from Anna University in the year of 2011. He has published more than 10 Papers in various International Journals.