

Crowd Detection for Social Distancing in Smart Cities of Developing Countries amidst Covid-19 Outbreak

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Abstract: *The entire world is suffering from the outbreak of the novel coronavirus and the world is in lockdown. The governments have taken intense and never seen measures to protect its citizens from the global pandemic. However, a lot of the measures implemented by the Developed countries are not applicable to all the places around the world. We will explore how we can use the existing infrastructure to better fight the spread of the virus. In the days to come, social distancing will have to be the norm even after the lockdown is lifted. Hence, it is important to use our resources at the best to help the front line workers by helping maintain distance using methods like IoT, artificial intelligence, deep learning and already existing infrastructure of CCTV cameras.*

Key Words: *Smart Cities, Covid-19, Coronavirus, Developing Countries, Crowd detection.*

1. INTRODUCTION:

The outbreak of the novel coronavirus, Covid-19 (or generally called coronavirus) has led to entire countries imposing lockdowns and taking strict measures to fight the spread of the disease. As of now, there have been over 4 million reported cases worldwide and almost 300,000 deaths [1]. This has impacted the world economy but governments around the world are placing their citizens above the economy and imposing strict measures to curb the virus spread. India imposed a nationwide lockdown on 25th March 2020 with all but essential services being stopped, and the country continues to be under lockdown with some relaxations. It is going to enter its 4th phase of lockdown on 18th May 2020 [2]. The plan has been to gradually lift the lockdown while still adhering social distancing rules, regulation and increased hygiene initiatives. In such a highly populated country, managing crowds post lockdown will become a difficult task. However, we can take advantage of existing infrastructure around our cities, like CCTV cameras, to monitor crowd gatherings and crowd density [3].

2. Smart cities of the Developing countries:

According to the most recent Demography collected, around 31% of India's population lives in urban settings [4] and this number is only growing. This means that the Government needs to implement plans to convert these establishments to smart cities in order to cater for such a large number of people otherwise the cities would become inhabitable [4]. There exists no universally accepted definition of a smart city. A smart city in Europe can be very different from a smart city in India. [5]. The amalgamation of physical and virtual worlds forms a smart city [6]. To follow a loose definition, a smart city are municipalities that make use of information and communication technologies to improve the quality of life of the people and the governance using data sharing and the Internet of Things [7]. There are however some issues like poverty, lower literacy rate, immigration, pollution etc. that affect the transformation of a city into smart city in developing countries and make it more challenging [8] Under the Smart city mission of the government of India, the (features) they want to implement is make the city more planned while concentrating on technology to provide citizens with identity, transparency and security. The aim is to use fewer resources to manage any disasters [5].

3. Guidelines in Successful countries in minimizing outbreak:

Many countries have shown success in their fight against the coronavirus. A few of them are New Zealand, Jordan, Greece, Slovenia, Vietnam. These countries attribute their success in battling the spread of virus to early actions taken, imposing lockdowns, testing large numbers of its population and strict social distancing behaviour [9,10]. These countries also give credit to its citizens for following the strict measures imposed by the government on them [9,10]. It is hence important to place trust in the authorities and ask questions wherever necessary and follow all the measures backed up by science and research in order to control the spread of the virus.

4. Aarogya Setu and other measures put by the Indian Government:

As a measure to curb the spread of the deadly coronavirus, the government of India launched the Aarogya Setu app in addition to national lockdown and strict social distancing rules. The app is made available in 11 different

languages to cover the demographics of the Indian public as widely as possible [11]. The app uses your location and Bluetooth to scan their database and lets you know if you are in the proximity of an infected person. The app also provides a chatbot so that you can see if your symptoms are signalling towards a potential infection [12]. However, the app has sparked much doubt and mistrust in people regarding breach of privacy by unjustified and uncontrolled collection of data [13]. The difficult times that we are facing now, however, requires the people to place trust in the government as data sharing among the authorities is one of the best solutions in event of disasters. Internet of Things (IoT) devices produce billions of GB of data that with integration of Artificial Intelligence (AI) can be used to make strategies to maximise public health safety [14]. It is, in fact, a necessity to share data among the authorities to put in place a multi-industry coordination mechanism that helps improve the emergency handling in time like these [15]. We must look at the success of South Korea's approach to trace, test and treat instead of taking drastic measures such as immigration control and lockdowns [16]. It shows how overriding the privacy policies in times of international emergencies can be a better measure [17] than to put the country in lockdown and halt the economy. Apart from this, other measures taken by the government is issuing advisories on social distancing and mass gatherings [18]. Once the lockdown is lifted, the main problem we will face would be a large number of people physically interacting with one another or being in close proximity, making the spread of the virus even worse.

It is therefore very important that all kinds of gatherings and crowds are monitored to make sure they are still following the guidelines issued on social distancing and mass gatherings. In order to do so, we can make use of IoT devices to make sure social distancing is followed.

5. Crowd Detection using existing infrastructure to maintain social distancing:

Post lockdown, we will still need to maintain social distancing and avoid gathering in numbers larger than advised by the government.

CCTV cameras installed all around us can help the authorities better monitor the crowding in places. Rather than manually looking at every street and corner for crowds violating the rules of social distancing, we can use Artificial intelligence, convoluted neural networks, and various such techniques to monitor crowds. Analysing surveillance videos, such as the ones from CCTV cameras, use object recognition, action recognition and classification of objects. Convoluted neural networks (CNN), auto encoders and their combinations are the more regularly used techniques for this purpose [3]. Previously, real time analysis has been used to monitor crowd violence in Football Stadiums using Big data and deep learning through bi-directional Long-short memory [19]. Various crowd counting and crowd tracing methods have been proposed, one of which uses attribute recognition down through slicing CNN models and representing it as a cuboid. Here, Crowd density and crowd counting has been solved as a regression problem [20]. Several companies around the world have been working on using cameras for detection of crowd behaviour, especially now when social distancing is very stressed upon. A home grown start -up, Tango Eye, uses a similar software to detect social distancing in shops [21].

6. CONCLUSION:

It is important that we study the ongoing developments in this world and use the knowledge to make the most use of our resources. A wide variety of techniques such as the ones mentioned in the paper are being tested on different frameworks by people all around the world. It is important for us to learn and modify and adapt these researches to develop applications and products to help the government in the fight against the pandemic of Covid-19.

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