A possible congestion index for public spaces during the pandemic

As the threat of COVID-19 infection continues, ***Rahul De, J Chris Macman, and Priyanka Deverakonda*** *propose two possible approaches to generating a congestion index and hope that some entrepreneurs or government agencies will take up one of these solutions*

As the COVID-19 pandemic rages across India, we are seeing an increase in infection cases, declines, and situations where cases first declined and then rose, particularly in urban areas. Governments across India are slowly opening up public spaces like markets, movie theatres, stations, airports, and temples. This trend is likely to continue as the economy is severely constrained and opportunities for businesses of all sizes to resume and return to some level of normalcy have to be encouraged.

One challenge that many people face is that of anticipating which places are safe and can be visited, versus crowded places where the possibility of getting infected is higher. If people could gauge this easily their confidence in visiting public places would improve, thus encouraging economic activity. In a recent survey of urban residents we found that the existing technology options available to us in India, such as the government recommended apps, were unsuitable, and people were open to other options.

The problem that has to be solved is that of people knowing, in their own neighbourhood, which places – shops, cafeterias, malls, or temples – can be visited safely. They have to know this immediately, perhaps as they approach the place, and reliably. Is it then possible to design an IT solution that can solve this problem?

One way is to create a “congestion index” for places, an index that shows how much congestion is in a place or how crowded is it. Places that are heavily crowded, like a mall, will have a high congestion index and places that are relatively uncrowded, maybe a park, will have a low index value.

Whichever IT solution determines this congestion index will have to satisfy certain criteria. First, the index value should be reliable and current, if a place is marked as congested, it should be a current value, not something that was valid possibly 15 minutes ago. Second, the technology should not be intrusive, making people open cumbersome apps and enter personal data. Third, the technology should preserve privacy and anonymity of people at these places.

Fourth, the technology should make the index visible in a public manner, either as a display, or as data on an app. Further, it should enable those without smart phones to also see this information. Fifth, the data should be displayed in at least two popular languages of that region. Sixth, the solution should be cost-effective, thus encouraging owners of establishments to adopt it.

Given the above criteria we propose two possible approaches to generating the congestion index. Our first approach is to use radio frequency identification tags or RFID tags that are

carried by all citizens. These tags enable devices at sites or locations to detect how many unique users are at the place and indicate how congested it is. These tags are available at low cost, are unique as identifiers, and can be read with low-cost detectors. As people enter or leave a mall, for instance, the reader can count them, thus the system can know how many unique visitors are at the facility.

The information about the congestion at a facility may be revealed on the web, through applications like Google Maps. Or the index may be displayed on a panel outside the facility. Feature phone users may text message a number to obtain the index for a location. This solution can provide updated and current information, does not require cumbersome procedures, protects privacy, is available to all users, can be displayed in multiple languages, and is also cost-effective. The last point is not strong, as getting all users to carry an RFID tag, unless mandated by law, may not be feasible.

A second approach to developing such an index could be by deploying AI-based software to work with existing security cameras to assess congestion. A neural network based software can be trained to detect congestion. This will require some effort to label images from a location, say a mall or a bus station, as being congested or not. This would have to be done for hundreds of images obtained from the location. Once such labelled images are available, a software can be trained to recognise the extent of congestion in that space.

This second solution has some advantages and some disadvantages as compared to the first solution. The index provided by the solution will be current, based on a visual rating of the extent of crowding. It can display this information locally, on a board, or through an app or sms message. It would protect privacy of the people, would be visible to all, and the information could be rendered in many languages. The challenge would be to develop and train the software that could be installed at many locations. Further, facilities owners would have to install this software on their security computers, which could be difficult, as many security setups have inflexible software configurations.

As we proceed towards opening public spaces, such an index is badly needed. If people are aware of the congestion they can take precautions and prevent the further spread of the COVID-19 infection. We hope that some entrepreneurs or government agencies will take up one of these solutions.

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