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IDENTIFYING DISEASE SUPER SPREADERS
FCL RESEARCHERS DEVISE STRATEGIES FOR EARLY DETECTION AND WARNING

Singapore, 10 February 2014 – As the world continues to urbanise at a rapid rate, more and more people will move to densely populated cities. Among the plethora of issues that emerge from this demographic shift is the fact that highly infectious diseases can spread very quickly through dense metropolitan cities.

Researchers at the Future Cities Laboratory (FCL) have identified a promising avenue for tracking the spread of infectious diseases, possibly giving authorities a very important early warning system to prevent epidemics.

Breakthroughs in the past few years have shifted our understanding of mobility patterns from random to highly structured and predictable ones. Building on an earlier research paper that identified *familiar strangers*, Mr Sun Lijun and team from the Mobility and Transport Planning research module at FCL together with Dr Manuel Cebrian from Australia's Research Centre of Excellence NICTA examined the largest metropolitan encounter dataset to date to identify potential *super spreaders* – a group of individuals who come into contact with far more people than others during their commute.

The team analysed anonymised travel smart card data, or EZ-Link data, from all of Singapore's bus commuters, covering approximately 3 million users within a one-week period, and built a large scale high resolution physical interaction network.

“Our work on *familiar strangers* demonstrated that physical encounters on public buses display a significant degree of temporal regularity and these rhythmic interactions form a large scale spatial temporal contact network,” said Mr Sun Lijun. “Based on this understanding, we were able to identify a particular group of individuals and monitor their interactions. Given that they are highly connected, should one of them be *Patient Zero*, they would facilitate the quick spread of infectious diseases.”

In the past, mapping such structure from real-world physical contact processes could be expensive to collect and procure, computationally costly, labour intensive and possibly sensitive in terms of privacy issues. This is especially so for large metropolitan cities. However, the process developed by the team is considerably more cost effective and less labour intensive, with the potential to serve as an efficient early warning indicator for the spread of contagious diseases.

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ABOUT FUTURE CITIES LABORATORY

The Future Cities Laboratory (FCL) is a transdisciplinary research institute focused on urban sustainability in a global frame and aims to build a foundation for a new curriculum of urban science. FCL is run under the auspices of the Singapore-ETH Centre for Global Environmental Sustainability (SEC), which was established by ETH Zurich and funded by the National Research Foundation (NRF), Prime Minister's Office, Singapore under its Campus for Research Excellence and Technological Enterprise (CREATE) programme.

Research work at FCL encompasses material science, advanced fabrication, architecture, engineering, landscape ecology, computer science, transportation planning, and urban and territorial design. FCL aims to develop integrated solutions for the sustainable development of future cities, districts and regions.

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