

Social distancing research at train stations makes platforms safer

November 24 2020, by Hilde Van Genugten



Credit: ProRail

To improve safety at train stations and tackle busy hotspots, ProRail, the authority that runs the Dutch rail infrastructure, anonymously measures crowd dynamics of travelers. Eindhoven University of Technology

(TU/e) assists the railway manager with the analysis and also uses the information to investigate the behavior of crowds. That behavior has completely changed due to the corona social distancing rule. TU/e researchers searched for new patterns and published their results in the journal *PLOS ONE*.

Understanding human behavior in crowds is interesting from a scientific point of view, and it can also provide solutions to many societal problems. One of those is a congestion, which can turn dangerous in busy times. Over the past two years, TU/e has been working together with ProRail to use sensors to keep platforms in [train stations](#) safe. This allowed them to see if new systems aimed at spreading passengers on the [platform](#) really worked. During corona, the word congestion took on a whole new meaning. TU/e-researchers saw opportunities to use the same sensors to look at behavior of crowds that must adhere to the distancing rule.

Frank van Schadewijk, pedestrian flow expert at ProRail: "With better information we can design our stations better, communicate in a more targeted way with our passengers and evaluate pilot projects at the platforms. For example, we are working on high-tech solutions such as real-time crowding information and automatic speakers, to improve traffic flow on the platform. The TU/e research is interesting for ProRail because it provides more insight into the pedestrian flows at the station, not only during the 1.5 meter society, but also afterwards. With that knowledge we can design even better stations in the future. "

Filtering people who travel together from the dataset

Although the corona situation means fewer people at the station, they suddenly need a lot more space due to the distancing rule. This can create new bottlenecks on platforms that were not a problem before. The researchers wanted to investigate this new behavior, but first had to filter

people who travel together from the dataset. After all, there are many members of the same households, such as couples and parents with children, on the platforms, who "pollute" the data because they are not bound by the distance rule.

TU/e-researchers Alessandro Corbetta, Cas Pouw and Federico Toschi, from the Fluids and Flow research group at the department of Applied Physics, set to work. Corbetta: "We developed an algorithm that can recognize family-like groups very precisely and in real time." In other words: when two or more people enter the station together, stay together during their journey through the [station](#), and also get on the same train together, you can safely assume that they are couples or family.

"The fact that we are able to do this real-time, is really new. Many algorithms go through the data several times before giving an outcome. That takes a lot of time and processing power. Our system is fast, runs on a simple laptop and is easily scalable," explains Corbetta. With each new measurement that comes in, the system becomes more accurate. This additive process ensures that people traveling together are correctly recognized. The longer such a group stays in the measured area, the more securely you can exclude them from the dataset.

One hundred thousand trajectories per day

Since 2017, 19 sensors have been suspended above the platform of track 5 at Utrecht Central Station, which together can anonymously monitor the entire platform for research purposes. Platform 5 is known as one of the busiest platform in the Netherlands, with trains leaving for Amsterdam Central Station and Schiphol Airport. The sensors work day and night, with an average of 100,000 measurements per day in normal situations, and an average of 16,000 per day during the first three months of the corona crisis.

The sensors manage anonymous tracking using a principle that is similar to the technology developed by researchers at TU/e since 2014. The key of these tracking systems is the reconstruction of overhead 'depth maps.' These maps represent the distance between each spatial point and the [sensors](#). As pedestrians walk by a sensor, a distinct depth fingerprint emerges: heads are the topmost points, shoulders are a little lower, then comes the rest of the body, with arms and legs.

Corbetta: "Such a fingerprint, which per se does not include any personal identifiable information, lasts for a split-second only, enough to identify pedestrians' positions and estimate trajectories. Only these positions and trajectories will be stored for analyses." This enables reliable tracking while ensuring the passengers' privacy.

Understand how people move in crowds

"Our CrowdfLOW topical group (part of the research group Fluids and Flow) tries to get to a fundamental understanding of how people move around in large crowds. Due to the social distancing rule, our research has suddenly acquired a whole new set of interesting variables," says Corbetta.

He wants to find social structures in the data, for example what social ties there are between people. This research into family-like groups offers that possibility. But also, for example, the difference between a crowd at rush hour or on a Saturday afternoon is very interesting.

"What's more, we can study behavioral patterns before and during corona," Corbetta adds.

He concludes: "We are still computing over platform 3, so we expect to publish new insights soon. Moreover, we are eager to deploy our knowledge and system in other settings to support, for example, municipalities, museums, stadiums and airports."

More information: Caspar A. S. Pouw et al. Monitoring physical distancing for crowd management: Real-time trajectory and group analysis, *PLOS ONE* (2020). [DOI: 10.1371/journal.pone.0240963](https://doi.org/10.1371/journal.pone.0240963)

Provided by Eindhoven University of Technology

Citation: Social distancing research at train stations makes platforms safer (2020, November 24) retrieved 19 April 2024 from <https://medicalxpress.com/news/2020-11-social-distancing-stations-platforms-safer.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.