Mathematical modelling for improving passengers safety during COVID-19 in railway and public transport

Problem description

The spread of viruses such as COVID-19 brought new challenges to our society, including a stronger focus on safety in rail and public transport. Due to pandemic, crowding at vehicles has become considered as unsafe, as close contacts among passengers tend to significantly increase probability for spreading infections between them. Therefore, many national and local authorities advise against travelling unless it is considered to be certain essential trips. However, passenger mobility shall be of high importance and public transport and railway operators shall provide safe travelling to all customers during COVID-19 as well. One way to do it is to make sure that passengers in the rail/PT network keep safe distances between each other. By doing so, the probabilities of getting infected should be significantly reduced. Therefore, the questions that arise are: How to optimally allocate passengers in a vehicle (train, tram, bus) given its seating and standing capacity and layout in order to maximize distances among themselves, and thus improve their safety, during travelling? What is a "safe" transport capacity of rail/PT vehicle?

Assignment

- Analyse current literature relevant to passenger allocation and vehicle capacity
- Define criteria and objectives for quantifying and improving passenger safety in railway vehicles
- Develop a mathematical model for optimal passenger allocation within vehicles
- Write a report

Background

A student will have an opportunity to further develop skills in mathematical optimization, data analysis and programming. The project can be conducted as final thesis project or research project. The research can be preformed within T&P or potentially within a relevant company.

Reference

Bešinović N., (2020). Resilience in railway transport systems: a literature review and research agenda. *Transport Reviews*, https://doi.org/10.1080/01441647.2020.1728419
Jenelius E., (2020). Rail Transport Resilience to Demand Shocks and COVID-19, paper link
Fischetti et al. (2020). Mathematical optimization for social distancing, paper link

Information

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