Running on a faster track: Researchers develop scheduling tool to save time on public transport

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What matters for commuters is not just if the train will be on time, but how long the journey will take. It's an important factor in public transportation and can make the difference in helping commuters choose mass transit over more polluting and costly transport like cars or airplanes.

Dr. Tal Raviv and his graduate student Mor Kaspi of Tel Aviv University's Department of Industrial Engineering in the Iby and Aladar Fleischman Faculty of Engineering have developed a tool that makes passenger train journeys shorter, especially when transfers are involved — a computer-based system to shave precious travel minutes off a passenger's journey.

Dr. Raviv's solution, the "Service Oriented Timetable," relies on computers and complicated algorithms to do the scheduling. "Our solution is useful for any metropolitan region where passengers are transferring from one train to another, and where train service providers need to ensure that the highest number of travellers can make it from Point A to Point B as quickly as possible," says Dr. Raviv.

Saves time and resources

In the recent economic downturn, more people are seeking to scale back their monthly transportation costs. Public transportation is a win-win —

good for both the bank account and the environment. But when travel routes are complicated by transfers, it becomes a hard job to manage who can wait — and who can't — between trains.

Another factor is consumer preference. Ideally, each passenger would like a direct train to his destination, with no stops en route. But passengers with different itineraries must compete for the system's resources. Adding a stop at a certain station will improve service for passengers for whom the station is the final destination, but will cause a delay for passengers who are only passing through it. The question is how to devise a schedule which is fair for everyone. What are the decisions that will improve the overall condition of passengers in the train system?

It's not about adding more resources to the system, but more intelligently managing what's already there, Dr. Raviv explains.

More time on the train, less time on the platform

In their train timetabling system, Dr. Raviv and Kaspi study the timetables to find places in the train scheduling system that can be optimized so passengers make it to their final destination faster.

Traditionally, train planners looked for solutions based on the frequency of trains passing through certain stops. Dr. Raviv and Kaspi, however, are developing a high-tech solution for scheduling trains that considers the total travel time of passengers, including their waiting time at transfer stations.

"Let's say you commute to Manhattan from New Jersey every day. We can find a way to synchronize trains to minimize the average travel time of passengers," says Dr. Raviv. "That will make people working in New York a lot happier."

The project has already been simulated on the Israel Railway, reducing the average travel time per commuter from 60 to 48 minutes. The tool can be most useful in countries and cities, he notes, where train schedules are robust and very complicated.

The researchers won a competition of the Railway Application Section of the International Institute for Operation Research and Management Science (INFORMS) last November for their computer program that optimizes a refuelling schedule for freight trains. Dr. Raviv also works on optimizing other forms of public transport, including the bike-sharing programs found in over 400 cities around the world today.

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