



भारतीय प्रबंध संस्थान बेंगलूर
INDIAN INSTITUTE OF MANAGEMENT
BANGALORE

The Decision Sciences Area at IIM Bangalore welcomes you to a webinar, titled:

What is My Train's Route: Planning the Movement of Trains in Large Railroad Networks



by

Dr. Rajesh Natarajan,
IFMR-Krea Graduate School of Business

Date: 07th January, 2022

Time: 3:00 p.m. to 4:00 p.m.

Abstract:

Traditionally, train movements in railroad networks are controlled by dispatchers. Each dispatcher is responsible for train movements in a small portion of the overall network. Because of their scope of operation and limited visibility, the decisions made by dispatchers tend to be sub-optimal. Hence, the need for a near real-time system like Movement Planner, that automates the dispatching of hundreds of trains, while considering the global picture. After setting up the context, we first discuss the problem space and its corresponding constraints. Planning the movement of trains in a large railroad network with hundreds of trains is challenging for two primary reasons. First, the large number of variables and constraints which could number in the thousands. Secondly, the dynamic nature of the network that calls for near real-time decisions. For example, trains entering and leaving the network, temporary track restrictions, etc. which could reduce the network capacity and change the number and nature of the constraints. The best IP-based solutions are unable to tackle this complexity.

The Movement Planner, developed by GE Transportation (now Wabtec Corporation) is a near real-time successful implementation of a movement planning solution that is capable of automatically dispatching trains for any major railroad. Based on AI techniques, like back tracking, etc. this system took more than 10 years to be developed and perfected. We first discuss the solution approach in generic terms. Movement Planner is not a single algorithm, but rather a family of related algorithms that work together in synchrony to deal with the dynamic nature of the problem. The system's architecture is elaborated and the functions of its components is detailed. Finally, based on the speaker's experience in the project, we discuss a simulation-based approach that was developed to demonstrate the value of the Movement Planner to a railroad client. We end with the lessons learned during the roll-out of the system for a large railroad network and scope for future research.