Measuring Robustness of Timetables at Stations using a Probability Distribution

Stations are often the limiting capacity factor in a railway network. This induces interdependencies, especially at at-grade junctions, causing network effects. This paper presents three traditional methods that can be used to measure the complexity of a station, indicating the robustness of the station’s infrastructure layout and plan of operation. However, these three methods do not take the timetable at the station into consideration. Therefore, two methods are introduced in this paper, making it possible to estimate the robustness of different timetables at a station or different infrastructure layouts given a timetable. These two methods provide different precision at the expense of a more complex calculation process. The advanced and more precise method is based on a probability distribution that can describe the expected delay between two trains as a function of the buffer time. This paper proposes to use the exponential distribution, only taking non-negative delays into account, but any probability distribution can be used. Furthermore, the paper proposes that the calculation parameters are estimated from existing delay data, at a station, to achieve a higher precision. As delay data do not exist for future potential timetables the same level of precision cannot be achieved when these are analyzed.

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