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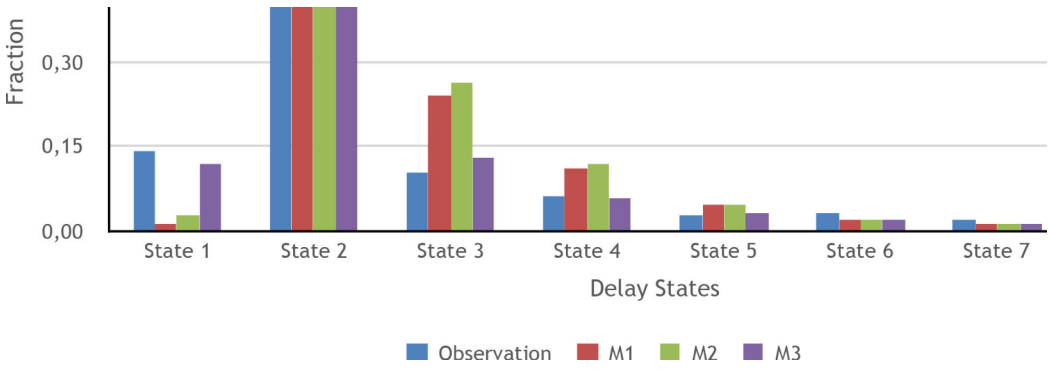
Category: **Rail** Country: **Turkey**

Research Area 8: **Planning, Modelling and System Design** Idea Number: **60**

Investigation of train delay prediction with homogeneous and non-homogeneous Markov Chains

Passenger trains in The Netherlands are an important transport mode with millions of passenger traveling every day. A detailed planning of the railway operations is vital to ensure comfortable and on-time trips to the passengers and an efficient exploitation of the railway network. Because railway systems are complex and competition amongst various transportation systems is high, the need for efficient capacity utilization due to economic reasons increases the importance of planning function. However, train movements are subject to disturbances and disruptions, which may cause late departures and/or late arrivals at stations with respect to their pre-determined times. Train delay prediction has been a popular problem amongst the researchers and multiple approaches have been proposed, from econometric models to stochastic models based on Bayesian networks. In this work, we start from the consideration that, because of the many possible causes of disturbances and disruption, individual train movements and train traffic are exposed to randomness. This perspective calls for adopting stochastic modeling approaches for train delay prediction. Markov chains is a widely used analysis and modeling tool for systems with stochastic processes. In this study, two homogeneous and one non-homogeneous Markov chain models are developed and used to predict delays and delay probability distributions of trains at their subsequent activities by using Dutch railways data. The results show that non-homogeneous Markov chain model can make better predictions than homogeneous Markov chain models.



Key Characteristics

Railway operation • Markov chain models