Abstract:

Shared mobility solutions improve traffic efficiency in cities. This paper addresses the design of an urban demand-responsive transit system operated by a fleet of autonomous modules as a public transportation service. We introduce a discrete event-based multi-agent simulation to reflect system dynamics at an operational level. Vehicles, customers, and intelligent stops are modeled as software agents. Each entity has its own decision-making and planning component. Vehicles compete for a limited number of order requests, and decentralized stops manage the matching between a customer and a prospective vehicle. Scheduling and routing events take place highly dynamically. A simulation study evaluates a demand-responsive operation as a replacement for a fixed-route bus service. Results show that a total demand of 2.3 million rides can be fulfilled with a fleet of around 43,000 six-seater modules. In comparison with the current bus system, the total energy consumption and the system’s utilization are improved, while transport times and distances result in values below the bus system’s performance and therefore must be optimized in further research. © 2018, National Academy of Sciences: Transportation Research Board