# The Spatial and Operational Constraints of Shared-Automated-Vehicle Mobility

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## Abstract:

Shared Automated Vehicles (SAVs) could radically change the urban transport landscape by reducing congestions, air pollution, and traffic accidents. To establish SAVs service, providers need to supply a high level-of service with a minimal as possible fleet size. These two objectives are contradictory and service rejections or excessive waiting time jeopardize the future adoption of SAVs. The tradeoff between the fleet size and level-of-service (LOS) is estimated with the Agent-Based MATSim simulation of the Tel-Aviv Metropolitan Area. We demonstrate that for minimally necessary SAV fleet about 45-50K vehicles are needed resulting in a decrease of congestion by 20%. However, this fleet size results in either a 6% rejection rate or in 40-minutes waiting time ($95^{th}$ percentile). To reduce the rejection rate to a reasonable 1-2% level or $95^{th}$ percentile of less than 20 minutes, the fleet should be increased to at least 75K or even 100K vehicles. Even then the rejection rate for trips between the metropolitan core and its outskirts remains above 20%. We thus assert that: (1) an economically justified future SAV service must be bounded to the metropolitan core where demand for the rides between any two locations is sufficiently high and (2) future urban transportation will remain essentially multimodal.