**Modeling Traffic Around a Pedestrian Zone in a Monocentric Network**

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ABSTRACT

Traffic tends to be most congested in the centers of urban networks. Even for uniformly distributed demand, the center of the network serves the greatest numbers of vehicle routes, and congestion is exacerbated by the fact that urban centers tend to attract more demand as hubs for business, shopping, and transport. This paper presents an analytical link between the macroscopic fundamental diagram (MFD) for network traffic and policies to manage congestion in city centers by implementing a car-free pedestrian zone. An idealized analytical model for ring-radial and rectilinear street networks is used to identify the size of the pedestrian zone, the capacity for parking at the edge of the zone, and capacity of perimeter road around the zone that allows the network to maintain free-flow conditions. The results are then extended to consider the effect of traffic flow on speed, as indicated by the MFD. A microsimulation analysis demonstrates how traffic would be redistributed on the remaining streets of the network, accounting for diminishing speeds as traffic flows increase near the center of the network. The results also provide insights for traffic management policies such as congestion pricing.