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EDITORIAL
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Editorial: Smart Mobility

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Editorial on the Research Topic

Smart Mobility

Urban mobility is experiencing a number of disruptive forces that are changing how individuals interact with cities. Many younger travelers are seeking on-demand mobility strategies to avoid the hassles of car ownership, while older travelers want the freedoms guaranteed by long-term access to personal mobility. Regulators, driven by concerns about climate change, air quality, noise pollution, and the economic and societal cost of congestion, are placing more stringent requirements on mobility strategies to manage their integration into urban settings. In addition, advances in areas such as communication networks, the internet of things (IoT), distributed ledger technology (blockchain), smart cities, and cyber physics, are placing increased expectations on the performance of urban mobility strategies. This is happening at a time when the workhorse of urban mobility—the motor vehicle—is undergoing a technological transformation. Cars have basically retained the same form, with the same functionalities, since the invention of the diesel engine over 100 years ago. More recently innovation is coming in every direction. The future of mobility is no longer dominated by internal combustion engine automobiles but rather automated, electric, connected, shared, and deliverable mobility options ranging from bikes and scooters to cars, shuttles, and more.

Since 2020, the COVID-19 pandemic has disrupted millions of people worldwide in a way that was un-imaginable just a short time ago. This disruption has resulted in many new constraints on transportation networks as society responds to tensions arising from public health and safety and the need for environmentally sustainable transportation options. This special edition features a range of innovative mobility strategies including: distributed ledger technology for ridesharing; intersection collision avoidance management for connected and automated vehicles; a joint optimization framework that addresses fleet size, pricing, and rebalancing to maximize Mobility-on-Demand profits and consumer welfare; and the use of artificial intelligence (or AI) to enhance urban mobility in Southeast Asia.

The first paper, *Distributed Ledger Enabled Control of Tyre (or Tire) Induced Particulate Matter in Smart Cities*, explores the link between transportation-related emissions and public health in municipalities across the world (Katsikouli et al.). Particulate matter (PM) emissions from exhaust and non-exhaust sources are a key contributor to air pollution. In this paper, the authors challenge the view that a ban on internal combustion engine (ICE) vehicles will result in clean and safer air in cities. They argue that eliminating ICE vehicles will not be enough, since emissions from vehicle tires and other non-exhaust sources are expected to increase in the future. The authors support this claim through simple calculations derived from publicly available data for the city of Dublin. They present a high-level strategy for reducing particulate emissions through a control mechanism and ridesharing initiative to limit the number of vehicles in cities to keep the amount of transport-related PM to safe levels. The authors propose the use of distributed ledger technology to support ridesharing platforms, as an equitable strategy that protects user privacy, in smart cities.

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The second paper in the volume is titled: *Resilient Intersection Management With Multi-Vehicle Collision Avoidance* (Worrawichaipat et al.). The authors present a resilient intersection management method that includes multi-vehicle collision avoidance with an emphasis on road barriers that cause major traffic delays. This paper presents a novel path prediction algorithm with a collision avoidance extension that has been customized for intersection management of connected and automated vehicles. The proposed approach guarantees safe paths and is adaptable to different intersection topologies to maximize overall vehicle throughput at intersections in the presence of obstructions. The distributed algorithm transfers most of the computational costs from the intersection manager to the driving agents, improving scalability. Without obstructions, the paper's decentralized method achieves similar performance to traffic lights and "first come first served" options. However, when there are intersection obstructions, the proposed model is more robust, maintaining vehicle throughput of 94% to 99% of optimal performance without obstructions.

In the third paper, *Optimal Operations Management of Mobility-on-Demand Systems,* the authors focus on the emergence of the sharing economy in urban transportation networks (Wollenstein-Betech et al.). They argue that the sharing economy has enabled new, fast, convenient, and accessible mobility services referred to as Mobility-on-Demand systems (e.g., Uber, Lyft, DiDi). These platforms have gained market share in the last decade across the globe, but they face many operational challenges. A key step in the effective operation of these systems is to reduce customer wait times while selecting the optimal fleet size and pricing policy. In this paper, the authors address three joint operational decisions: fleet size, pricing, and rebalancing to maximize the platform's profit and customer welfare. They first develop an optimization framework that gives rise to a static policy. Next, they propose dynamic policies that are more responsive to instabilities, such as unexpected increases in demand. The authors test this framework in a simulation environment employing three case studies by leveraging traffic flow and taxi data from Eastern Massachusetts, New York City, and Chicago. The results demonstrate that jointly solving for these three operational factors could increase profits between 1% up to 50%, depending on the baseline. Further, they observe that the proposed fleet size yields vehicle usage of approximately 75% compared to private vehicle use of 5%.

The final paper in this volume is titled: *Artificial Intelligence Policies to Enhance Urban Mobility in Southeast Asia* (Chong et al.). Artificial intelligence (AI) is a machine-based intelligence tool, which will likely have profound impacts on society, government, industry, universities, and more. AI, not surprisingly, presents opportunities and challenges (e.g., social equity, efficiency). Increasingly, local governments are experimenting with and piloting AI technology to create smarter, more sustainable, and more inclusive cities. While there is notable promise for AI adoption in cities, successful AI deployment requires thoughtful planning, implementation, and management. Fostering collaborations among the private sector, governmental agencies, academia, and the traveling public is critical to maximizing AI benefits and avoiding negative and unintended consequences. This paper presents an overview of how AI could be deployed to improve urban mobility in Southeast Asia.

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All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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