

Urban Mobility in the Era of Smart City/Internet of Things (IoT)

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Student Presentation



Mobility



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• Definition

"The ability to move or be moved **freely**, **easily**, and **safely**"

- Oxford Dictionaries



Internet of Things (IoT)



• Definition

"The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data"

- Oxford Dictionaries







What Smart City applications or Internet of Things (IoT) technologies can governments utilize now to improve overall mobility in their urban regions?

Potentials of IoT in Transportation





Big Data: To Gain Citywide Visibility in Real-Time

Data Mining & Super-computing Simulation System Trajectory GPS Speed smart phones **Big Data** O-D videos Transmission detectors . . . **Real-World Traffic** 2 2





Big Data: To Gain Citywide Visibility in Real-Time



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Traffic Operation: Real-Time Monitoring/Evaluation/Decision System

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Transit





Operating service

- Coordinate vehicle sensors with smart signals
- Real-time schedule broadcasting system
- Demand monitoring



Eco-driving

- Real-time fuel consumption measurement
- Driving behavior monitoring and improvement
- Idling reduction through schedule optimization



Inspection & maintenance

- Performance/configuration data for each vehicle
- Monitoring up-to-date working status
- Automated detection-evaluation-decision strategy



Special Demand

- Emergency: severe weather/vehicle fault
- Additional runs (peak & special event)
- Reaction function



Pedestrian Safety



- Smart reflector for pedestrian: blink and alert drivers (Finland)
- Smart traffic lights: warn turning vehicle when pedestrian is crossing

- Generating Sidewalk Quality Network
- To get crowdsourced data
- 0 To prioritize maintenance/repair
- To support pedestrian's routing decisions



Smart reflector



Smart walk system



Bike Sharing

- Benefits: flexibility, the "last-mile" travel
- Challenges: dynamic demand and asymmetric usage, leading bike sharing to an unbalanced system with biased distribution
- IoT-integrated bike sharing system: provide real-time bike supplies, predict demand
- Implement discounted fare strategies
- Encourage rent from spots with surplus bikes

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- Encourage park in spots with potentially higher demand with less supplies

Shared Bike Distribution in London





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References & Contact

References:

- Xu, X., H. Liu, Y. Xu, M.O. Rodgers, and R. Guensler (2018). Regional Emission Analysis using Travel Demand Models and MOVES-Matrix (18-05363). In 97th Annual Meeting of the Transportation Research Board. Washington, DC.
- Liu, H. Xu, X., M.O. Rodgers, and R. Guensler (2017). MOVES-Matrix and Distributed Computing for Microscale Line Source Dispersion Analysis. Journal of the Air & Waste Management Association 67(7), 763-775.
- <u>Lopez</u>, M. 2014. Right-Time Experiences: Driving Revenue with Mobile and Big Data. Wiley. ISBN: 978-1-118-84735-0.
- LEDinside. 2016. Smart Reflector Blinks to Improve Pedestrian Safety. Available at: <u>http://www.ledinside.com/news/2016/1/smart_reflector_blinks_to_improv_es_pedestrian_safety</u> (Accessed: 10/07/2017)
- Georgia Tech. 2017. Sidewalk Quality Assessment. Available at: <u>http://transportation.ce.gatech.edu/sidewalks</u> (Accessed: 10/07/2017)



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