

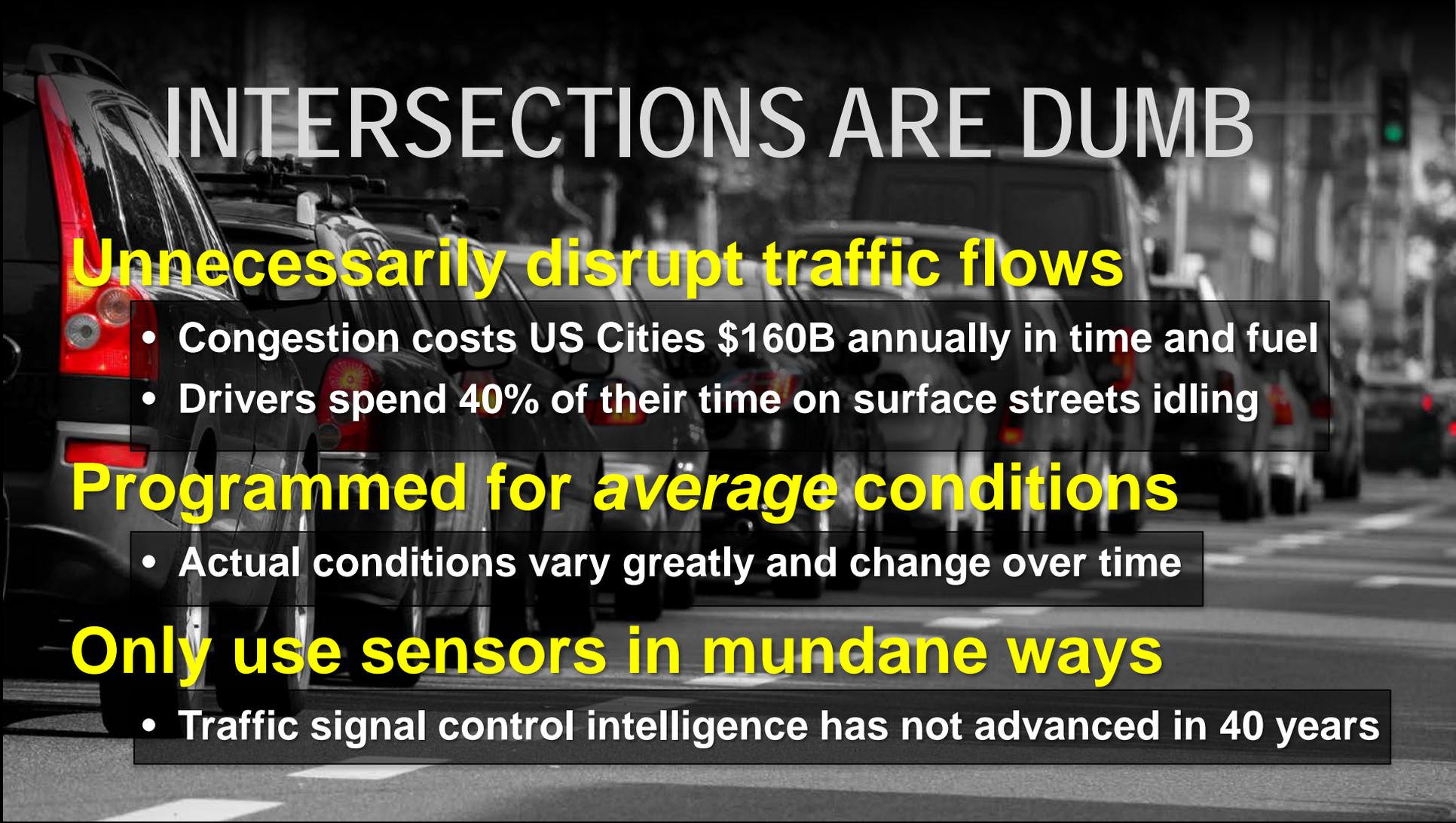


Smart Transportation Infrastructure and the Future of Mobility

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INTERSECTIONS ARE DUMB

Unnecessarily disrupt traffic flows

- Congestion costs US Cities \$160B annually in time and fuel
- Drivers spend 40% of their time on surface streets idling

Programmed for *average* conditions

- Actual conditions vary greatly and change over time

Only use sensors in mundane ways

- Traffic signal control intelligence has not advanced in 40 years



Scalable Urban Traffic Control

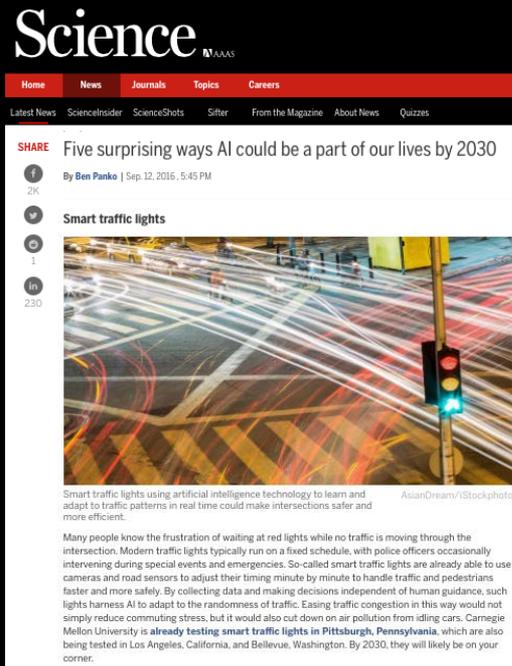
Goal: Real-time optimization of complex road networks

Technical Approach:

Collaborative Online Planning

– *Decentralized control*

– *Coordinated Action*





Scalable Urban Traffic Control

In the Field:

- 26% reduction in travel times
- 30% fewer stops
- 40% less time idling

Rapid Flow Technologies founded in 2015 to commercialize tech.



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SHARE Five surprising ways AI could be a part of our lives by 2030

By Ben Panko | Sep 12, 2016, 5:45 PM

Smart traffic lights



Smart traffic lights using artificial intelligence technology to learn and adapt to traffic patterns in real time could make intersections safer and more efficient. AsianDream/iStockphoto

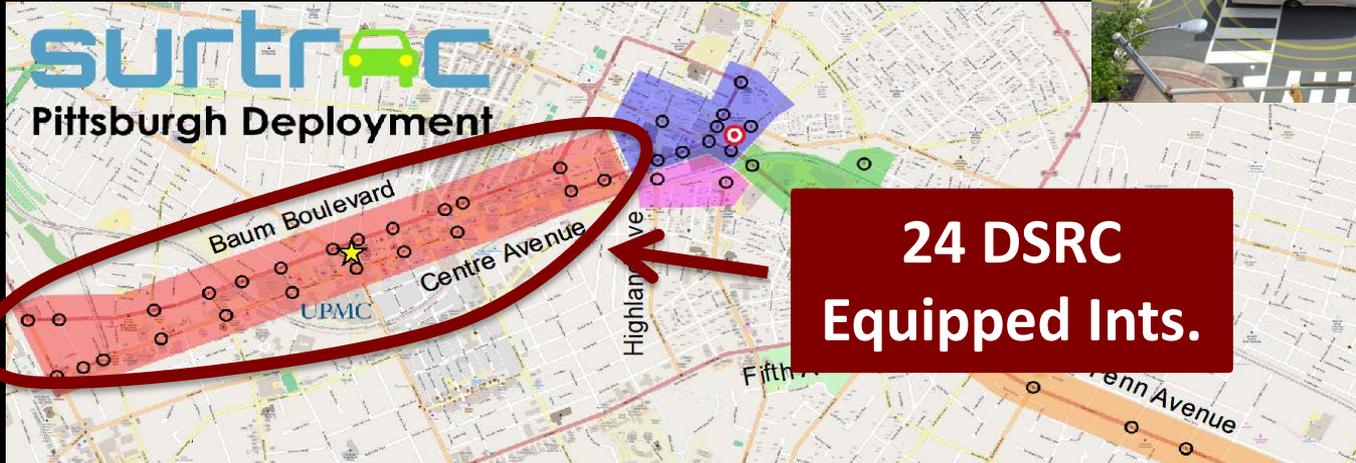
Many people know the frustration of waiting at red lights while no traffic is moving through the intersection. Modern traffic lights typically run on a fixed schedule, with police officers occasionally intervening during special events and emergencies. So-called smart traffic lights are already able to use cameras and road sensors to adjust their timing minute by minute to handle traffic and pedestrians faster and more safely. By collecting data and making decisions independent of human guidance, such lights harness AI to adapt to the randomness of traffic. Easing traffic congestion in this way would not simply reduce commuting stress, but it would also cut down on air pollution from idling cars. Carnegie Mellon University is already testing smart traffic lights in Pittsburgh, Pennsylvania, which are also being tested in Los Angeles, California, and Bellevue, Washington. By 2030, they will likely be on your corner.

Connected vehicles
are coming ...



Integration of Signal Control with Connected Vehicle Technology

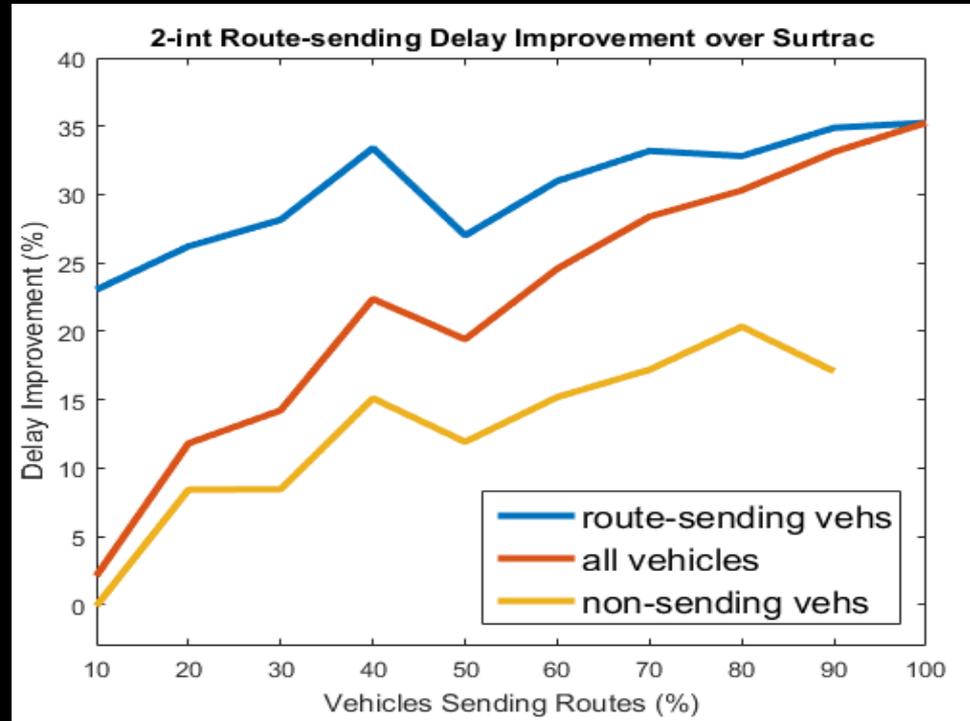
- V2I will transform real-time sensing
- Is there anything we can do in the shorter term?



Route Sharing

Basic Concept

- Connected Vehicle (CV) shares its route with the network
- Intersections incorporate this information into local optimization



Smart Transit Priority

Basic Concept:

- Bus shares real-time information with intersections
- Intersections combine this info. with bus's schedule to improve on-time reliability and reduce congestion



Safe Intersection Crossing

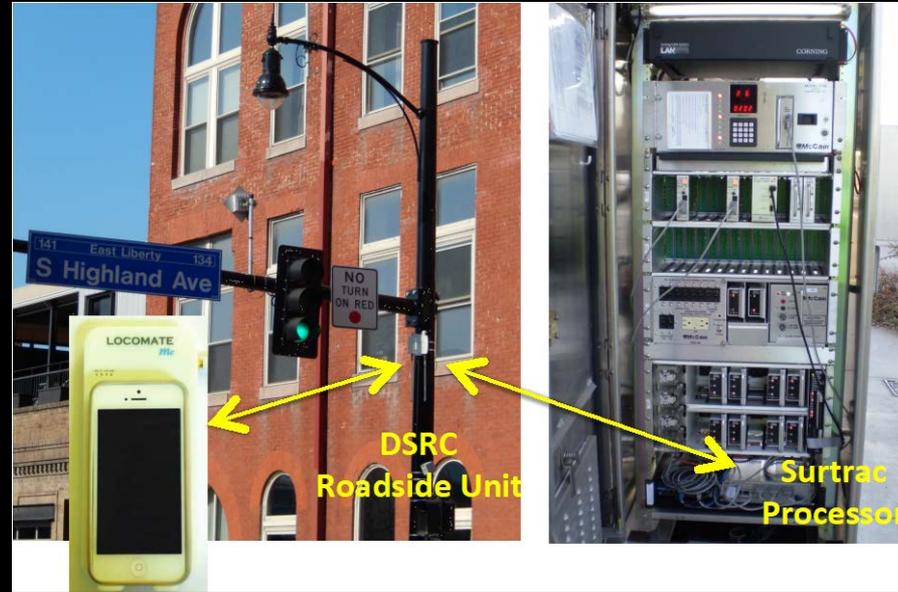
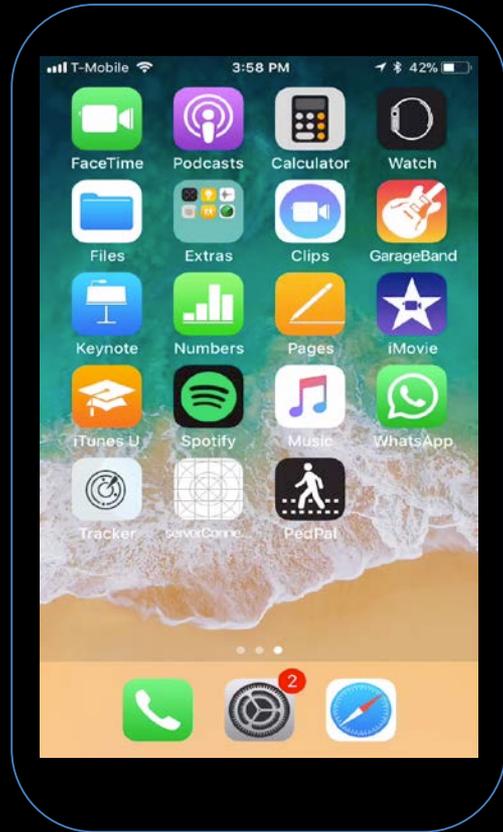
Concept: *A smartphone app that allows pedestrians to interact directly with traffic signal system*

Capabilities

- Personalized crossing time
- Active monitoring
- Anticipation of arrival time to streamline crossing



The *PedPal* Prototype

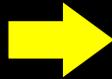


PHAENON Sensor Networks

- Measure real-time traffic conditions for:
 - Incident detection
 - Congestion due to cruising for parking
 - ...



Low-cost automatic vehicle identification (AVI) sensors



Dense, ubiquitous sensor network deployments



Reconstructed vehicle routes

Autonomous Vehicles

