



Traffic monitoring during extreme congestion events

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Limitations of current systems



- Surface streets
 - Sparsity of sensing
 - Limited (but increasing) GPS data from mobile devices

- Rely on statistical algorithms
 - Heavily influenced by historical priors



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Extreme congestion events



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- Event driven congestion

- Sporting events
- Natural disasters

- Impact on transportation infrastructure

- Network topology changes
- Damage to physical components
- Loss of cyber components
- Change in travel demands

Need for cheap, instantly
deployable (temporary) sensing

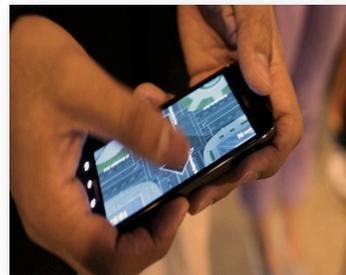


[A. Savulich, New York Daily News, 2012] 3

TrafficTurk smartphone app

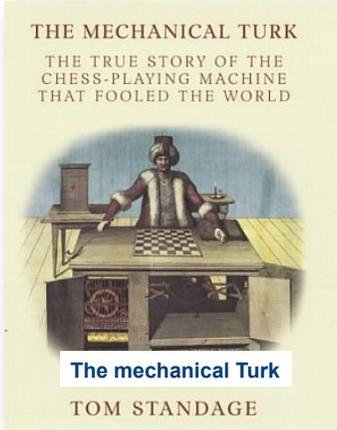


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When a vehicle passes the
intersection,
swipe its movement on the screen.

Inspiration for *TrafficTurk*

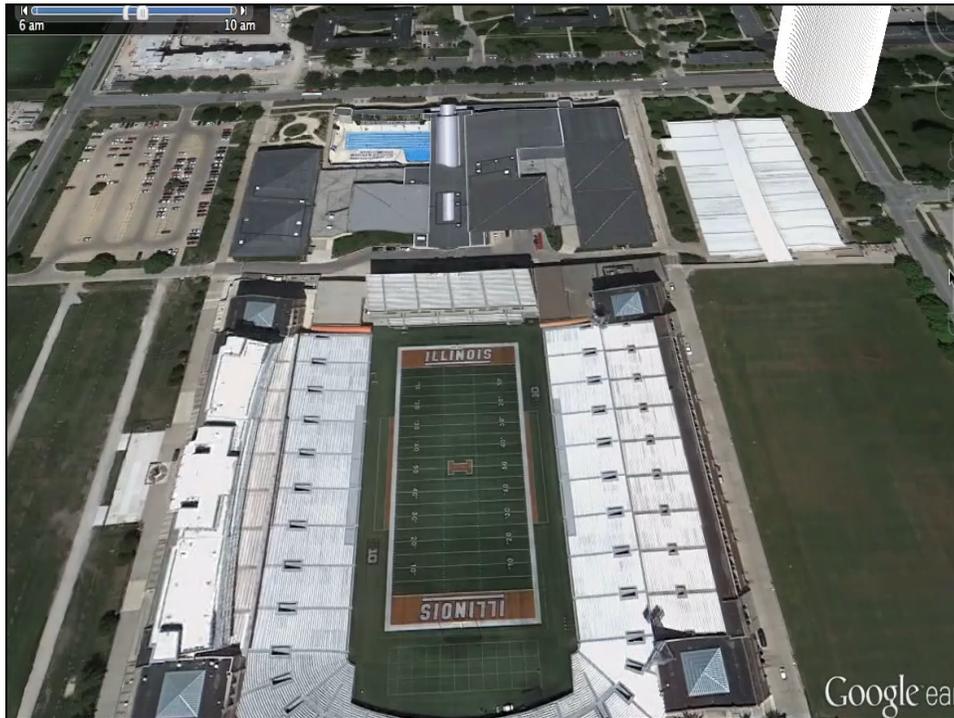


Turning movement counters
(Transportation's Mechanical Turk)



TrafficTurk in Urbana-Champaign

100+ sensors deployed to monitor football traffic
220,000+ vehicles swiped
140 volunteers



TrafficTurk Experiment - NYC

- Hurricane Sandy – November 3 and 4, 2012
- Garment District, Manhattan
- Overnight map deployment
- Recruitment at Columbia University
- Real disaster response experience

== **10+ hours monitoring**

[NSF RAPID # 1308842]

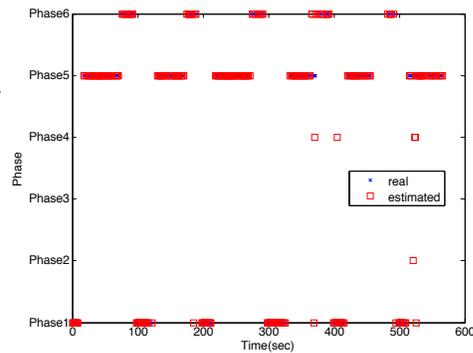
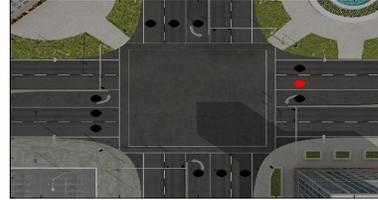
[Scientific American Citizen Science featured project '12]

Processing techniques: Phase Inference via Hidden Markov Modeling



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- **Goal:** identify traffic signal phases from maneuver data
- **Motivation:**
 - Recovery of traffic phase timings
 - Simplified *TrafficTurk* user interface



[M. Reisi Gahrooei & D. Work, IEEE ITSC 13]

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Processing techniques: Inverse optimal traffic signal control



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- **Goal:** recover traffic signal control logic via learning on the cost function
- **Motivation:**
 - Flow model forecasting on surface streets
 - Limited information on existing infrastructure (none at large scales)
 - Human traffic control



[S. Gowrishankar & D. Work, IEEE ITSC 13]

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Next steps



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- Processing *TrafficTurk* data for NY (phase detection controller detection)
- Integration into real-time traffic estimation algorithms
- Acquiring (FOIL) NYC GPS taxi data pre and post Sandy.

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