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
**Extreme congestion events**

- 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


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**TrafficTurk smartphone app**

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

The mechanical Turk

Amazon's Mechanical Turk

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

[NSF RAPID # 1308842]
[Scientific American Citizen Science featured project ‘12]
Processing techniques: Phase Inference via Hidden Markov Modeling

- **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]

Processing techniques: Inverse optimal traffic signal control

- **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]
Next steps

- 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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