Driving pattern analysis for emergency vehicle (EV) in Dallas, Texas, USA

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Introduction

- Response time?

- Reduce response time: Advanced algorithm with considering real-time data
  
  Less validation & limited computation resources
  Faster route but ignore the reasons for Unsuccessful Dispatches (UD)

- Data-driven evidence-based approach
  identify the key causes for UD and to improve emergency responses
Objectives

- A data-driven approach to uncover UD.
- Understand distribution of UD in micro-level (e.g., street segments).
- Identify response time variability.
Framework

- Dispatch: Successful and Unsuccessful
- Spatial pattern (micro-level)
- Geographical Features

Emergency Vehicle (EV) delay

Location? where

hour? when

why

Spatial

Road characteristic
Historical traffic accident
Historical traffic count

Temporal

Weather
Time of the day
day of the week
Data

- 887,825 emergency runs.
Method

- Detect UD (response time > 8 minutes)

*circle size is not related to number, only work for presentation*
Informative Results

Annual Unsuccessful Incident

- **Successful Incident**: As long as one EV has arrived within eight minutes.
- **Unsuccessful Incident**: All dispatched EVs haven’t arrived within eight minutes.
Spatial and temporal Pattern

1. Micro-level (street-segment)
   - City Peripheral experienced high proportion of UD
   - High proportion cluster in part of area may relate to local characteristics

2. Macro-level (Census Tract)
   Norther Dallas have higher proportion of unsuccessful incidents
Median of speed on street level for UD

- Speed is a direct manifestation for the delay occurrence.
- Dallas downtown have more road segments that with lower speed.
- Unsuccessful dispatches with lower speed are more important.
Response time variability

- 30 incidents (successful rate: 28/30 = 93.3%)
  - Successful incidents: 28.
  - Unsuccessful incidents: 2.

- 32 incidents (successful rate: 4/32 = 12.6%)
  - Successful incidents: 4.
  - Unsuccessful incidents: 32.
Total incidents: 1569
Successful rate: 95.3%

Total incidents: 1886
Successful rate: 95.9%

Total incidents: 1481
Successful rate: 96.1%
Discussions and future work

- Yearly pattern can be informative, but hourly pattern need to be developed due to response time variability.

- Considering the site and situational characteristic in modeling.

- Based on the surrounding geographical features, how to model the success probability for an event at a specific location.
Thank you!

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