Traced Accident Data Analysis Using Comprehensive Spatiotemporal Traffic Data

時空間交通データを用いた交通事故発生状況に関する分析

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1. Background

- Globally, highway accident data analysis is utilized to enhance safety measures.
- Precise temporal traffic data aids in understanding vehicle behaviour during accidents.
- The recorded accident time may not reflect the actual time of the accident, as there can be a delay in reporting.

Objective: To examine the traffic pattern prior to the reported accident time.

2. Study Site & Data

- Study site: **Tokyo Metropolitan Expressway. (2015-2021)**
  - Data provided by Metropolitan Expressway Co., Ltd.
- **Traffic detector data** is for every 250 m and aggregates of 5 min and consists of:
  - Vehicle count
  - Heavy vehicle count
  - Average Velocity
  - Occupancy
- **Accident data** consists of:

Spatiotemporal data:
- Date and time
- Route and location

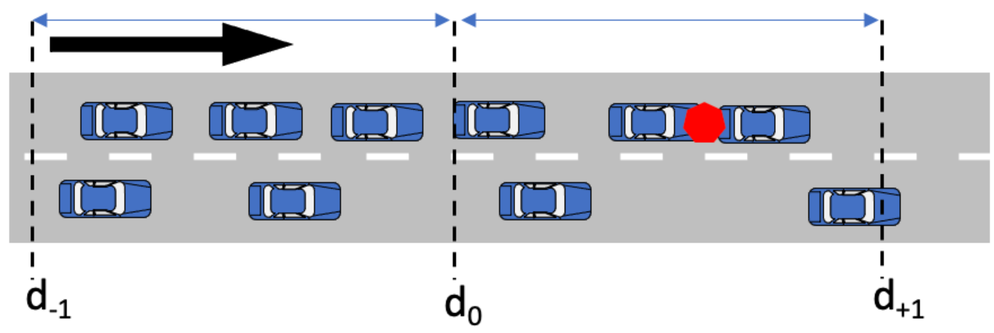
Crash characteristics:
- Vehicles involved
- Type of crash
- Damage
- Severity

3. Methodology

- After filtering errors and missing data: accident and traffic datasets are integrated by time and location.
- By examining the traffic behaviour of the detectors (d_{-1}, d_{+1}, and d_0) upstream of an accident 20 min before the recorded accident time, the assumed actual time of the accident is traced.
- At the detector d_0, the traffic flow condition from d_{-1} -> d_0 -> d_{+1} at any given interval is classified into Congested, Critical, and Uncongested.
- Pre-accident traffic flow conditions that lead to an accident are categorized from the traced accident time.
- The sample sizes are not equal; to avoid skewed comparison, accident rates are calculated.
- **Accident rate**

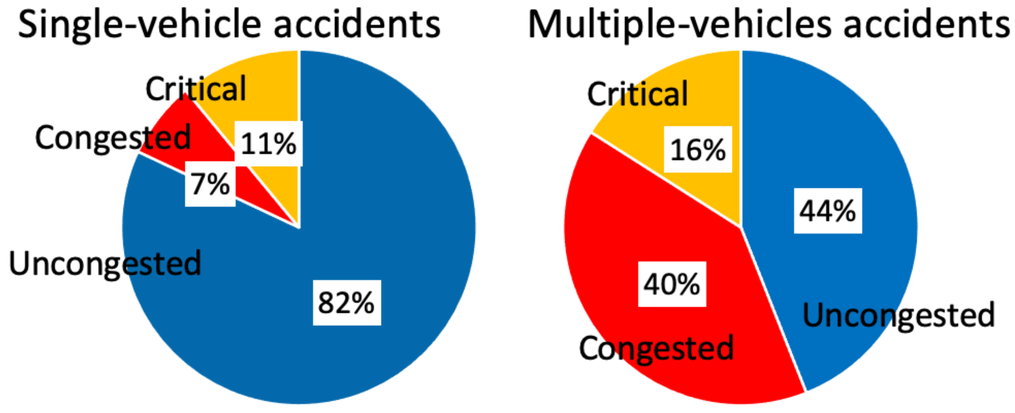
$$= \frac{Accidents}{total\ duration\ of\ the\ traffic\ flow\ detected\ on\ the\ expressway}$$

(accidents per million hours of traffic flow detected)



4. Results

Sample Size for Single Vehicle vs. Multiple Vehicle Accidents



- Accident rates for

multiple-vehicles >> single vehicle

- During periods of congestion, the likelihood of multiple-vehicle accidents increases, whereas, in free-flow conditions, single-vehicle collisions may occur.
- In future analysis, these traced accidents will be used in the accident prediction model and post-accident analysis.