Data-Driven Safety Training
Urban 4-Leg Signalized Intersection
Part 2 Desired Data

Carlos Sun, Praveen Edara, Yaw Adu-Gyamfi

University of Missouri

Missouri Center for Transportation Innovation

Outline

1 U4SG required data

2 Landing observed intersection crashes

3 Desired/optional data

4 Predictive structure

5 Salem MO-32/MO-19 example

Desired Data

- ped
- bus stops
- alcohol sales establishments
- educational facilities

Ped Volumes Cross All Intersection Legs

- Estimate vehicle-pedestrian collisions
- Estimate pedestrian activity based on surrounding land-use

General Level of Pedestrian Activity	Estimate of PedVol (pedestrians/day)
	4SG Intersections
High	3,200
Medium-High	1,500
Medium	700
Medium-Low	240
Low	50

Maximum Number of Lanes Crossed by Pedestrians

- Longest crossing path
- Both through and turning lanes
- Refuge or raised/depressed island resets the counting
  - flush or painted island does not reset

Maximum Number of Lanes Crossed by Pedestrians

Google 2016

Number of Bus Stops within 1,000 ft of Intersection

- Sources: transit publications, aerial photos
- Every stop is counted, even at adjacent intersections

Number of Bus Stops within 1,000 ft of Intersection

Google 2016

Number of Schools within 1,000 ft of Intersection

- Counted if any portion of the school grounds is within 1,000 ft of the intersection
- Sources: local school registers, aerial photo

Number of Schools within 1,000 ft of Intersection

Google 2016

Number of Alcohol Sales Establishments within 1,000 ft of Intersection

- Counted if any part of alcohol establishment is within 1000 ft
- Examples: liquor store, bar, restaurant, convenience store
  - verify if serving alcohol
- Sources: local business registers, aerial photo

Number of Alcohol Sales Establishments within 1,000 ft of Intersection

Google 2016

Default HSM Values

Crash Modification Factor	Base Condition
Intersection Left-Turn Lanes	Not Present
Intersection Left-Turn Signal Phasing	Permissive Left-Turn Phasing
Intersection Right-Turn Lanes	Not Present
Right Turn on Red	Permitting
Lighting	Not Present
Red-Light Cameras	Not Present
Bus Stops within 1,000 ft of the Intersection	Not Present
School within 1,000 ft of the Intersection	Not Present
Alcohol Sales Establishments within 1,000 ft of the Intersection	Not Present

Safety Prediction Structure

- $N_{\text{predicted } int} = C_i \times (N_{bi} + N_{pedi} + N_{bikei})$
  - combine vehicle (*bi*), pedestrian (*pedi*), bike crashes (*bikei*)
- C_i calibration factor
- $N_{bi} = N_{spf\ int} \times (CMF_{1i} \times CMF_{2i} \times \ldots \times CMF_{6i})$
- $N_{spf\ int}$ predicted number of total intersection crashes (excluding ped & bike)

Vehicle Crashes

- Split into multi vehicle and single vehicle
- $N_{spf\ int} = N_{bimv} + N_{bisv}$
- multi vehicle
  - $N_{bimv} = exp[a + b\ x\ ln(AADT_{maj}) + c\ x\ ln(AADT_{min})]$
- single vehicle
  - $N_{bisv} = exp[a + b\ x\ ln(AADT_{maj}) + c\ x\ ln(AADT_{min})]$
- Note the coefficients a, b, c are different for mv vs. sv
- $AADT_{maj}$ combined major road AADT (both directions)
- $AADT_{min}$ combined minorroad AADT (both directions)

Ped & Bike

- Ped Crashes
  - $N_{pedi} = N_{pedbase} \times CMF_{1p} \times CMF_{2p} \times CMF_{3p}$
  - $N_{pedbase}$ predicted vehicle-pedestrian collisions
- Bike Crashes
  - $N_{bikei} = N_{bi} \times f_{bikei}$
  - f_{bikei} bicycle crash adjustment factor