A Novel Method for Vehicle-Pedestrian Near-Crash Identification using Roadside LiDAR

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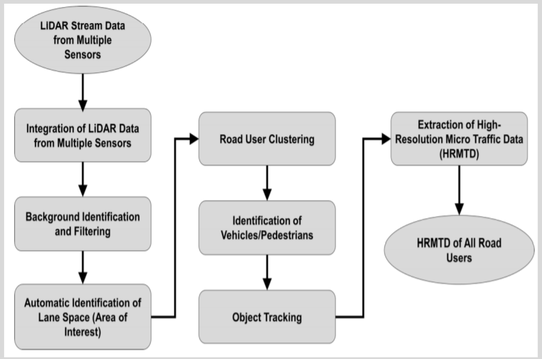
Introduction

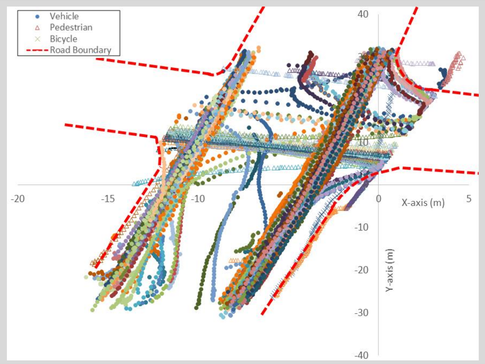
For the traditional NDS, the near-crash events can be only extracted from the vehicles installed with NDS devices. This limited the safety evaluation using NDS data at individual sites. It is necessary to find a method that can collect all near-crash events at individual sites.

This study introduces a Light Detection and Ranging (LiDAR)-enhanced connected infrastructure for vehicle-pedestrian near-crash identification at specific/individual sites.

LiDAR Data Processing

A detailed procedure was developed to extract the high-resolution micro traffic data (HRMTD) (mainly including speed, location, direction and timestamp) from roadside LiDAR data.





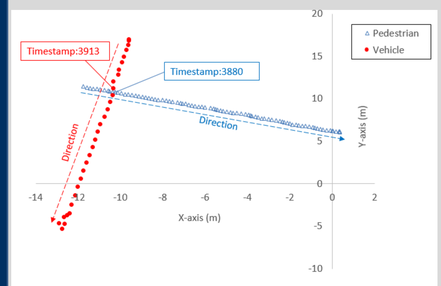
Near-Crash Identification

❑ **Limitation of time to collision (TTC)**

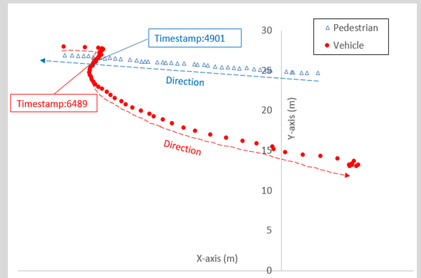
TTC is the travel-time difference between a leading vehicle and a following vehicle, which may lead to collision **if these vehicles maintain their current speeds without the performance of evasive maneuvers.**

❑ **Developed Parameters**

- Time Difference to the Point of Intersection

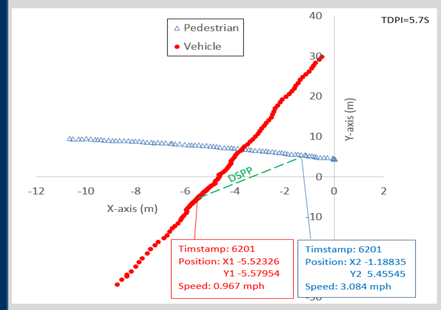


(a) Near-Crash

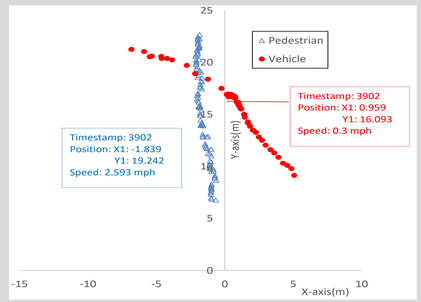


(b) Baseline-Normal Maneuver

- Distance between Stop Position and Pedestrian

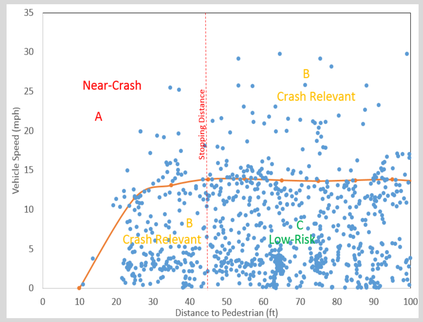


(a) DSPP-11.86m (38.91ft)



(b) DSPP-4.21m (13.81ft)

- Speed-Distance Profile

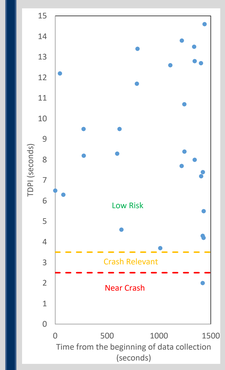


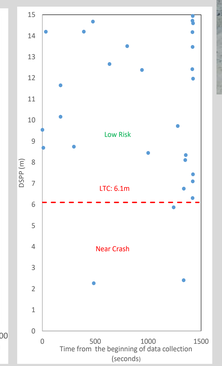
Case Study

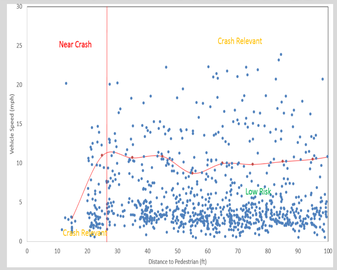
Thresholds of Near-Crash Identification

Risk	Thresholds
Near-crash	TDPI<2.5s or 0<DSPP<LTC or vehicle speed within area A in speed-distance profile
Crash Relevant	2.5s≤TDPI≤3.5s or vehicle speed within area B in speed-distance profile
Low risk	TDPI>3.5s or DSPP≥LTC or vehicle speed within area (a) in speed-distance profile within area C in speed-distance profile

The Engineers can also define their own thresholds based on the features of different sites.







Conclusion

This paper provides a novel method for vehicle-pedestrian near-crash identification using roadside LiDAR data. The proposed method was coded into an automatic procedure, which can release the labor work for near-crash identification. The proposed method serves the supplement of traditional NDS method. With the detailed trajectories of all road users on the road, the near-crash at the individual site, not only sample data, can be identified.