Developing a V2I Motorcycle Warning Algorithm using Naturalistic Driving Data

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Outline

- Introduction to Motorcycle Hazards
- Connected Vehicle Technology
- Motorcycle Warning Algorithm - System Overview
- Framework for Algorithm Development
- Future Work
- Summary
- References

Background

- Road hazards such as gravel, potholes, and debris, may cause a rider to lose control of his or her bike.
- These conditions can occur on any roadway where activity has altered the quality of the existing pavement.
- Motorcyclists are more likely to be seriously injured or killed when interacting with pavement abnormalities than passenger vehicles.

Connected-Vehicle Technology

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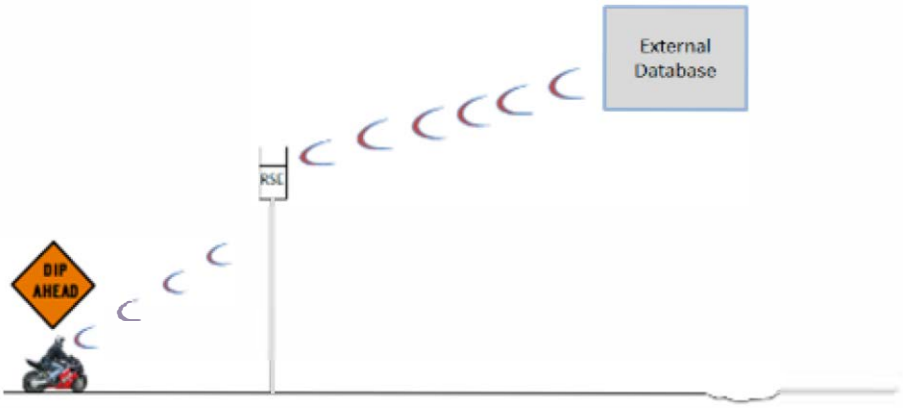
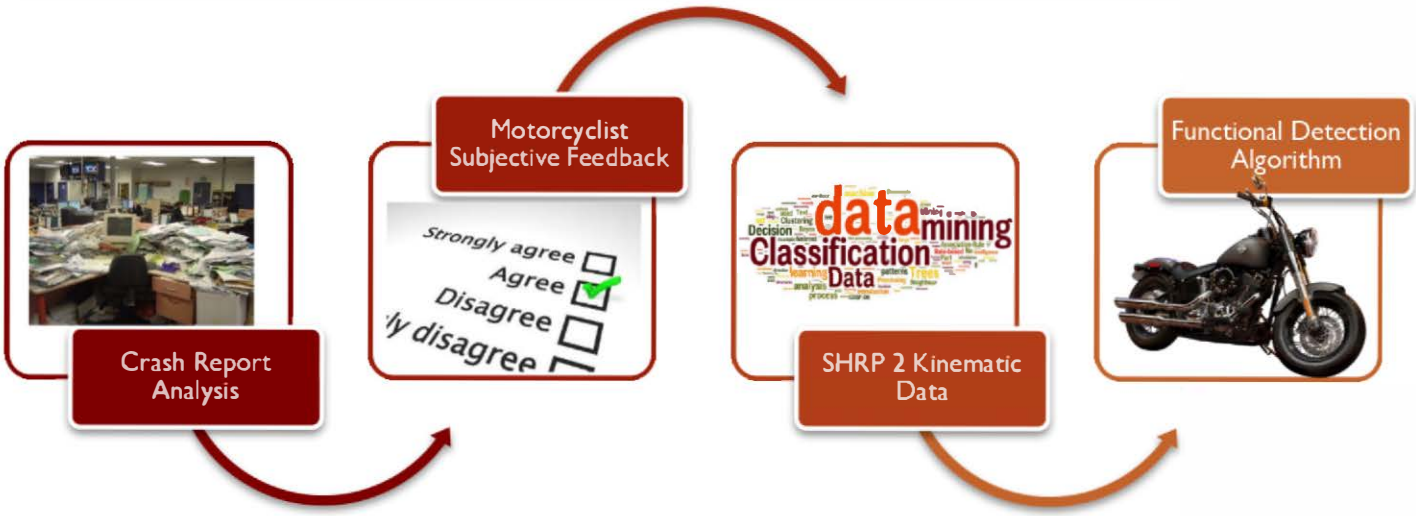
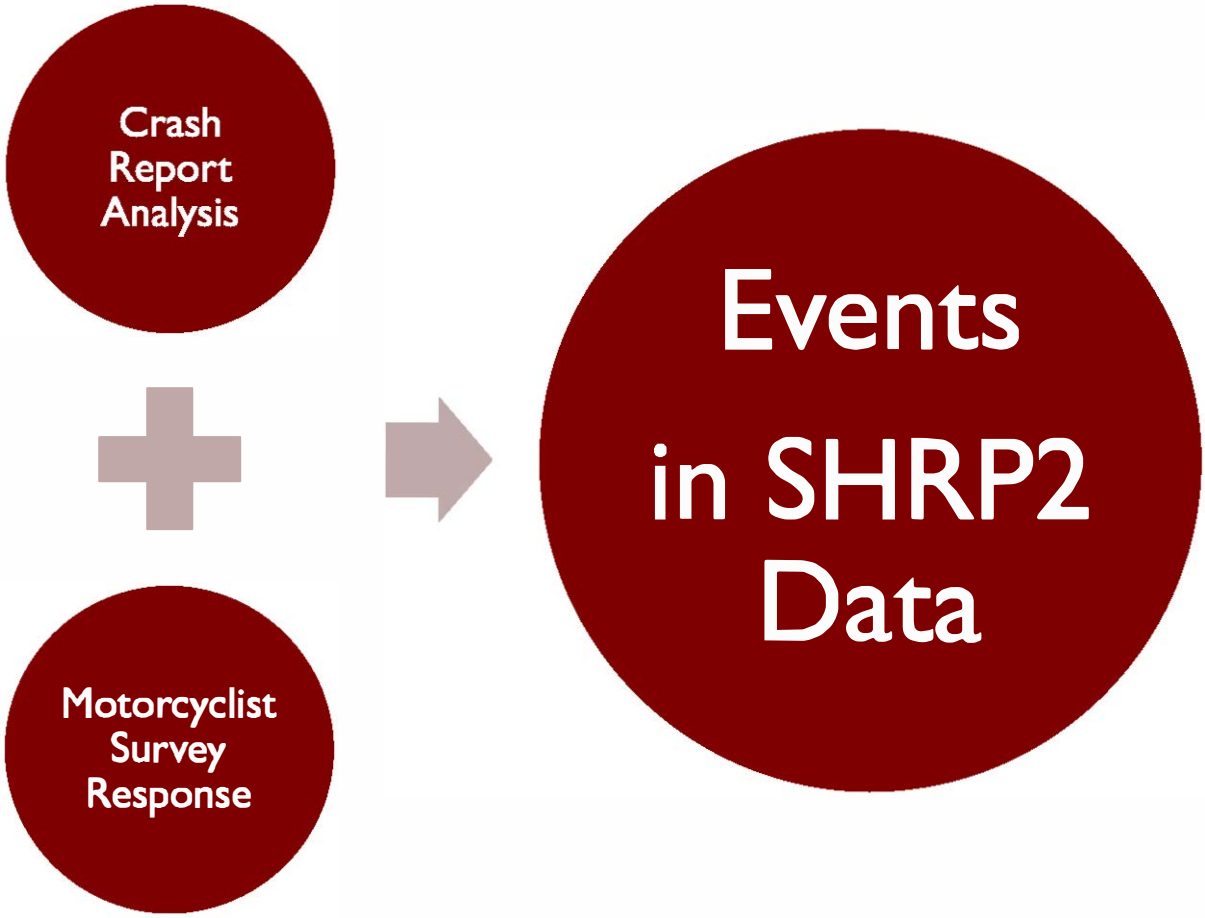
Motorcycle Warning Algorithm- Application



The Process



Determining Events of Interest



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- VARIETY –

- LARGE
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Getting into the data

- Variables of interest will be identified for different event types
- Some variables include:
  - Speed
  - Acceleration (x,y,z)
  - Braking/Steering input
  - Activation of integrated safety systems

Video Assessment to further algorithm development

Event Classification

- Transverse Surface Irregularities
- Longitudinal Surface Irregularities
- Low Traction Situations
- Debris in Roads

Hazard Severity Assessment

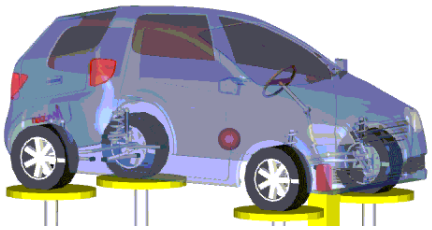
- Low Level
- Medium
- High Level

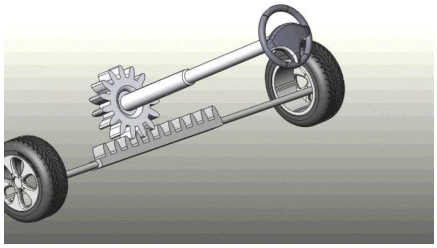
Driver Response Classification

- Driver Strikes Surface Abnormality
- Driver Takes Evasive Action

Driver Response Classification

	Driver Hits Deformation	Driver Takes Evasive Action
Data Collected:	**Vehicle Kinematic Data before, during, and after striking the deformation**	**Driver response data** **- Steering** **- Braking**
How it will be used:	**Deformation type and severity identification**	**Directional information for motorcyclist for hazard avoidance**





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Future Work

- Algorithm, false-positive and false-negative rates will be ascertained using a confusion matrix
- After preliminary algorithm validation and refinement, a Field Operational Test will be deployed on a small set of passenger vehicles and motorcycles

		Predicted Outcome	
		Positive	Negative
Actual Value (Experiment)	Positive	TP True Positive	FN False Negative
	Negative	FP False Positive	TN True Negative

In Summary

- Motorcyclists are a vulnerable group of road users
- Using naturalistic data with subjective feedback from motorcyclists allows this to be holistic and human based
- Implementation of a warning algorithm using advanced technology has the potential to reduce motorcyclist injuries and fatalities

References

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Thank you!

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