Differential Bike Detection:
Meeting USDOT Mayor’s Challenge

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Bicycling Growing in Popularity

• Between 2000 and 2011, bicycle commuting grew 47 percent nationwide.

• In 2012 about .64% of commutes were made by bicycle (10% increase from 2011).

• 864,883 bicycle commuters in 2012.


The League of American Bicyclists, ACS: Bike Commuting Continues to Rise; [http://bikeleague.org/content/acs-bike-commuting-continues-rise](http://bikeleague.org/content/acs-bike-commuting-continues-rise)
Bike Sharing is big!

- Allows members to borrow/return bicycles to multiple locations
- Over 80 cities in North America have bicycle sharing locations
- This number is constantly growing
- Even in Bangkok, Thailand!
More Bikes = More Injuries & Fatalities

- Bicyclist deaths in 2012: 726 (NHTSA Traffic Safety Facts)
- Bicyclist injuries in 2012: 49,000 (NHTSA Traffic Safety Facts)
- The total cost of bicyclist injury and death is over $4 billion per year (National Safety Council).

Pedestrian and Bicyclist Crash Statistics
http://www.pedbikeinfo.org/data/factsheet_crash.cfm
Bicyclist Deaths Increased in 2011, 2012 & 2013

- 1.2% Increase

<table>
<thead>
<tr>
<th>Fatality and Injury Rates per 100 Million VMT</th>
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<tr>
<td></td>
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<tr>
<td>Fatality Rate</td>
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<tr>
<td>2012</td>
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<td>1.14</td>
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<td>Injury Rate</td>
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<td>80</td>
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Source: FARS, GES, and FHWA VMT

<table>
<thead>
<tr>
<th>Occupants and Nonoccupants Killed and Injured in Traffic Crashes</th>
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<tr>
<td>Description</td>
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<tr>
<td>Total*</td>
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<tr>
<td>Occupants</td>
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<td>Passenger Vehicles</td>
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<tr>
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<td>Light Trucks</td>
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<td>Motorcycles</td>
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<td>Nonoccupants</td>
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<tr>
<td>Pedestrians</td>
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<td>Pedalcyclists</td>
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Towards Zero Deaths (TZD)

- A National Strategy on Highway Safety rolled out March 2015
- The U.S. version of Vision Zero; Vision Zero essence is:
  "In every situation a person might fail, the road system should not."
- TZD provides a platform of consistency for state agencies, private industry, national organizations and others to develop safety plans that prioritize traffic safety culture and promote the national TZD vision
USDOT Mayor’s Challenge

Safe Design, Safer Streets

- People, Safer Streets
- …take significant action to improve safety for bicycle riders and pedestrians of all ages…
- Complete Streets Approach
- Gather bicycling and walking data
- Make streets safe and convenient

Mayors Challenge Summit – March 12, 2015

Innovation for better mobility
Join the List of Challenge Cities

Local List:
- Chicago, IL
- Peoria, IL
- Madison, WI
- Wisconsin Rapids, WI
- South Bend, IN
- Indianapolis, IN
- Madison, IN
- Columbus, OH
- Akron, OH
- Marietta, OH
- Parma Heights, OH
- NOACA, OH
- Dayton, OH
Safety Issues

- **Pattern**: 40% of bicyclist fatalities in crashes occur at intersections (NHTSA Traffic Safety Facts, 2008)
- **Strategy**: Reduce intersection conflicts among vehicle & bicycle
- **Countermeasure**: Use enhanced detection systems to extend traffic signal green phase for bicyclists
Bicycle Detection: The Need

- More bikes on the road = Increase in bicycle fatalities
- Agencies are requiring bicycle detection to help reduce crashes
- Several states in USA require bicycle detection at intersections
- Bicycle advocacy groups are pushing the issue effectively
Lots of Roadway Treatments
Lots of Roadway Treatments
But what happens...

• ...when all those bikes get to the intersection?
Some Intersection Treatments

Innovation for better mobility
Historical Signal Timings

• Traffic Engineers like to:
  – Maximize arterial green time
  – Minimize minor movement green time
  – Eliminate motorist delay
  – Coordination

• Designed for vehicles not bicycles
  – Short Initial green times
  – “Snappy” gap-out times
Why Not Bicycles?

- Historically no Differentiation from Motor Vehicles
- Slower than Vehicles – Faster than Peds

No special accommodation means:

**Bicyclists cannot safely get through a large intersection with too-short initial or extension times**
How can intersections be safer for cyclists?

• Only with **Differentiation**!

• Design the signal system to operate differently when the system **knows a bicycle is present**

• Key Benefits
  – Extended Phase by Extending a Bike Only Detection Zone
  – Add Min Green Time for Bikes
  – Improve efficiency – special timing for bikes only when they are present
  – Enhanced data collection
Bicycle Detection Technologies

- In order to create special timings it is necessary to detect bicycles at intersections.
- Detection manufacturers are providing tools to allow engineers to take action.
- It is now possible to not only detect a bicycle but differentiate a bicycle from other motor vehicles.
Thermal Detection

- Detectors installed overhead
- A virtual zone is created
- Outputs are put into the controller based on the setup of the zones
Loops & Micro-Radar

- Installed in the pavement
- Creates a detection zone above the detector
- Outputs are put into the controller based on the set up of the zones
Video Detection

- Using video to **differentiate** bicycles from cars
- Performing bicycle differentiation concurrently with stop bar detection
- Providing for both bicycle and vehicle count zones
Bicyclists Deserve Safer Intersections

- Bikes start and move slower than cars
- What can we do to prioritize a traffic safety culture?
  1. Implement differentiating bike detection to optimally operate signals
  2. Set Initial & Gap times to safely accommodate bicycle crossings
Provide a system to detect bicycles

Differentiate bicycles from vehicles

Count Bikes in all lanes & Extend min green time

Safer intersections
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