V2X Bicycle and Pedestrian Detection

ITS Wisconsin Annual Conference
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Denver, CO
Wisconsin is focused on improving safety for bikes and pedestrians!

WisDOT Funded Bike/Ped Projects
1993 – 2014
~700 projects
$283M

WisDOT
2018 – 2022
TAP Awards
29 Projects
$15.7M
1998 WI Bicycle Transportation Plan

• **Increase levels of bicycling throughout Wisconsin**, doubling the number of trips made by bicycles by the year 2010 (with additional increases achieved by 2020)

• **Reduce crashes involving bicyclists** and motor vehicles by at least 10% by the year 2010 (with additional increases achieved by 2020).
1999 Wisconsin Pedestrian Policy Plan

- **Increase the number** and improve the quality of walking in Wisconsin.

- **Reduce the number of pedestrian crashes and fatalities.**

- **Increase the availability of pedestrian planning and design guidance** and other general information for state and local officials and citizens.
The trends are going in the right direction!

Source: Wisconsin Pedestrian & Bicycle Crash Analysis: 2011-2013; Schneider and Stefanich, University of Wisconsin-Milwaukee
BUILDING A BICYCLE FRIENDLY AMERICA℠

A roadmap to transforming states, communities, businesses and universities

THE LEAGUE OF AMERICAN BICYCLISTS
since 1880
WISCONSIN

#26 STATE RANK

17 COMMUNITIES

43 BUSINESSES

6 UNIVERSITIES
## 2017 Ranking

**Key:** Category rank among all 50 states

<table>
<thead>
<tr>
<th>State</th>
<th>2017 Rank</th>
<th># of Bicycle Friendly Actions*</th>
<th>Infrastructure &amp; Funding</th>
<th>Education &amp; Encouragement</th>
<th>Legislation &amp; Enforcement</th>
<th>Policies &amp; Programs</th>
<th>Evaluation &amp; Planning</th>
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Madison is one of 5 platinum level cities today.
 Together we can help pass a Complete Streets policy that allows all people, regardless of their age or physical ability, to walk, bike, take public transportation or drive safely.
Riding bikes is not something of the past. It is the future.

41% OF AMERICANS RIDE BICYCLES

48% of Americans live in BICYCLE FRIENDLY COMMUNITIES
59% wish it was easier to use a bicycle as a source of transportation where they live.

54% believe that IN THE FUTURE more people will ride bicycles

The Growing Popularity of Bicycling

Between 2012 and 2017, the number of bike riders increased from 51 million to more than 66 million riders.

Prior to 2012, the number of cyclists only slightly increased each year.*

More bikes equal more fatalities and injuries.
The Importance of **Bicycle Safety**

**FACT:** 40% of bicyclist fatalities in crashes occur at intersections.*

**NEED:** Reduce intersection conflicts by optimizing traffic signals.

**ACTION:** Use enhanced detection system to extend green phases for slow moving bicyclists.

*Source: NHTSA Traffic Safety Facts, 2008*
Some Intersection Treatments
Historical Signal Timings

• Traffic Engineers want 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**
What can we do as traffic professionals to improve safety at signalized intersections for vulnerable road users?

- Bicycle Differentiation
- Pedestrian Detection
- V2X Applications
Detection versus Differentiation
Optimize Intersections For Effectiveness & Safety

Use Bicycle Differentiation

Design signal system to operate differently when system detects a bicycle is present

Allow special timing only when necessary to improve efficiency

Provide the ability to collect data
Other Detection Technologies for Bikes

- **Thermal**
  - Can Differentiate

- **Inductive Loops**
  - Requires special loop in specific location

- **Radar**
  - Harder to differentiate
Passive Ped Detection
Pedestrian Detection and Data Collection
What are other agencies doing in this space?
I-STREET University of Florida Smart Test Bed

- FDOT, City of Gainesville, and UF
- 13 intersections, 7 mid-block
- Testing passive pedestrian and bicyclist detection
- Providing real-time notification to transit, vehicles, and peds/bikes
- DSRC broadcasting via RSUs with various technologies
• Using LIDAR sensors to map crosswalk and transmit pedestrian detections to vehicle OBUs
USDOT New York City CV PILOT

Pedestrian in Signalized Crosswalk
- Peds (and bikes) in crosswalk with mobile app sending location data

Mobile Accessible Pedestrian Signal System (PED-SIG)
- Pedestrian Information Device (PID)
- For the visually impaired
- Custom app/interface
C-V2X

Smartphone warning of potential collision with cyclist

Pedestrian Alert
1. Video cameras detect pedestrians moving in crosswalk.

2. Pedestrian detection output is sent to road side unit (RSU).

3. RSU sends information to vehicle on-board unit (OBU).

4. Audible alarm and on-tablet alert inside vehicle: “Pedestrian in Crosswalk Ahead”
Summary

- Existing detection sensors today can provide additional value by also detecting vulnerable road users
- New sensors & technology are being tested and evaluated
- Mobile apps for VRUs can support increased safety
- V2X is new, but has great potential for increasing ped and bike safety at intersections
Thank you!

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