Bike Detection:
MTC Meeting

Michael G. Montoya
Iteris, Inc.
Bicycle Detection: The Need

• Agencies are requiring to have bicycle detection

• California signed law in 2012
  – All new and upgraded traffic signals are required to:
    • Effectively detect bicycle and motorcycle traffic
    • Provide appropriate timing

• Other states and regions are requiring more preference for bicycles
  – University towns, bike friendly communities
  – All need bicycle detection

• Bicycle advocacy groups are gaining momentum and turning up the volume
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
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

• Safer 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
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
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
  – 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 setup 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
Summary

Provide a system to detect bicycles

Differentiate bicycles from vehicles

Extend min green time

Safer intersections
Thank You

Michael G. Montoya
Iteris, Inc.
408-442-4537
mgm@iteris.com

www.iteris.com
Image Detection Systems
Jaime Rodriguez
Founding Principal, Traffic Patterns
20 Years Experience

Public Sector Experience
• City of Palo Alto  Chief Transportation Official
• City of Milpitas  City Traffic Engineer
• City of San Jose  Traffic Signals/ITS
• City of Walnut Creek  Traffic Tech

Private Sector
• Traffic Patterns  Founding Principal 2008
• Western Pacific Signal  Director of ATMS
Discussion Topics

Video Detection Basics
• Channel Detection Strategies
• Sample Applications

Video Detection for Bicycles
• Experiences
• Video vs Microwave

Alternative Bicycle & Pedestrian Detection
• Internet of Things (IoT) Applications
Video Detection Channel Assignments

Traditional Detection Channel Assignments

VEH Phase 1  DET Channel 1
VEH Phase 2  DET Channel 2
VEH Phase 3  DET Channel 3
VEH Phase 4  DET Channel 4
VEH Phase 5  DET Channel 5
VEH Phase 6  DET Channel 6
VEH Phase 7  DET Channel 7
VEH Phase 8  DET Channel 8
**Bicycle Specific Detection**

- Lane Specific Detection
- Adaptive Loop Detection
- **BICYCLE** Specific Detection

---

**Video Detection Channel Assignments**

Wednesday, September 30, 2015
Metropolitan Transportation Commission
Video Detection Systems
Palo Alto – 64 Channel Detection Standard
Sand Hill Rd & Stock Farm Rd

- Channel Assignment Example
City of Walnut Creek
Typical Detection
Channel Assignment Detail

Channel Assignments by BIU

<table>
<thead>
<tr>
<th>BIU</th>
<th>Approach</th>
<th>Channel Assignments</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adv Loops &amp; System Loops</td>
<td>1 - 4, 5 - 12</td>
<td>12 Det Channels Remain in BIU-1 with Video Det Equip in Slots 13-1B.</td>
</tr>
<tr>
<td>2</td>
<td>EB</td>
<td>17 - 24</td>
<td>Virtual BIU thru Video Unit</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>25 - 32</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NB</td>
<td>33 - 40</td>
<td>Virtual BIU thru Video Unit</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>41 - 48</td>
<td></td>
</tr>
</tbody>
</table>

Typical Rack Detail
City of Walnut Creek
Detection Channel Assignments
Ygnacio Valley Rd & N Main St
Connected Vehicle Technology

- Industry Standards still Developing
- Palo Alto Standard for ATMS Connected Vehicle Module with Trafficware
Detection for Bicycles

**Video Detection Example**
- Iteris along Sand Hill Rd in Palo Alto for SynchroGreen Adaptive

**MS SEDCO Microwave**
- Iteris along Sand Hill Rd in Palo Alto for SynchroGreen Adaptive

Wednesday, September 30, 2015
Metropolitan Transportation Commission
Video Detection Systems
Detection for Bicycles

**Dynamic Signal Timing**
- Enabled through bicycle-specific detection
- Longer Min. Green by bicycle presence

Bike Traffic Signals- Early Release Bike/Ped
 “Flashing Yellow Bike”
Bicycle-Focused Detection

<table>
<thead>
<tr>
<th>Early Bike/Ped Release</th>
<th>Flashing Yellow Arrow/Bike Permissive</th>
</tr>
</thead>
</table>

Traffic Patterns

- Car
- Bicycle
- Pedestrian
- Bus
- Parking
Low-Cost Image Sensors

- Bicycle/Pedestrian/Auto Count Stations

Vision Zero

- Near-Miss Detection
Questions/Comments

Jaime Rodriguez
jaime@trafficpatterns.net
C: (408) 916-8141