

Presenter Introduction

Xuanwu Chen, Ph.D. Candidate

- **Research Interests:**

- Intelligent Transportation Systems
- Traffic Control Systems
- Traffic Simulation
- Traffic Operations

Shahadat Iqbal



- **Dissertation Title:**

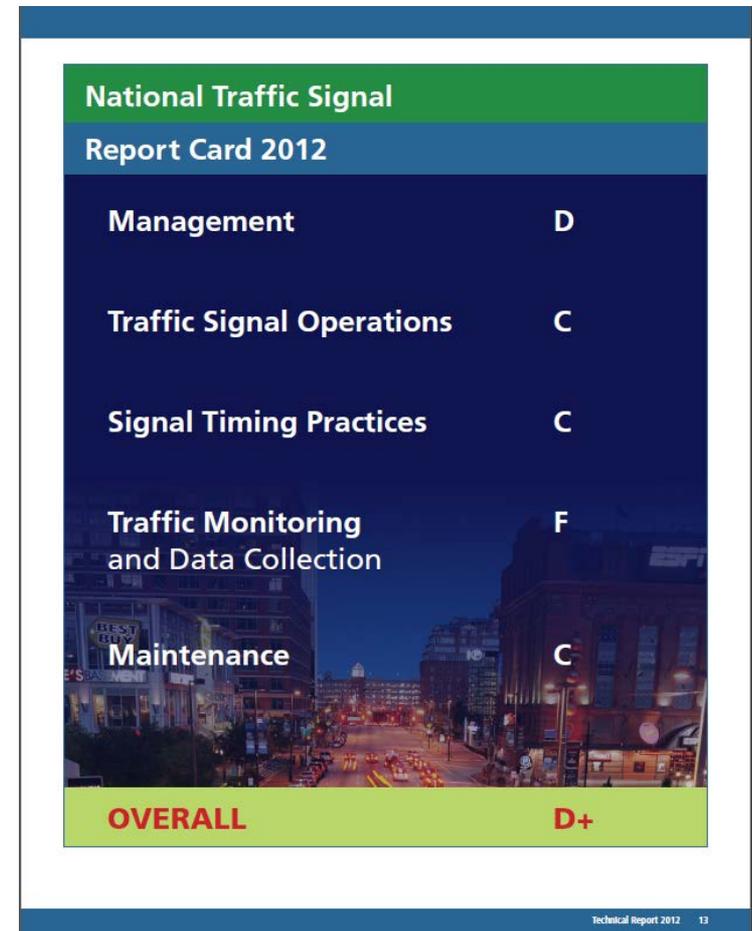
A Framework for Recommending Signal Timing Improvements based on Automatic Vehicle Matching Technologies

- **Selected Honors / Awards:**

- Bill McGrath Transportation Studies Scholarship, FSITE, 2014
- Henry P. Boggs Student Paper Award, FSITE, 2014

Motivation

- Traditional identification of signal control problems
- Current practices of signal retiming
- Emergence of ITS detection technologies
 - Automatic Vehicle Matching Technologies
- Traffic monitoring and data collection



Research Goal

- Develop a framework of automatic decision-support signal operation diagnosis that utilizes
 - Data from automatic vehicle matching technologies, and
 - Data from existing signal controllers.

Example Raw Data from Wi-Fi Sensors

Timestamp	MAC Address	Strength	Serial
1449192285	000812c00ec133d56e0fe87cb83847f8512e4648e38c5a458b7bd91ee9b2b976	-61	265276
1449192289	000812c00ec133d56e0fe87cb83847f8512e4648e38c5a458b7bd91ee9b2b976	-58	265276
1449192289	000812c00ec133d56e0fe87cb83847f8512e4648e38c5a458b7bd91ee9b2b976	-58	265276
1449192293	000812c00ec133d56e0fe87cb83847f8512e4648e38c5a458b7bd91ee9b2b976	-58	265276
1449192293	000812c00ec133d56e0fe87cb83847f8512e4648e38c5a458b7bd91ee9b2b976	-61	265276
1449192296	000812c00ec133d56e0fe87cb83847f8512e4648e38c5a458b7bd91ee9b2b976	-60	265276

Example Raw Data from Signal Controller

<i>Historical Intersection Timing Report Int: SW 107 Av&SW 8 St (3709)</i>					
<i>Start Time: 12/17/15 00:00</i>		<i>End Time: 1/15/16 11:00</i>			
<i>Print Date 01/15/2016</i>					
<u>Time</u>	<u>Plan</u>	<u>Ring 1 Phase</u>	<u>Interval</u>	<u>Grn Dur</u>	<u>Ring 2 Phase</u>
12/18 12:27:25		1-EBL			5-WBL
12/18 12:27:31		1-EBL	Clear		
12/18 12:27:32					6-EBT
12/18 12:27:38		2-WBT	Green	39	6-EBT
12/18 12:28:17		2-WBT	Clear		6-EBT
12/18 12:28:23		3-SBL	Green	12	7-NBL
12/18 12:28:35		3-SBL	Clear		7-NBL
12/18 12:28:41		4-NBT	Green	56	
12/18 12:28:42		4-NBT			8-SBT

Methodology – Data Acquisition

Figure below: Sensor Locations and Data Matching



Wi-Fi sensor installed



Figure above: Sensor Installation

Methodology – Data Preprocessing

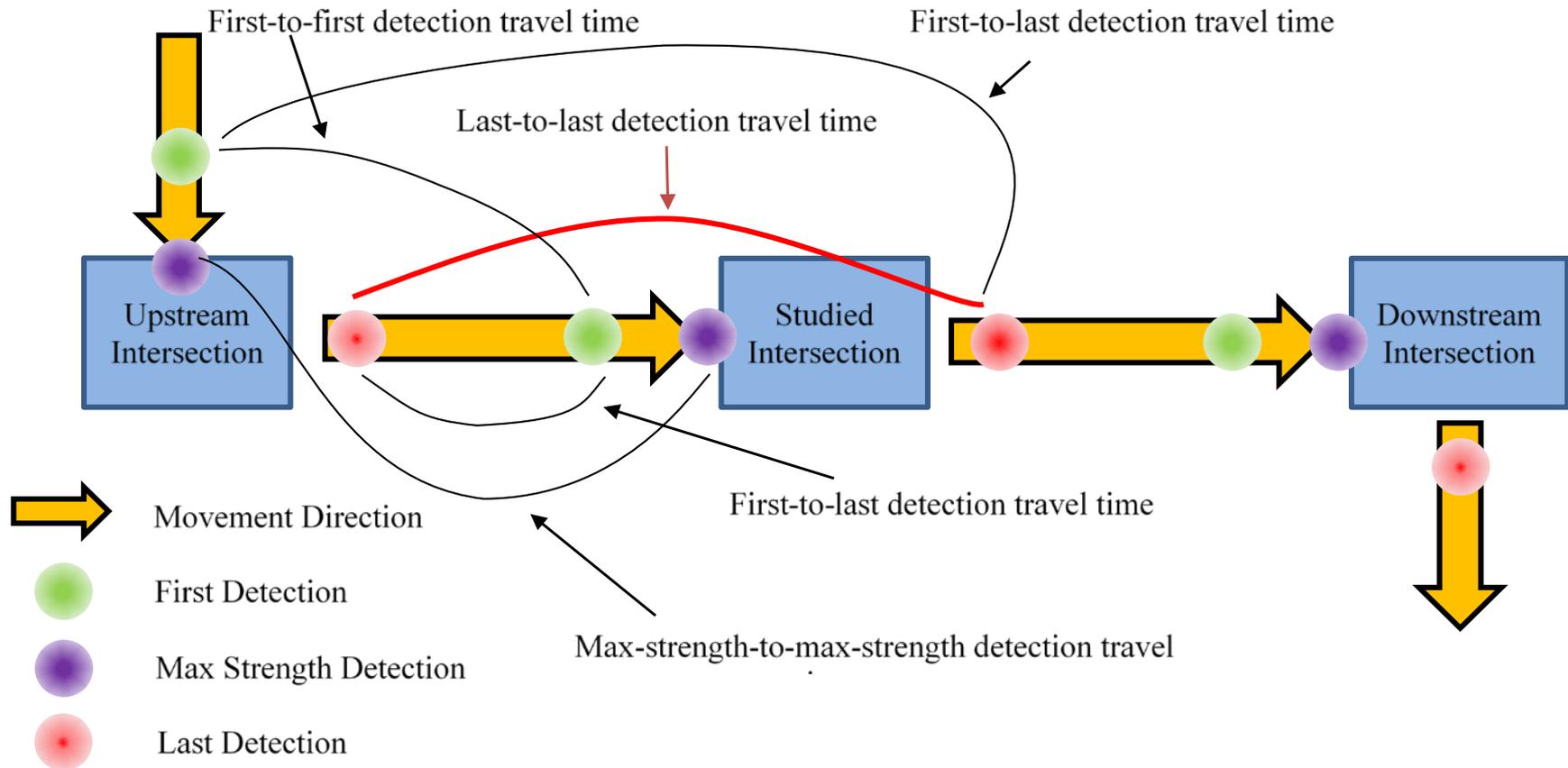


Figure above: Illustration of Different Types of Matched Travel Times

Methodology – Diagnosis Scheme

- Travel Time Index (TTI)
- Max out Ratio (MR)

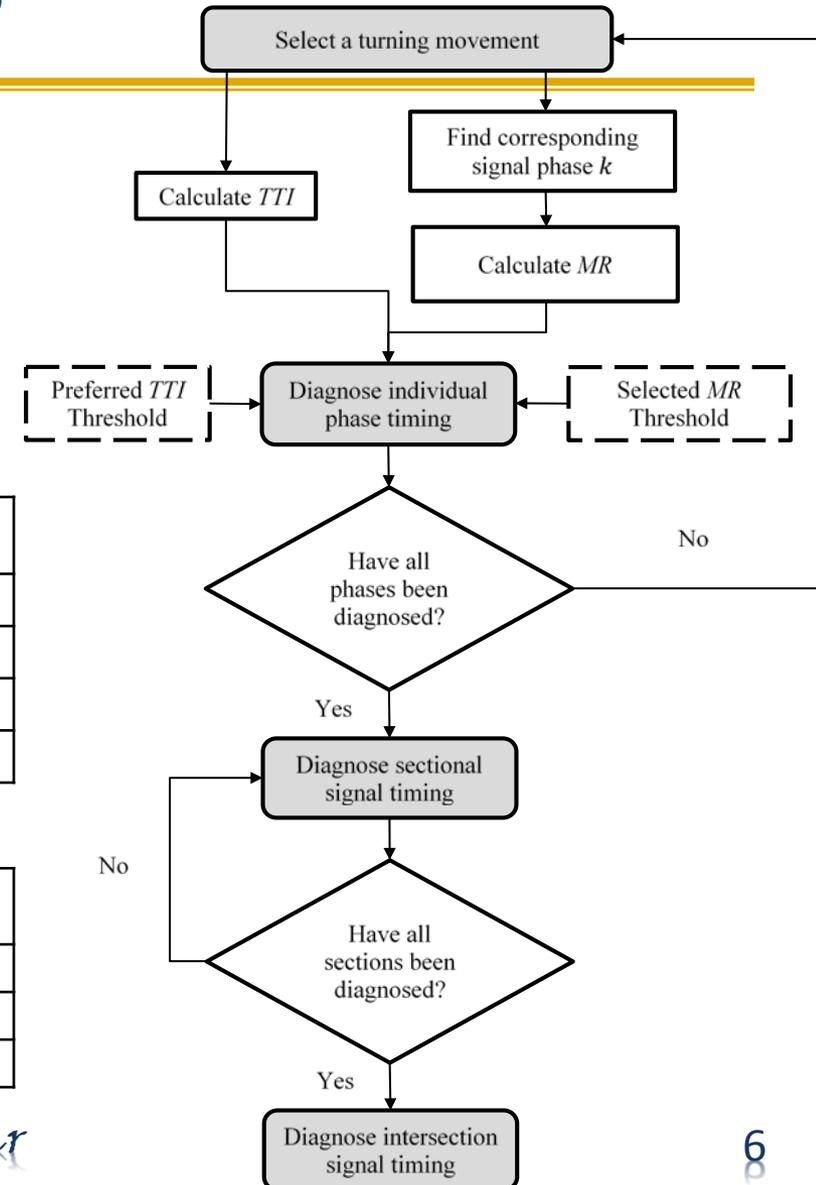
$$MR_k = \frac{\sum_{i=0}^m \text{maxout}_{i,k}}{\sum_{j=0}^n \text{cycle}_j}$$

Diagnoses of the Uncoordinated Phases

calculated <i>TTI</i> vs. <i>TTI</i> threshold	calculated <i>MR</i> vs. <i>MR</i> threshold	recommendation on green time	code
≤	≤	decrease	-1
≤	>	keep	0
>	≤	keep	0
>	>	increase	1

Diagnoses of the Coordinated Phases

calculated <i>TTI</i> vs. <i>TTI</i> threshold	recommendation on green time	code
<	decrease	-1
=	keep	0
>	increase	1



Diagnosis Example

