4. 付録（APPENDEX）

4.1 ITSの近況（Exchange of Information on Recent ITS Activities）：U.S.A.

Plans for Intersection Collision Avoidance Research and Development

U.S. – Japan ITS Workshop
Nagoya, Japan
October 19, 2004

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Federal Highway Administration

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Introduction

- Intersection crashes result in more than 9000 deaths and 1.5 million injuries each year in the U.S.
- The Intelligent Vehicle Initiative sponsored research that suggests that intersection collision avoidance services have the potential to avoid many of these crashes
- The ITS program plans has initiated a new research program to achieve this potential

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My Objectives

- Summarize progress and early findings from the Intelligent Vehicle Initiative (IVI) research program
- Outline a new research program: the Cooperative Intersection Collision Avoidance Initiative (CICAS)

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Intersection Collision Avoidance

Intelligent Vehicle Initiative (IVI)

Schedule 1999 - 2005

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Goals

- To substantially reduce intersection crashes:
  - Addressing violations of red lights and stop signs
  - Assisting the driver in maneuvering through an intersection

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Milestones

- To demonstrate infrastructure-only and infrastructure-vehicle cooperative intersection collision avoidance systems
- To develop prototype systems
- To plan future field operational tests

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Partners

- Signal Violation Warning: Virginia DOT and Virginia Tech Transportation Institute
- Left Turn Advisory at Traffic Signals: California DOT and California PATH
- Maneuvering Advisory at Stop Signs: Minnesota DOT and the University of Minnesota ITS Institute

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Signal Violation Warning

Virginia Tech Transportation Institute

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Signal and Stop Sign Violation Warning Application

- Objective is to develop systems to avoid crashes due to signal and stop sign violations
- VTTI has developed an over-performing test bed
- Test bed will support architectures for:
  - Infrastructure only
  - Infrastructure-vehicle cooperative
  - Totally vehicle based

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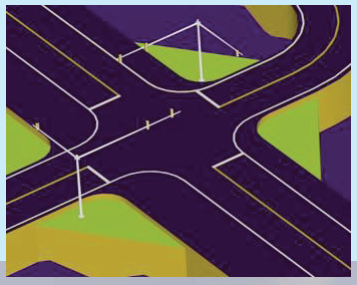
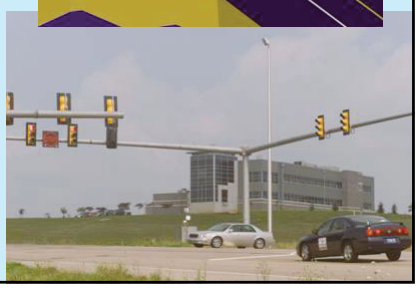
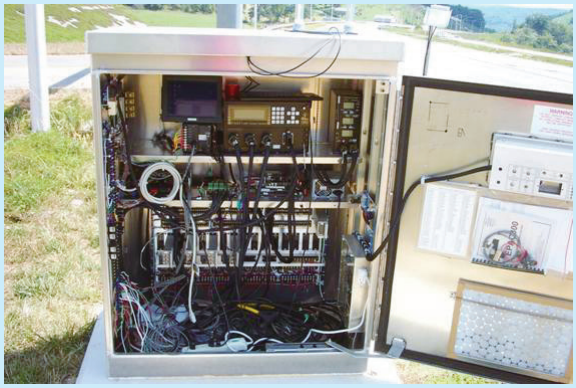
Infrastructure Test Bed

- Smart Road Intersection
- Will run participant-driver experiments





Intersection Controller



- Interface with 2070 and 170 controllers

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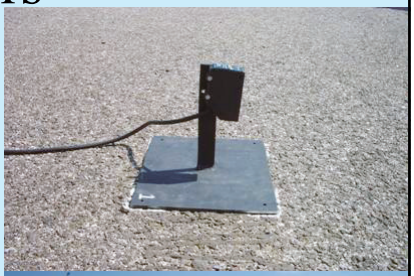
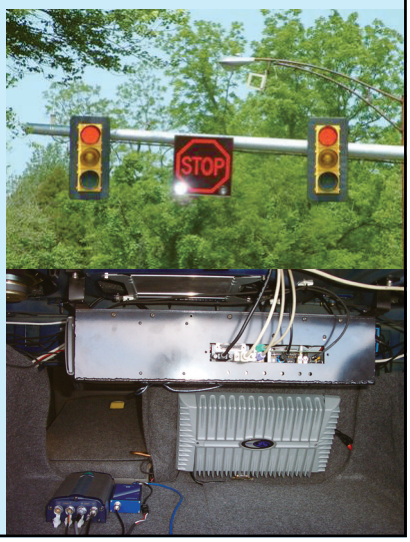
Infrastructure Sensors and Detectors

- Radar
- Laser detection technology to simulate point detection



Infrastructure DIIs

- Visual via external signs
- Haptic to simulate an intelligent rumble strip



Vehicle Test Bed

- 2000 Impala was loaned by General Motors for the project

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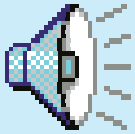
Vehicle DVIs

- Exploring visual, auditory, and haptic warnings



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Communications

- Simulated DSRC

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Left Turn Advisory at Traffic Signals

California PATH

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Left Turn Advisory Application

- Features of Approach
  - Problem is gap decision in presence of oncoming vehicles
  - Focus on traffic signals
  - High potential for initial infrastructure-based warning application
  - Cooperative (wireless) systems should enhance system

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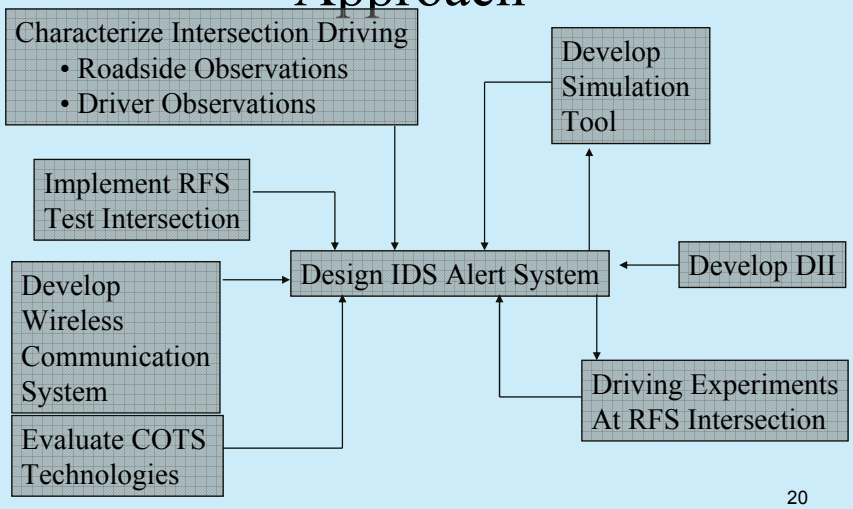
Definition: Left Turn Across Path / Opposite Direction (LTAP/OD)

Schematic of California Approach



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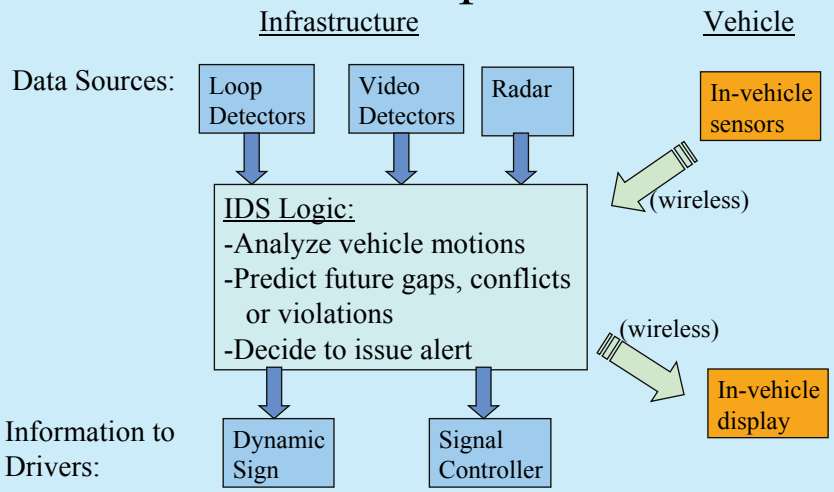
Diverse IDS Implementations



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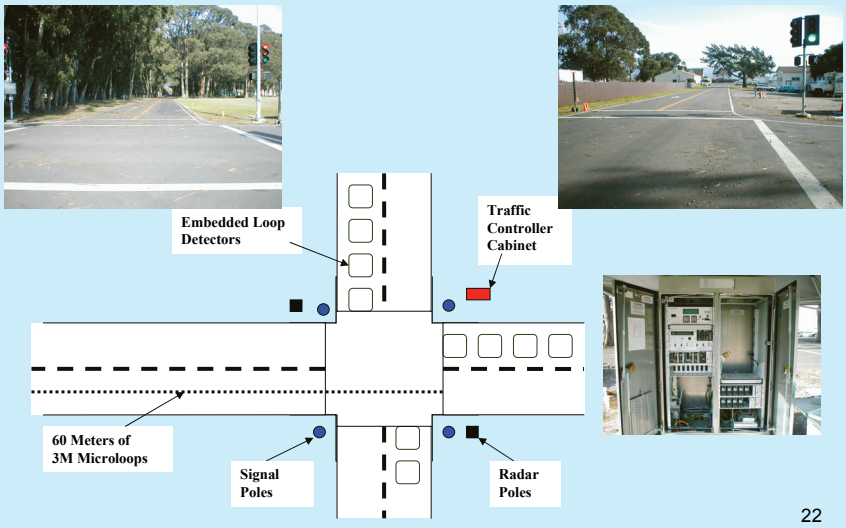
PATH RFS Test Intersection



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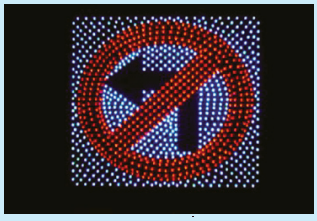
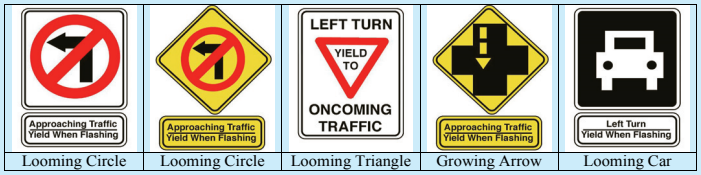
Driver Infrastructure Interface (DII)



- "Looming Circle" DII will be further investigated



Looming Circle	Looming Circle	Looming Triangle	Growing Arrow	Looming Car

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Cooperative System for a Transit Bus

- 40-ft Bus at PATH/RFS

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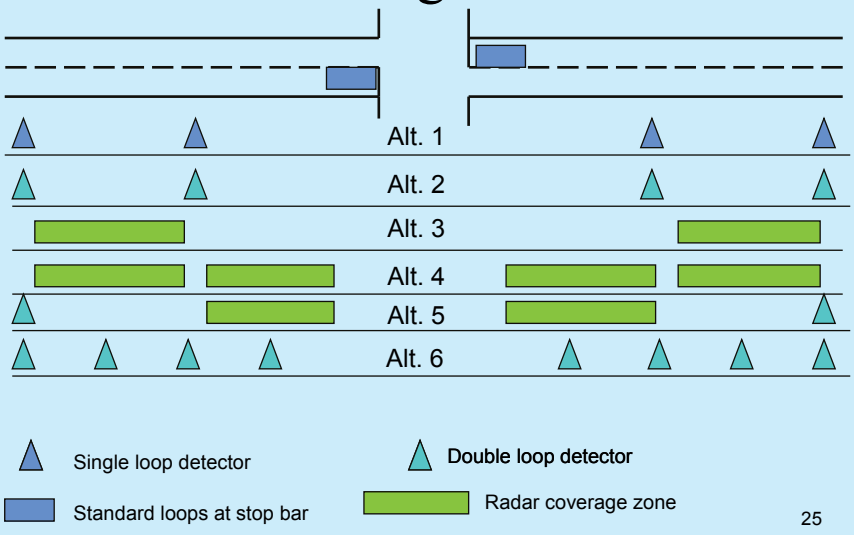
Sensor Coverage Alternatives



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Maneuvering Advisory at Stop Signs

University of Minnesota ITS Institute

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Maneuvering Advisory Application

- **Objective**: Improve the safety of drivers entering or crossing the high speed traffic flow
- **And**: Do it for less cost than a 4-way controlled intersection.

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System Overview

- **Sensors**
- **Communication systems**
- **Central processor**
- **Driver interface**

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Sensors

- **Mainline sensors** provide vehicle speed, location, lane of travel
- **Minor road sensors** provide vehicle type (passenger car, truck, tractor)

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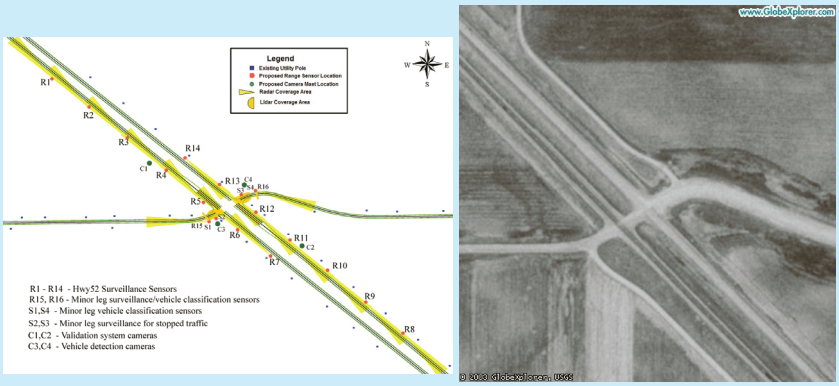
Minnesota Test Intersection



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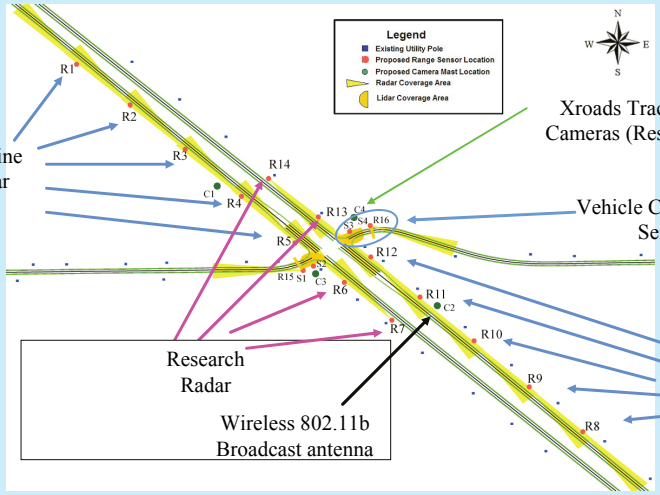
Plan View



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MN IDS Intersection Mainline Radar Station Picture

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IVI Interim Results

- Results encouraging
- Challenges have emerged:
  - Stakeholder engagement needed
  - Must continue research and development
- Cooperative Intersection Collision Avoidance program is the next step

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Intersection Collision Avoidance

Cooperative Intersection Collision Avoidance (CICAS) Initiative

Schedule 2004 - 2008

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Goals

- To substantially reduce intersection crashes
  - Addressing violations of red lights and stop signs
  - Assisting the driver in maneuvering through an intersection
- To develop systems that provide safety benefits without shifting the crash problem elsewhere

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Milestones

- To develop and demonstrate cooperative intersection collision avoidance systems
- To assess the value and acceptance of cooperative collision avoidance systems
- To develop and provide tools

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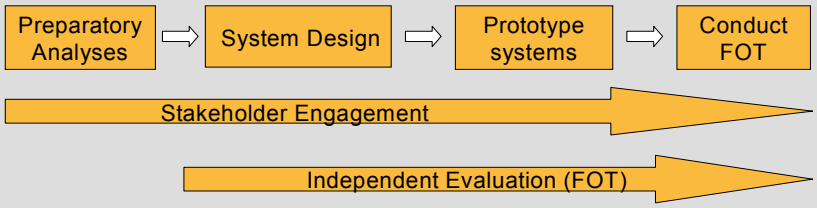
Program Structure



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Foundation for the Program

- Establish stakeholder ownership
- Formulate Program Definition
- Define Execution Strategy

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Create Viable System Designs for Prototyping

- Develop system architecture
- Develop performance specifications
- Develop needed technologies
- Develop objective tests
- Build data acquisition systems
- Identify designs for prototyping
- Engage potential FOT partners

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Develop and Evaluate Prototype Systems

- Integrate subsystems
- Conduct objective tests
- Validate performance
- Evaluate alternatives for FOT
- Collaboration with VII

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Demonstrate and Quantify Effectiveness

- Identify FOT partners and locations
- Build FOT ready systems
- Craft evaluation strategy
- Develop analysis methods
- Install systems
- Conduct tests
- Analyze data

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Create Industry Support for Deployment

- Form ICA working group
- Establish broader industry stakeholder group
- Develop and execute outreach plan
- Develop tools to support deployment

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Summary

- Focusing on intersection collision avoidance opportunities
- Exploring alternative system architectures
- Assessing value and acceptance
- Developing tools for deployment

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