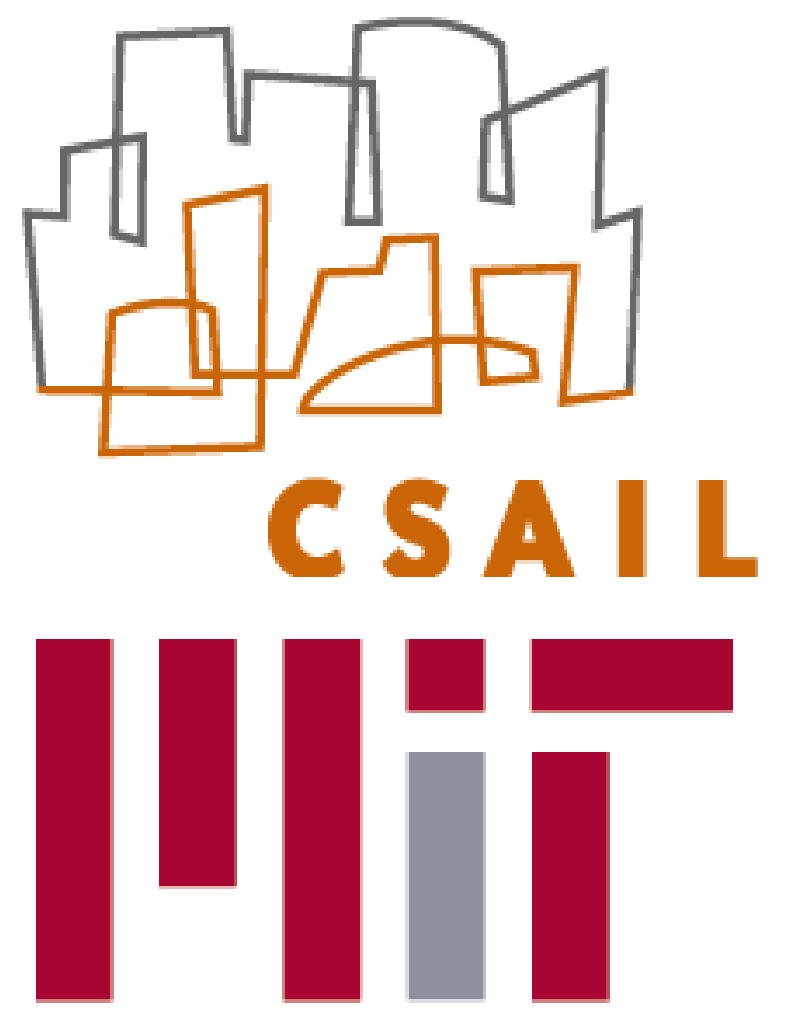




# Divert and Alert: Mitigating and Warning of Traffic Threats to Police Stopped Along the Roadside

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## Research Goal

Aim to reduce roadside collisions between traffic and stationary police cruisers. The project is the design of a vehicle-mounted device that can integrate easily into the officer's routine.

The first part of the device, the Motorist Diverting Module (MDM), projects virtual flares on the pavement to divert traffic flow. MDM uses guided laser beams to illuminate designated positions on the pavement. By quickly changing the laser power, spots become visually similar to flares.

The second part, the Officer Alerting Mechanism (OAM) uses rear-facing cameras to record oncoming traffic. The officer is warned if a collision is imminent, giving them vital time to move to safety.

The device can be used for any application that benefits from improved safety between stationary vehicles and traffic. The module can be applied for EMTs, construction crews, and road maintenance teams.



Proposed Device Form-Factor



Proposed Module's Area of Effect

## Current Prototypes

Modules are developed as independent prototypes.

### Motorist Diverting Module

- Creates spot projections 50m away.
- Stores and projects up to 4 unique patterns.
- Manual control of laser power up to 1.5 Watts.

### Officer Alerting Mechanism

- Detect vehicles 100 meters away.
- Reconstruct 3-dimensional vehicle paths in real time.
- Collected 30GB of real time traffic footage

## Future Milestones

August 2012:

- MDM: Flares visible up to 200m away
- OAM: Predicts Safe-Zone intrusion by normal vehicles

October 2012:

- MDM: Flares accurate to 0.1m
- OAM: Detection of errant driving behavior

December 2012:

- Integrate MDM and OAM into unified device prototype

## Usability

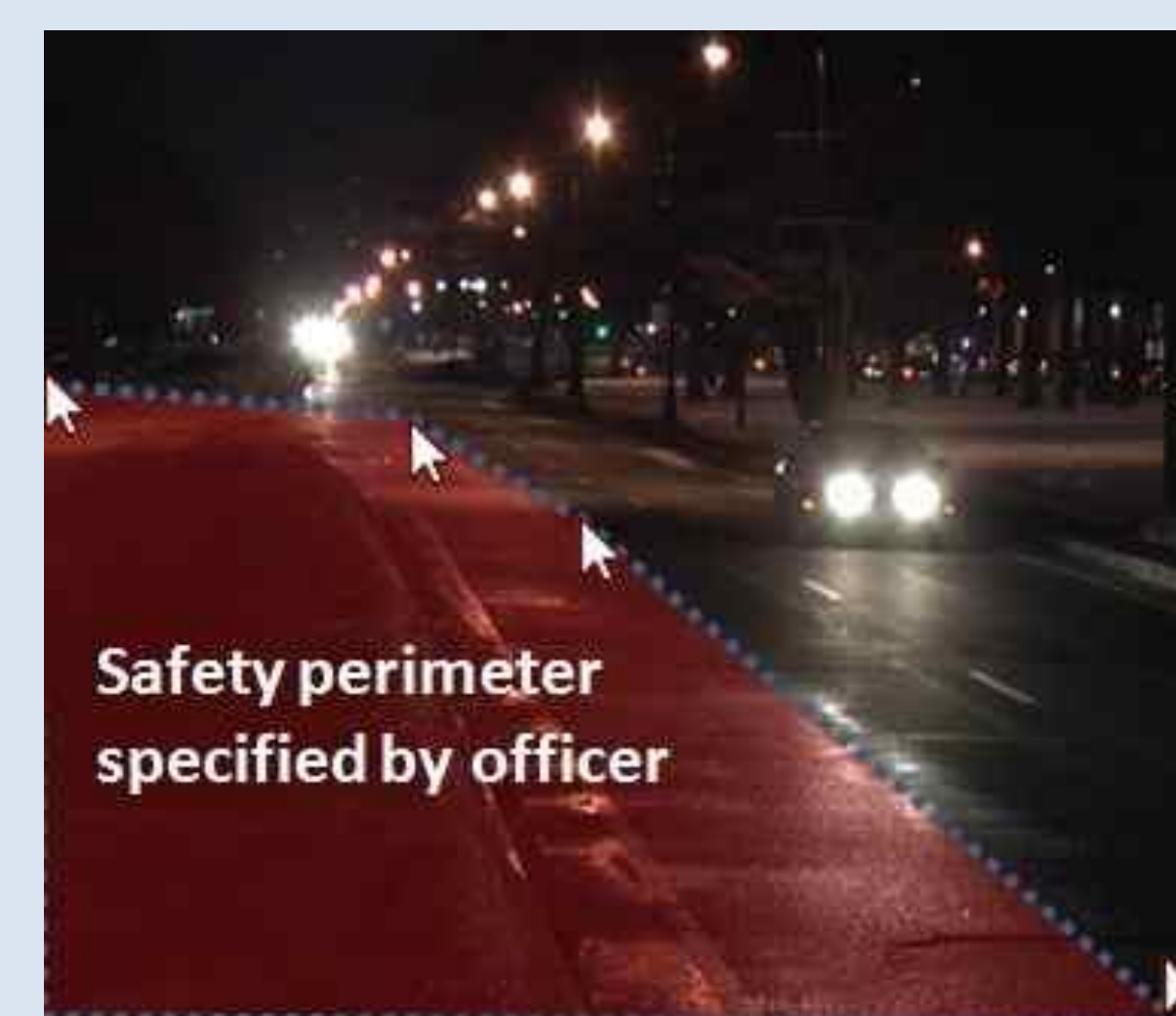
Officer feedback and perception of modules will be used extensively in design. Officer must be able to input data efficiently and accurately. Device must display information consistently.

Device and operations tested with cognitive walkthroughs, cognitive task analyses, and usability evaluations

## Motorist Diverting Module

Increases spatial awareness of the police cruiser, provides visual guides for safe driving.

Officer designates a 'Safety Perimeter'. MDM uses this data to display laser 'flares' along the perimeter. 'Flares' are displayed up to hundreds of meters behind the cruiser.



Proposed Input Method (Officer's Perspective)



Proposed Laser Projection (Motorist's Perspective)

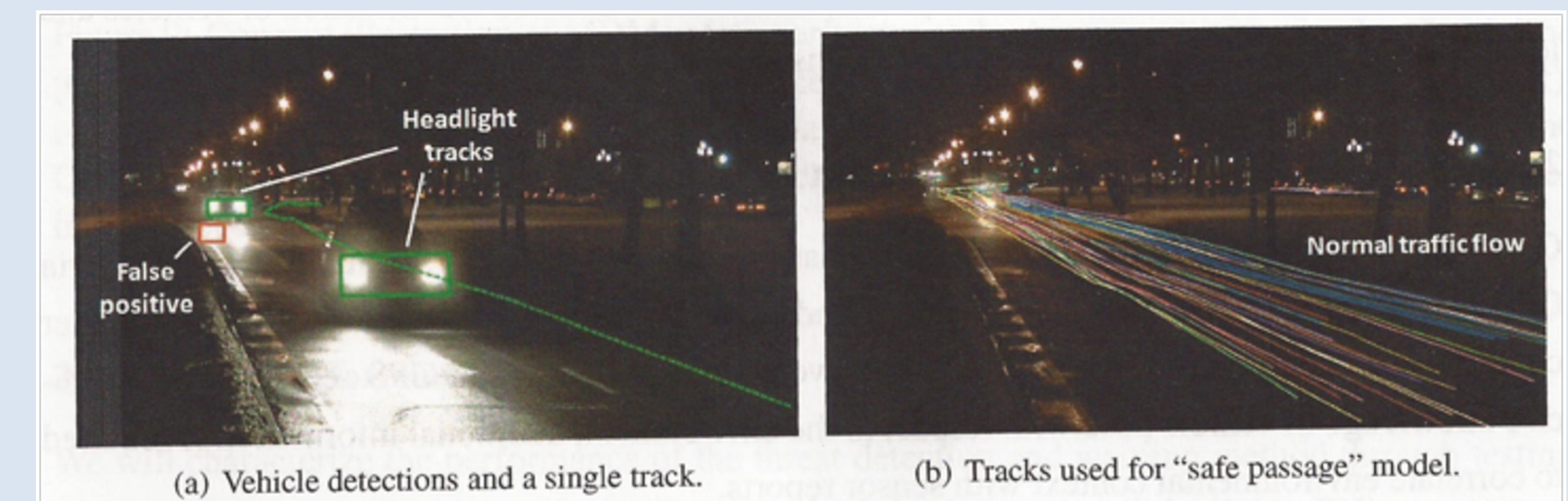
Challenges are maintaining laser accuracy at long distances and maintaining eye safety.

Uses an embedded processor for storing and generating flare positions. Illumination will be generated by a 5-Watt red diode laser. Laser beam is guided by high-precision galvanometers.

## Officer Alerting Mechanism

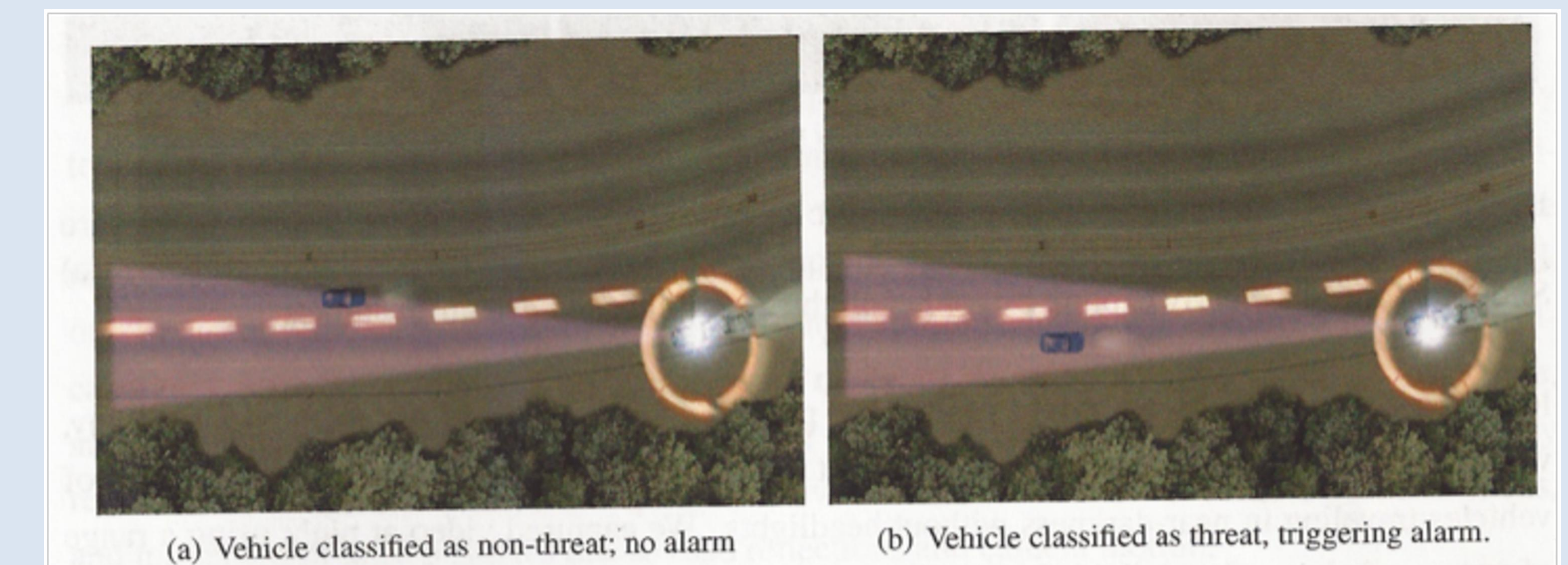
Gives an officer advance warning of traffic-based threats to their safety. Challenges are detecting vehicles from image data and predicting vehicular motion.

Vehicles are identified in video footage by headlights. Correlation of headlight data determines the vehicle's distance and velocity. Overall traffic flow created from a collection of vehicle paths.



Multiple cameras compensates for cruiser position and natural curvature of the road.

Characterizing dangerous vehicle motion is inferred from excessive speed, improper position, entering the Safety Perimeter, and deviating from expected traffic flow. Machine-vision can identify other vehicles and compensate for reflections, ambient light and fog.



## Acknowledgements

The group would like to thank the Massachusetts State Police, Cambridge Police Department, and BAE Systems for their expertise and support.

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