

ANGEL EYE

ROADWAY GUARDIAN

Angel Eye makes road intersections safer for all road users by spotlighting danger areas.

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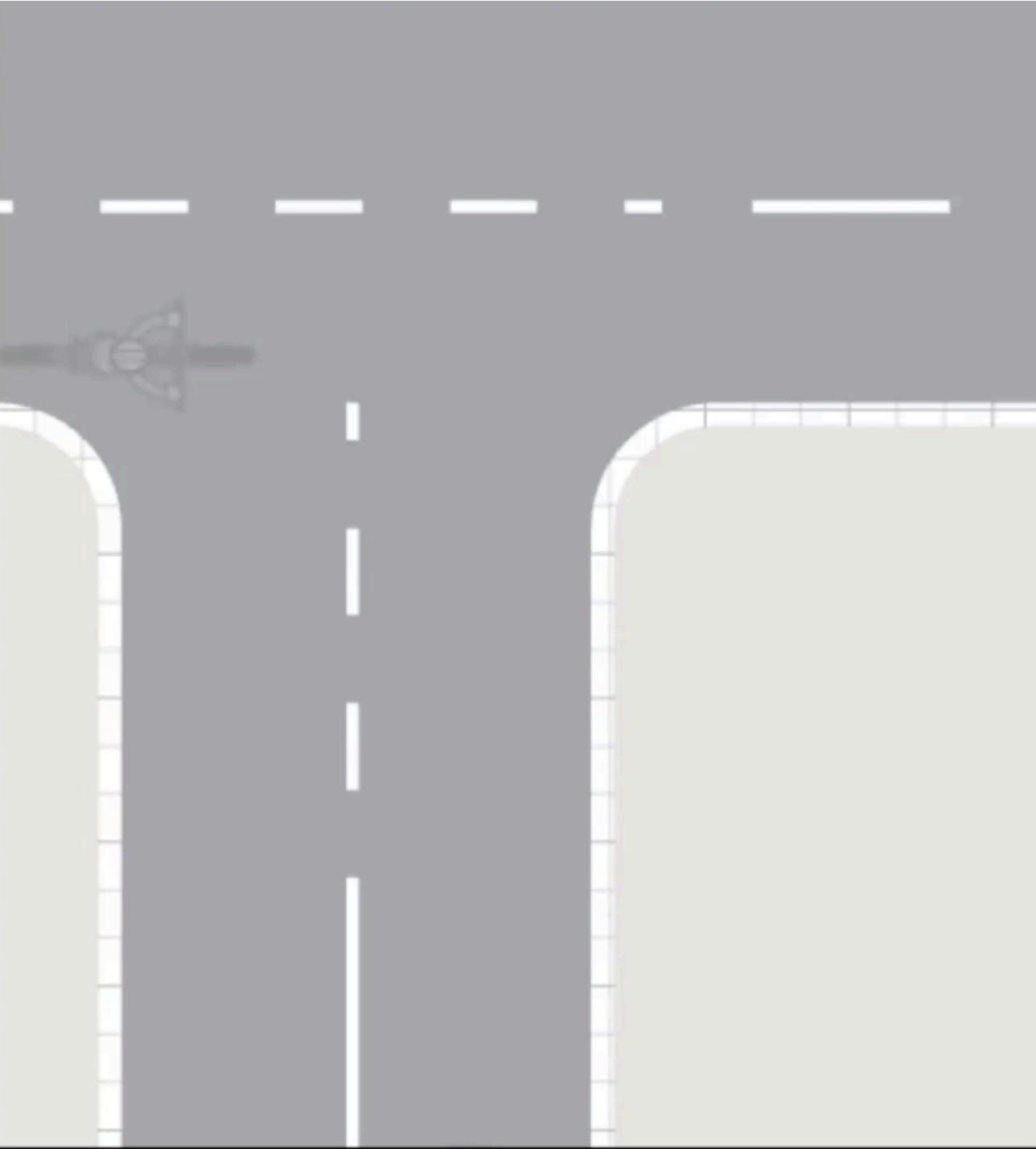
Making roadway intersections safer with collision forecasting

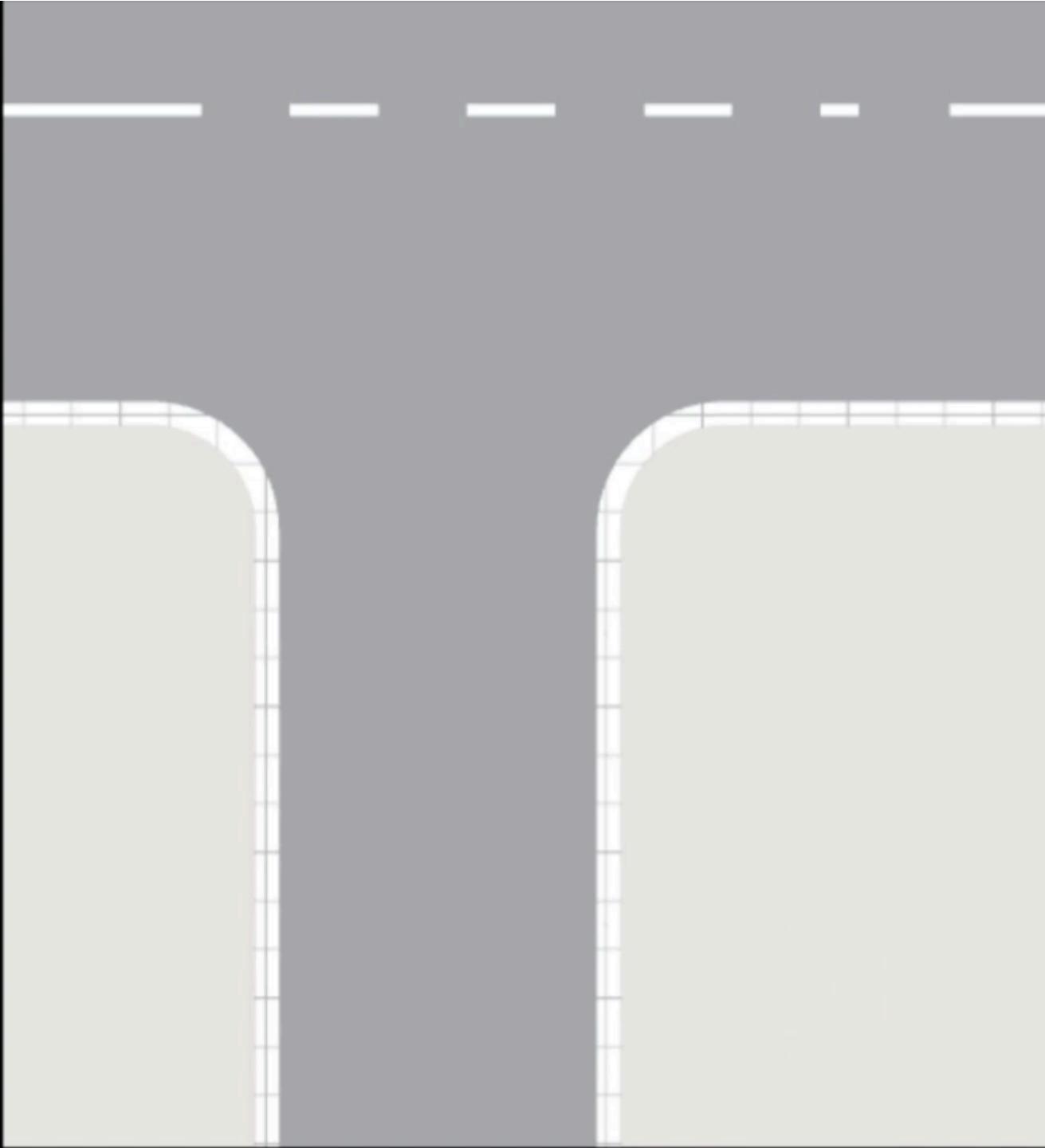
Problem

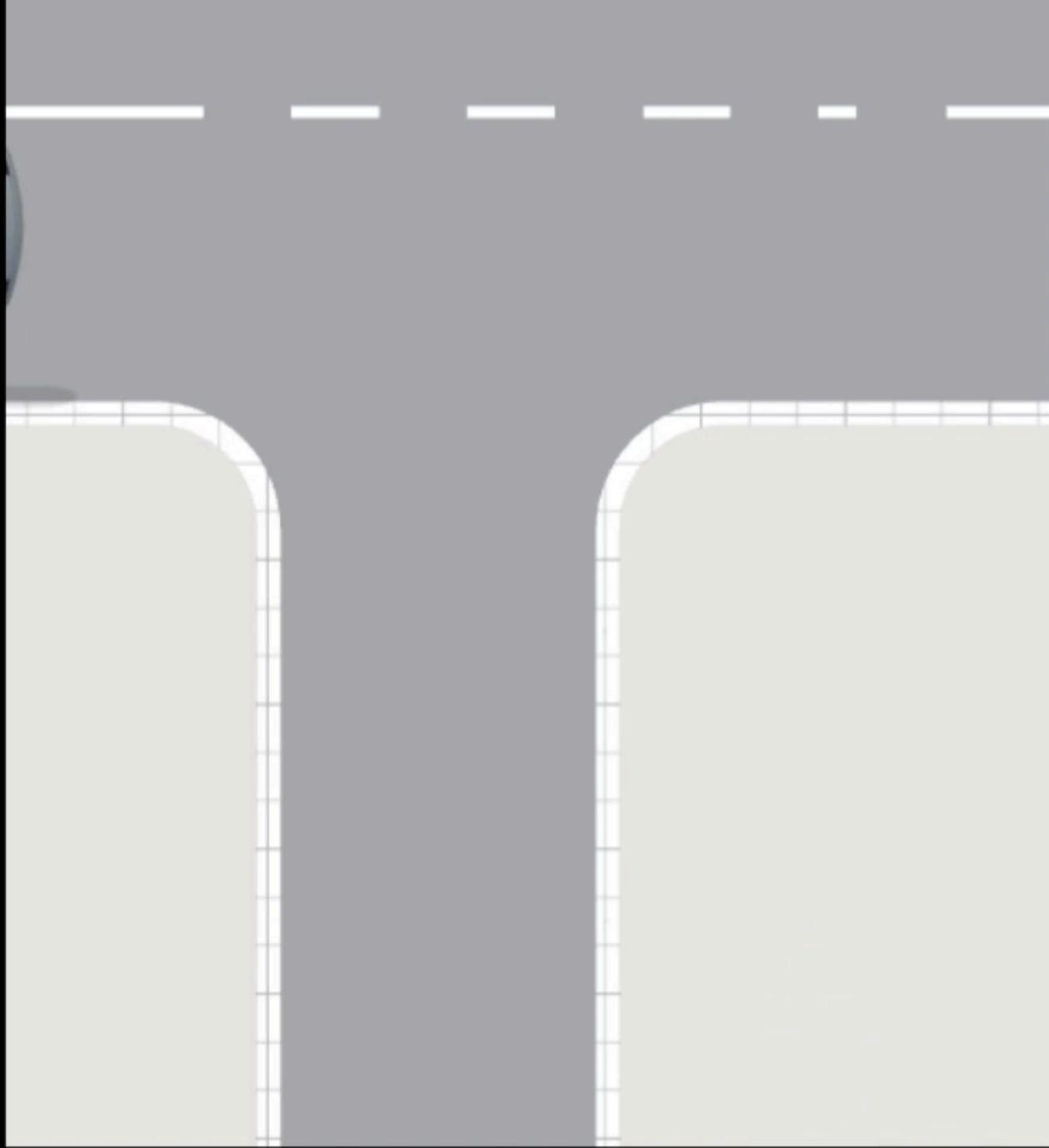
- Danger zones: Intersections
- Low levels of awareness between road users

Solution

- Middleware Platform for day and night alerts
- Independent of users' technology level
- Focus on intersections







Dissecting problem areas

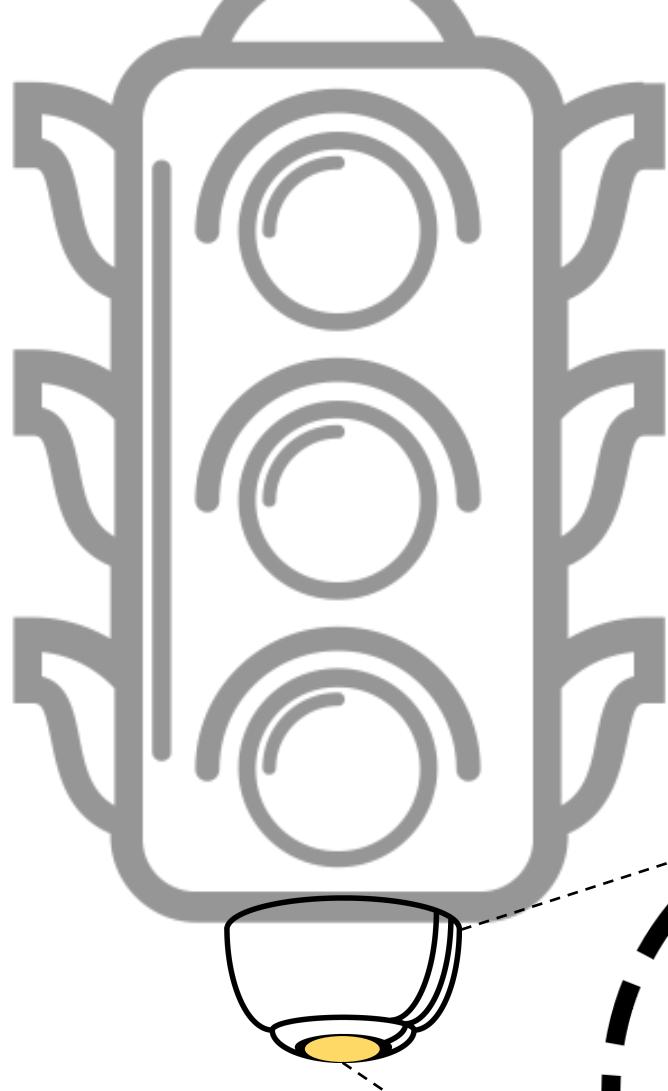
Intersections are dangerous

Stopping distances for average car

Speed	Thinking Distance	Overall Stopping Distance Can Be:	Time (seconds)
20 mph	20 feet	60 feet	1.95
30 mph	30 feet	120 feet	2.93
40 mph	40 feet	200 feet	3.91
50 mph	50 feet	300 feet	4.89

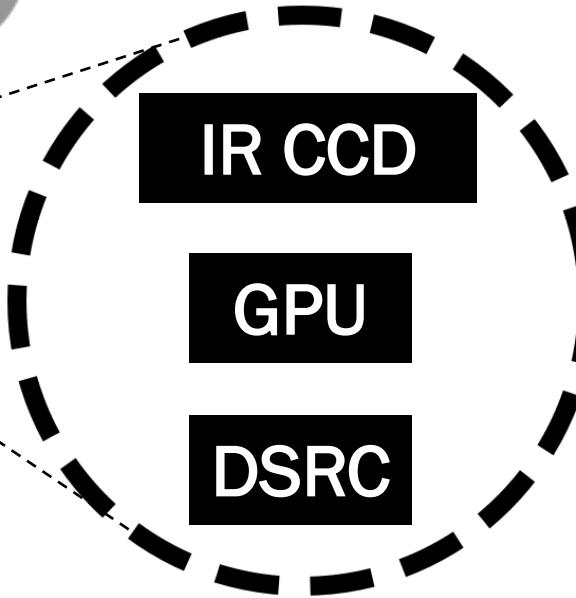
Technical implication: collision forecasting must be local (vs. cloud) to minimize latency.

ANGEL EYE



Multiple mounting options:

- Wall
- Window
- Streetlight
- Stoplight
- etc.



No behavior change for road users

Extend V2X network

Pre-Collision and Post-Collision Value

Target Performance

- Within 200 milliseconds, classify and track at least two road users simultaneously.
- ‘Interpret’ scene to infer potential for collision.
- Maintain false negative rate below 10%.
- Broadcast V2X valid message.
- Transmit over DSRC.

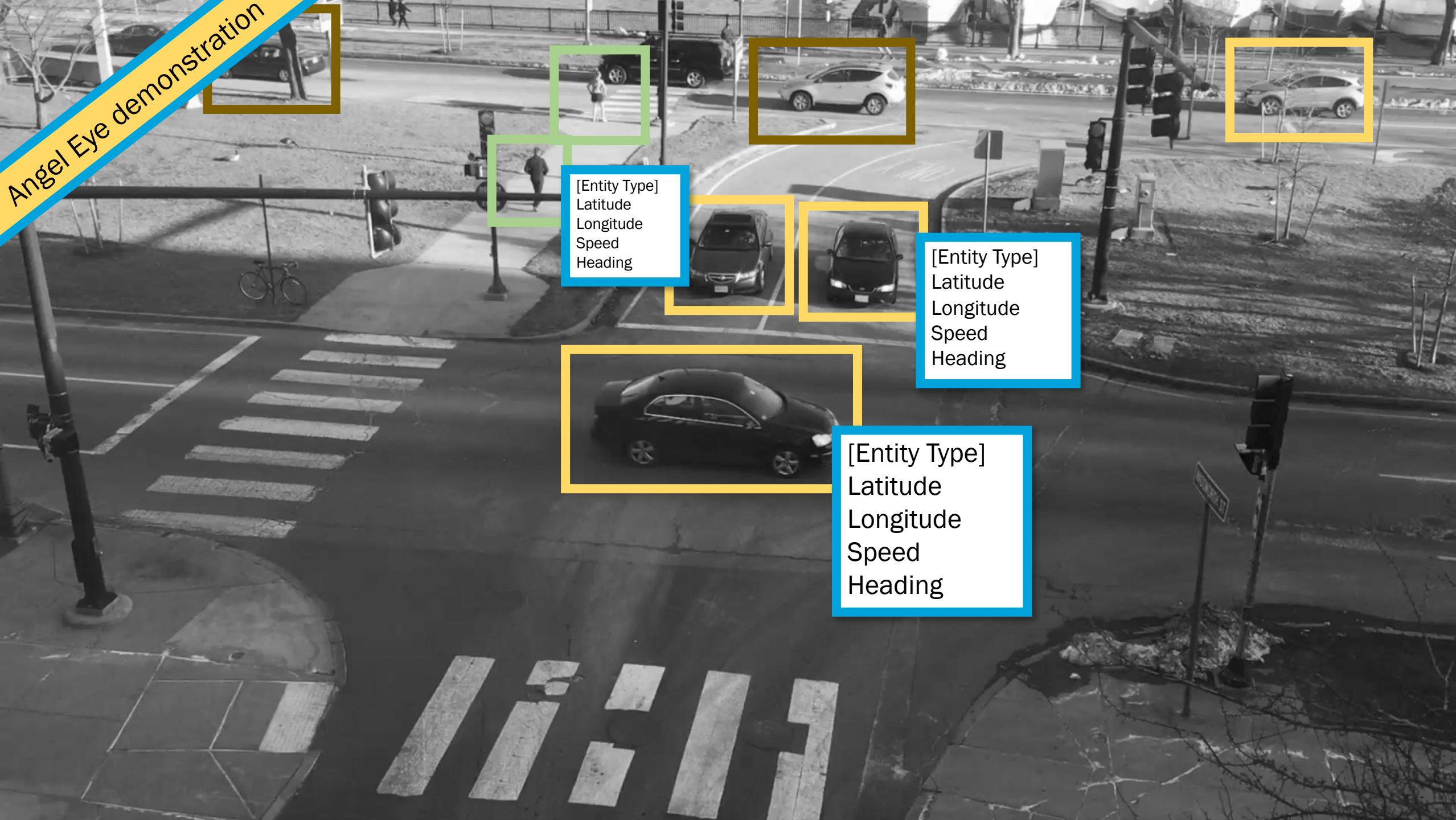
Selected hardware components:

- IR CCD camera: Infrared charge-coupled device for daytime and nighttime image capture
- GPU: graphics processing unit for real-time video processing
- DSRC module: Dedicated Short-Range Communications equipment for wireless V2X message transmission

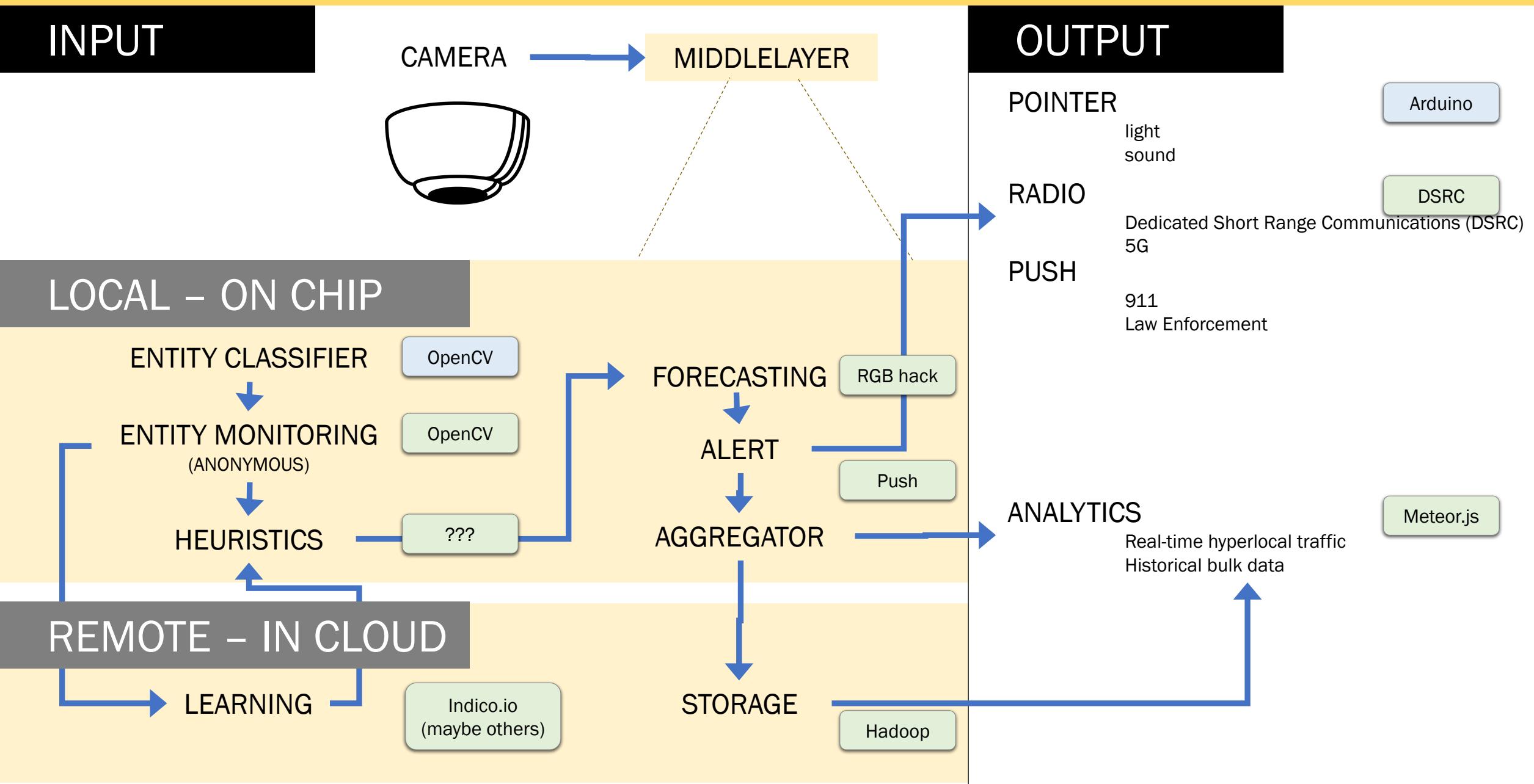
Angel Eye demonstration



Angel Eye demonstration



Technology Map: From solely camera input, we can unearth much data and provide collision forecasting



Managing risk by ‘uncertainty testing’ critical project components

Fast Enough Classification?

2D ‘Pong’ Map

Fake vehicles driving predetermined collision paths.

Entity Forecasting?

Repurpose RGB color channels for ‘time’

See Dark Sky approach: <https://www.wired.com/2016/09/dark-sky-site/>

Real-Time Data Visualization?

Real-time ‘intersection map’

Must handle dozens of entities displaying simultaneously.

Data Aggregation?

Valid DSRC communication

Review DSRC message set whitepapers to identify suitable grammar for collision mitigation.

Next Steps

COMPONENT	TASK
1. Mini-Model	Set up 2D ‘intersection map’ for testing
2. Share View	Display 2D map over HTTP
3. Forecast	Devise heuristic for one common collision type
4. Alert	Review DSRC dictionary set messages