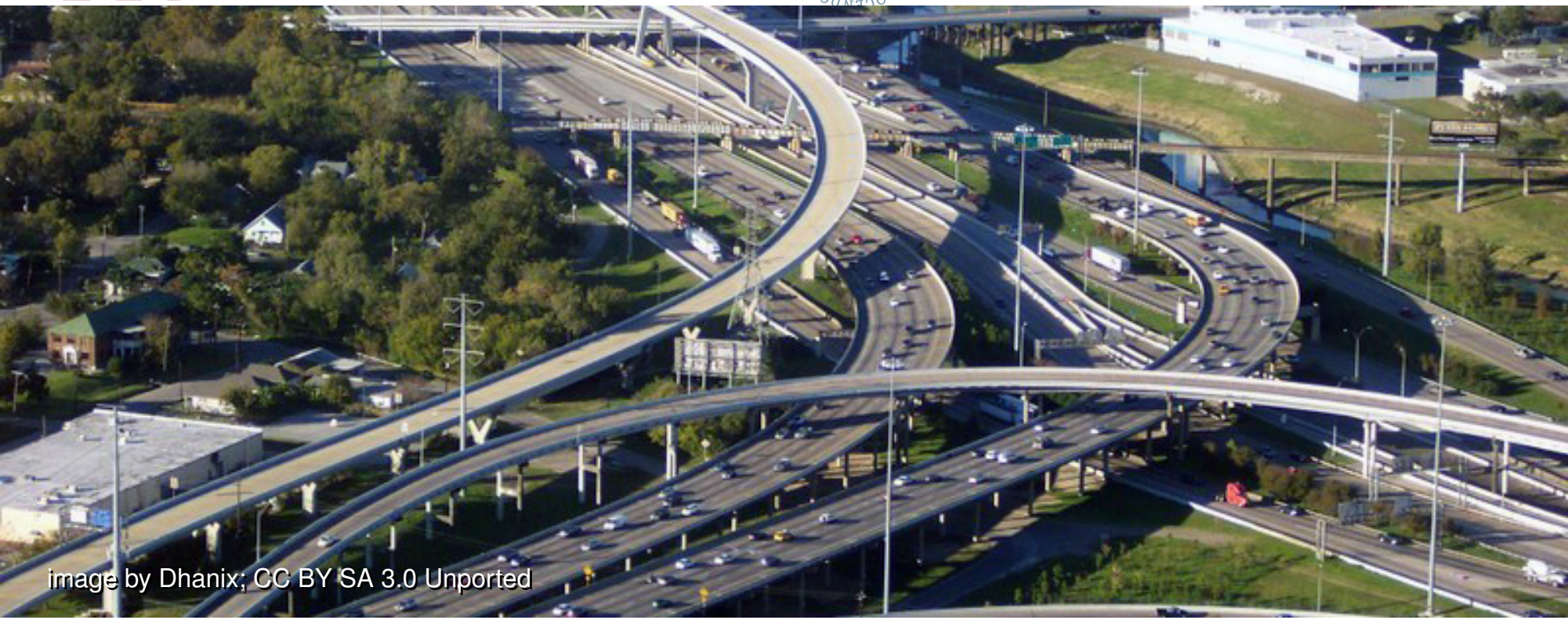

A Flexible, Subjective Logic-based Framework for Misbehavior Detection in V2V Networks

1st SmartVehicles Workshop

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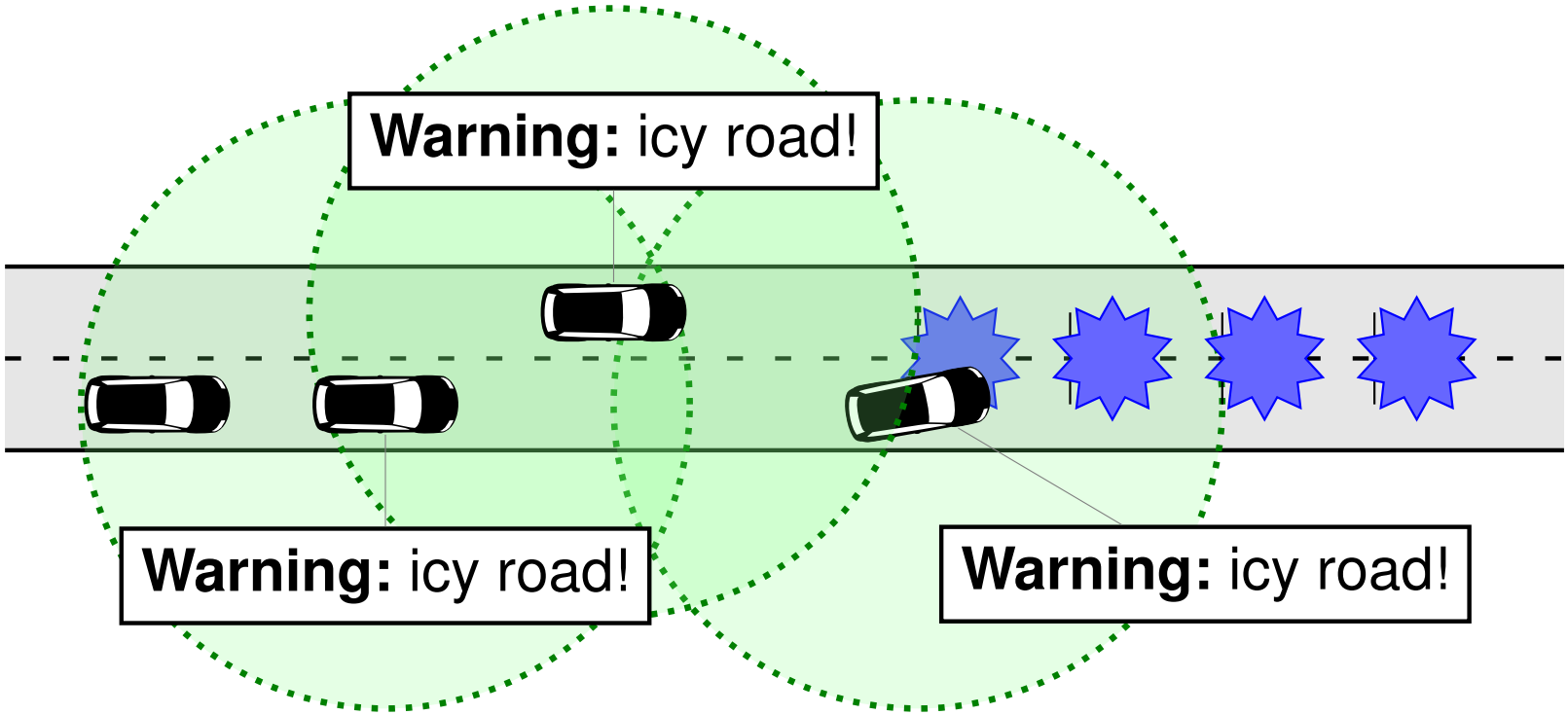
16.06.2014

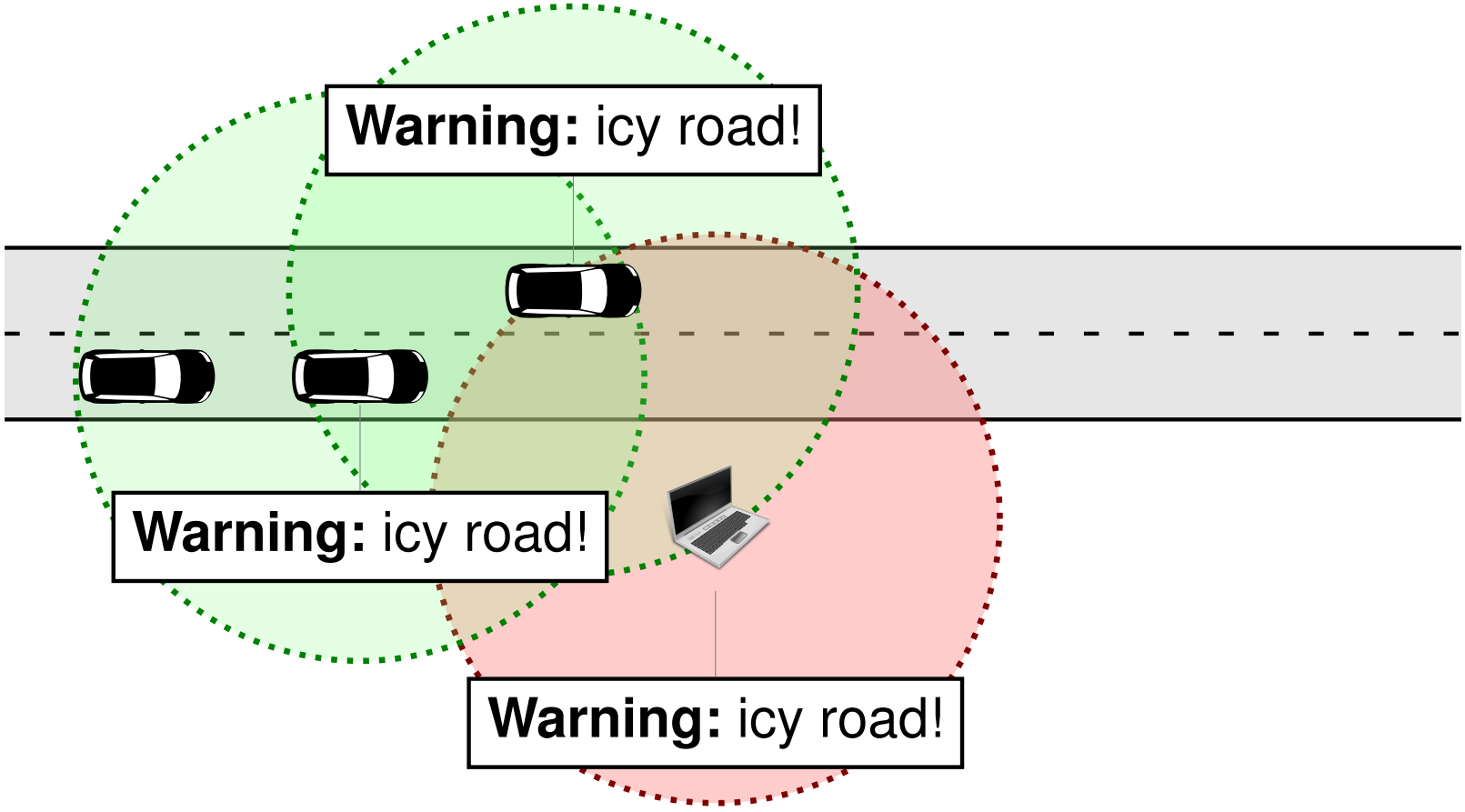
VANET Goals

- **safety**
- **traffic efficiency**
- infotainment

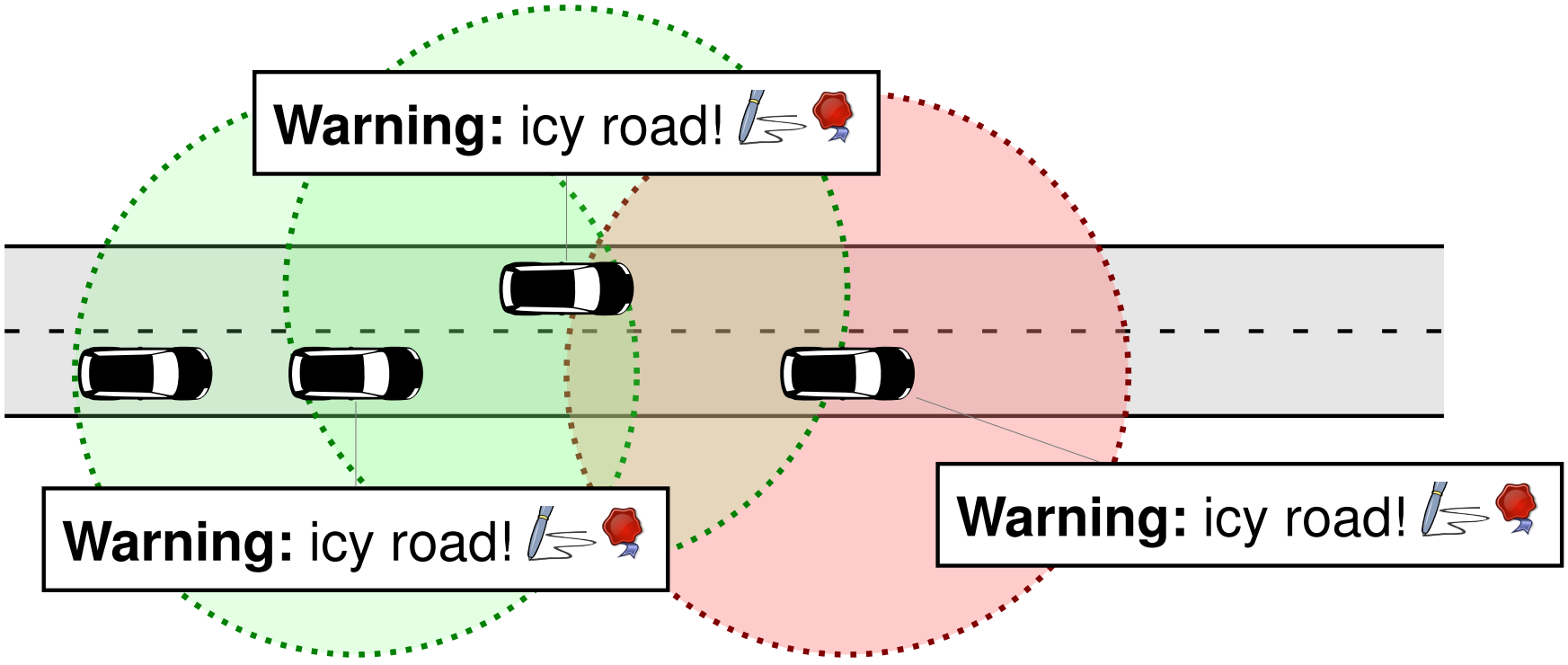
Application scenario



“Traditional” attacks



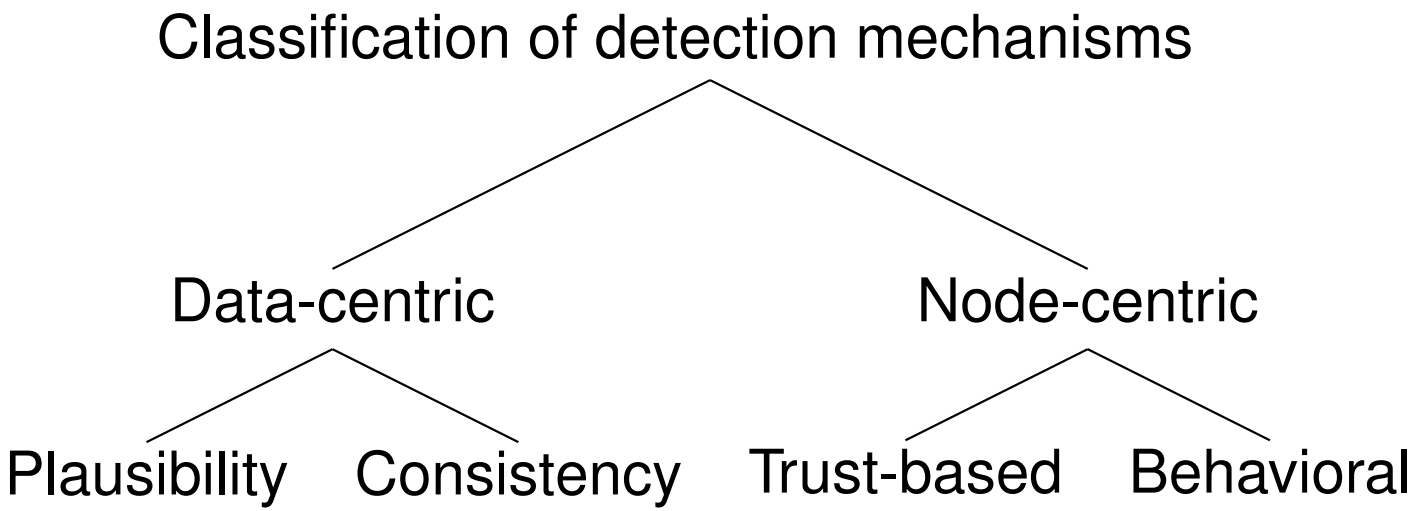
Misbehavior with (valid) keys



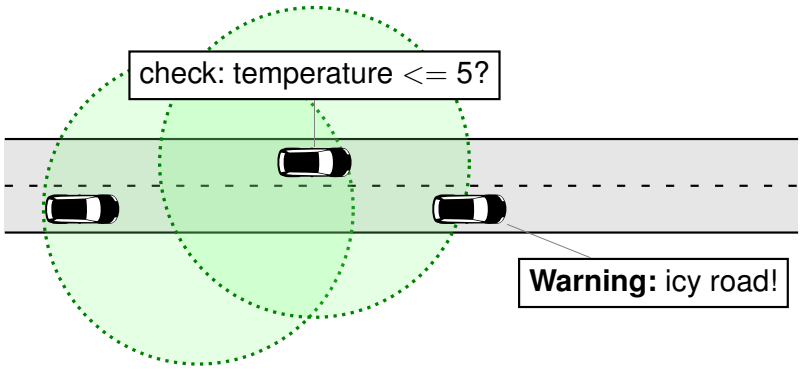
Other examples of attacks

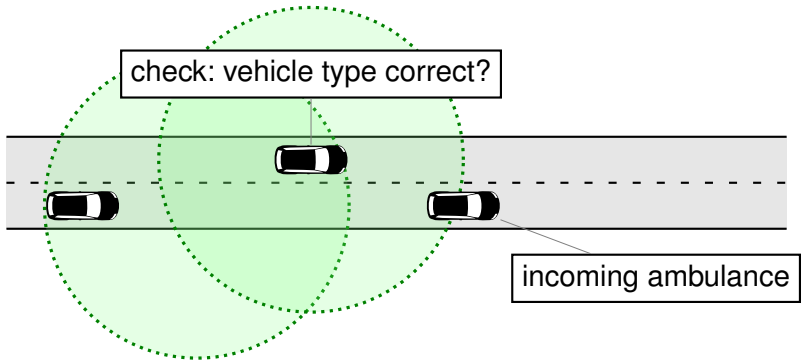
- false positions
- Sybil attacks
- falsified aggregates
- attacks on routing (blackhole, greyhole, wormhole, . . .)

Reactive security – misbehavior detection



Example: different detectors





VANET security: frameworks

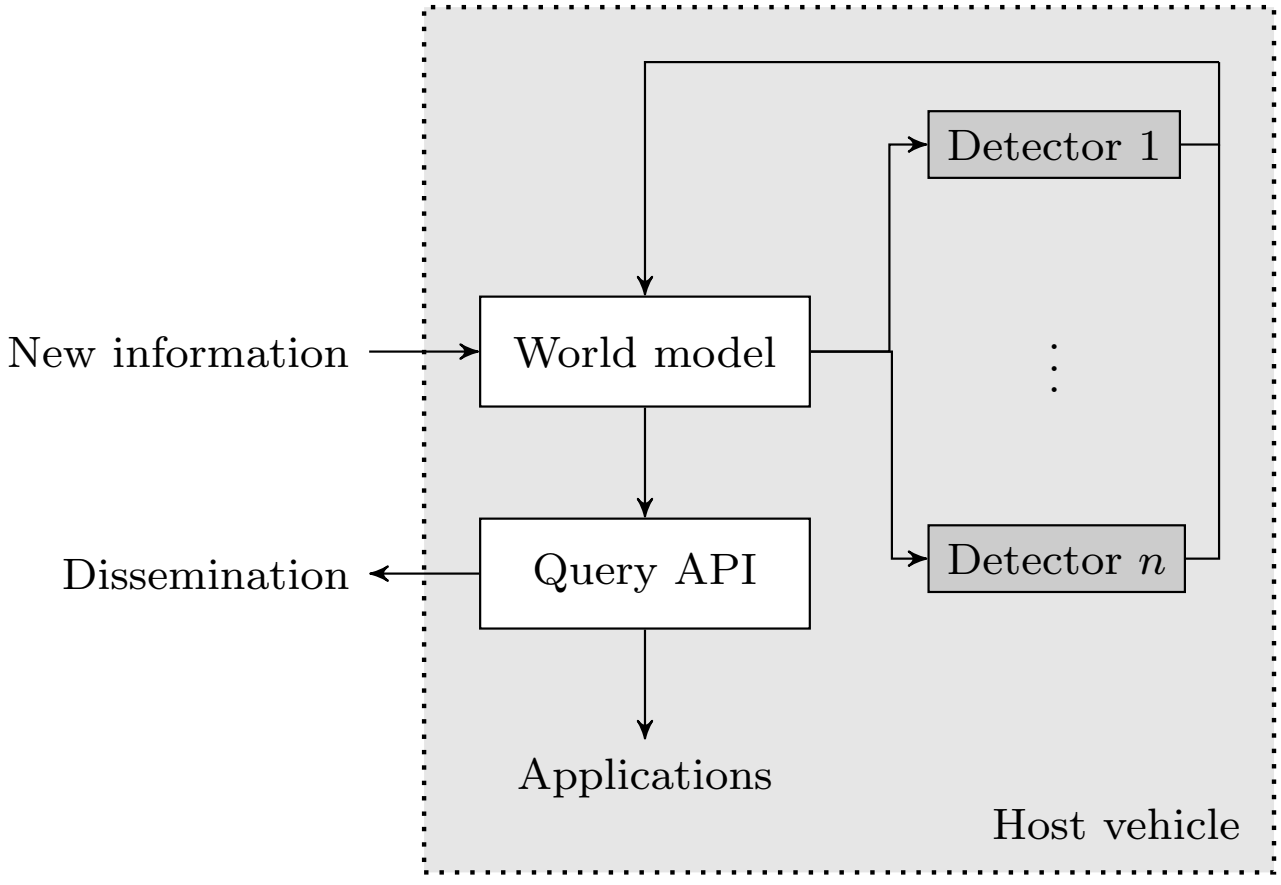
Goals:

- flexibility
- heterogeneous detector and attack types
- produce a confidence in the correctness of the data

Why flexibility? Context-dependence!

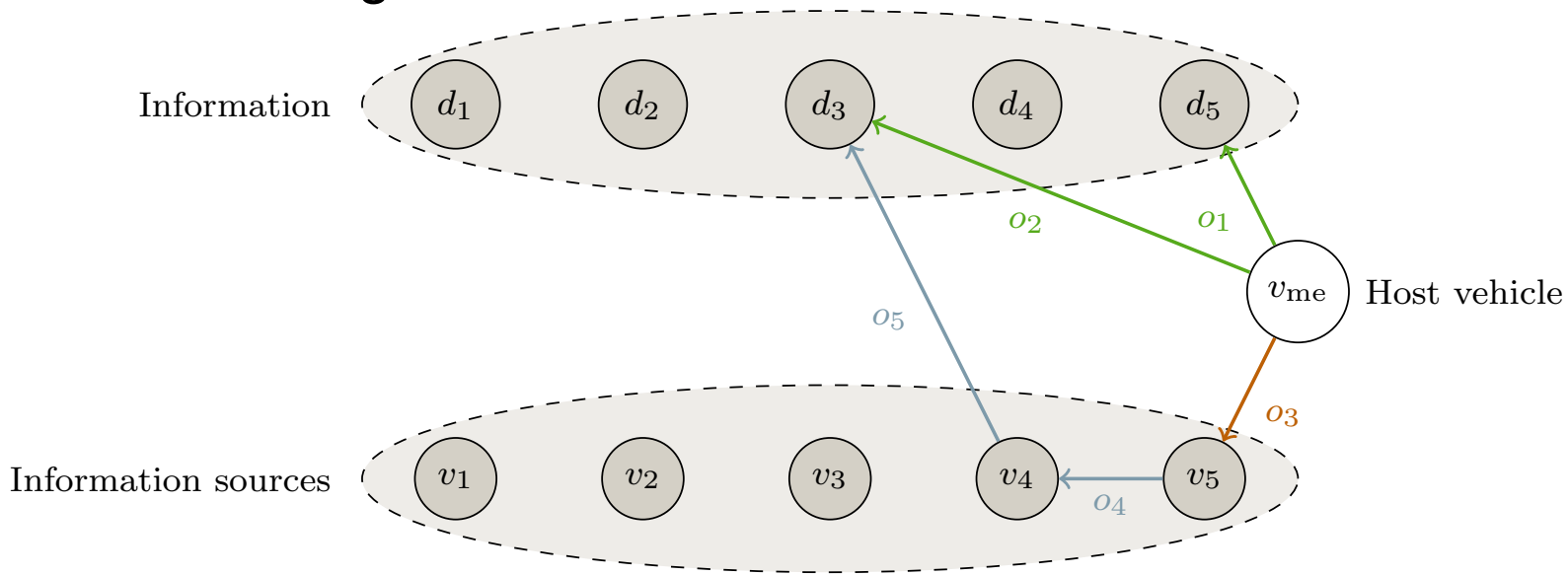
- vehicles behave differently in different situations
- detection mechanisms are often context-dependent (urban, highway, snowy, summer, . . .)
- flexibility means better parameterization of mechanisms
- flexibility means combination of mechanisms

Concept of our framework



Usage in our framework

Assumption: detectors produce expression of confidence and trust rating. Then:



Subjective logic 101

"trust rating" $\rightarrow$ opinion: belief, disbelief, uncertainty.

$o = (b, d, u)$

In particular; $b, d, u \in [0 \ldots 1]$ and $b + d + u = 1$

Examples:

Subjective logic 101

"trust rating" $\rightarrow$ opinion: belief, disbelief, uncertainty.

$o = (b, d, u)$

In particular; $b, d, u \in [0 \ldots 1]$ and $b + d + u = 1$

Examples:

True: (1, 0, 0). False: (0, 1, 0). Uncertainty: (0, 0, 1)

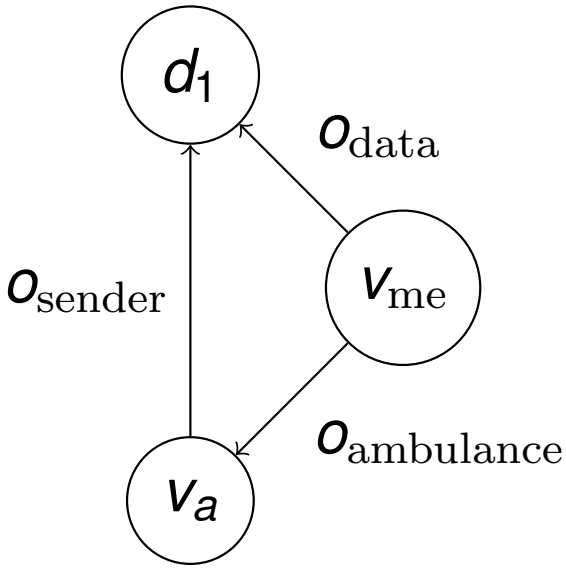
Subjective logic in our framework

Operators:
consensus, transitivity

Subjective logic in our framework

Operators:
consensus, transitivity
Decisions:
convert opinion to a result: $\theta > b + \frac{u}{2}$, where θ is a configured threshold.

Subjective logic in our framework



$$
\begin{aligned}
o &= o_{\text{data}} \oplus \left(o_{\text{ambulance}} \otimes o_{\text{sender}}\right), \\
&= (0, 0.25, 0.75) \oplus \left((0.5, 0, 0.5) \otimes (1, 0, 0)\right) \\
&= (0, 0.25, 0.75) \oplus (0.5, 0, 0.5) \\
&\approx (0.43, 0.14, 0.43). \qquad (1)
\end{aligned}
$$

Conclusion & future work

- higher expressiveness of subjective logic
- higher flexibility
- better parameterization of mechanisms
- Future work: producing optimal opinions
- Future work: combining parameterization with generation of opinions

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