



KESW 2015

International Conference on Knowledge
Engineering and Semantic Web



Ontology-Based Approach and Implementation of ADAS System for Mobile Device Use While Driving

A. Smirnov^{1,2}, A. Kashevnik^{1,2}, I. Lashkov², V. Parfenov²

¹ SPIIRAS, St. Petersburg, Russia

² ITMO University, St. Petersburg, Russia

OUTLINE

- Introduction & Motivation
- Driver & Vehicle Behavior Models
- Architecture
- Experiments
- Conclusion
- Q&A

ACCIDENT INCIDENCE RATE IN RUSSIA

Statistics as of 29 September of 2015*

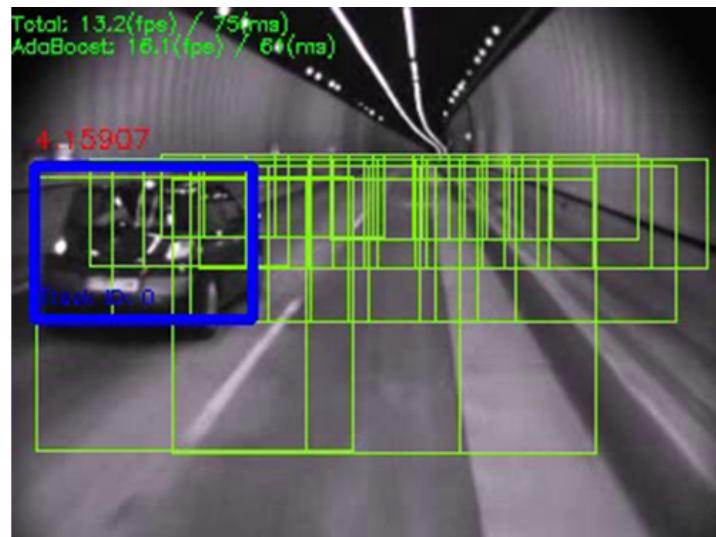
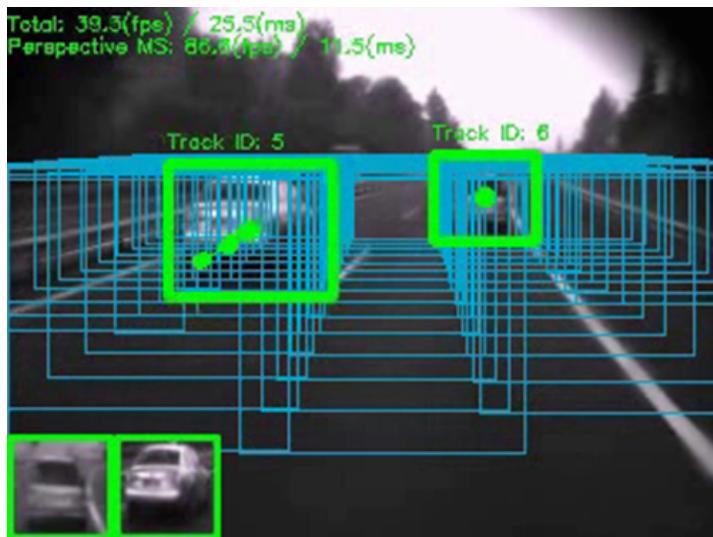


Accidents	623
Deaths	89
Child death	4
Injured	764
Injured children	86

*information taken from the website of Traffic Police of the MIA of Russia

ADVANCED DRIVER ASSISTANCE SYSTEM

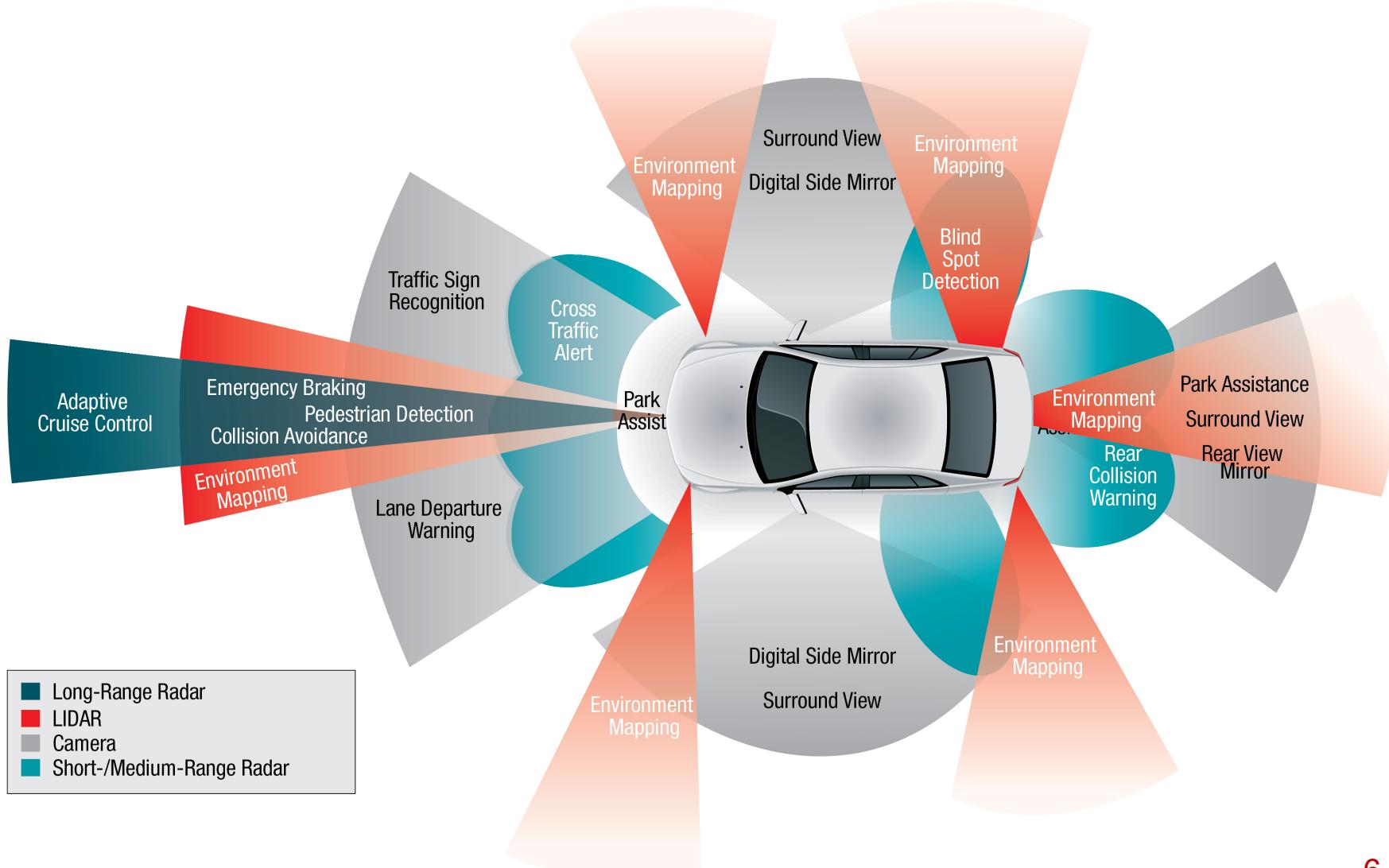
Advanced Driver Assistance Systems (ADAS) are systems developed to automate, adapt and enhance vehicle safety systems for driving.



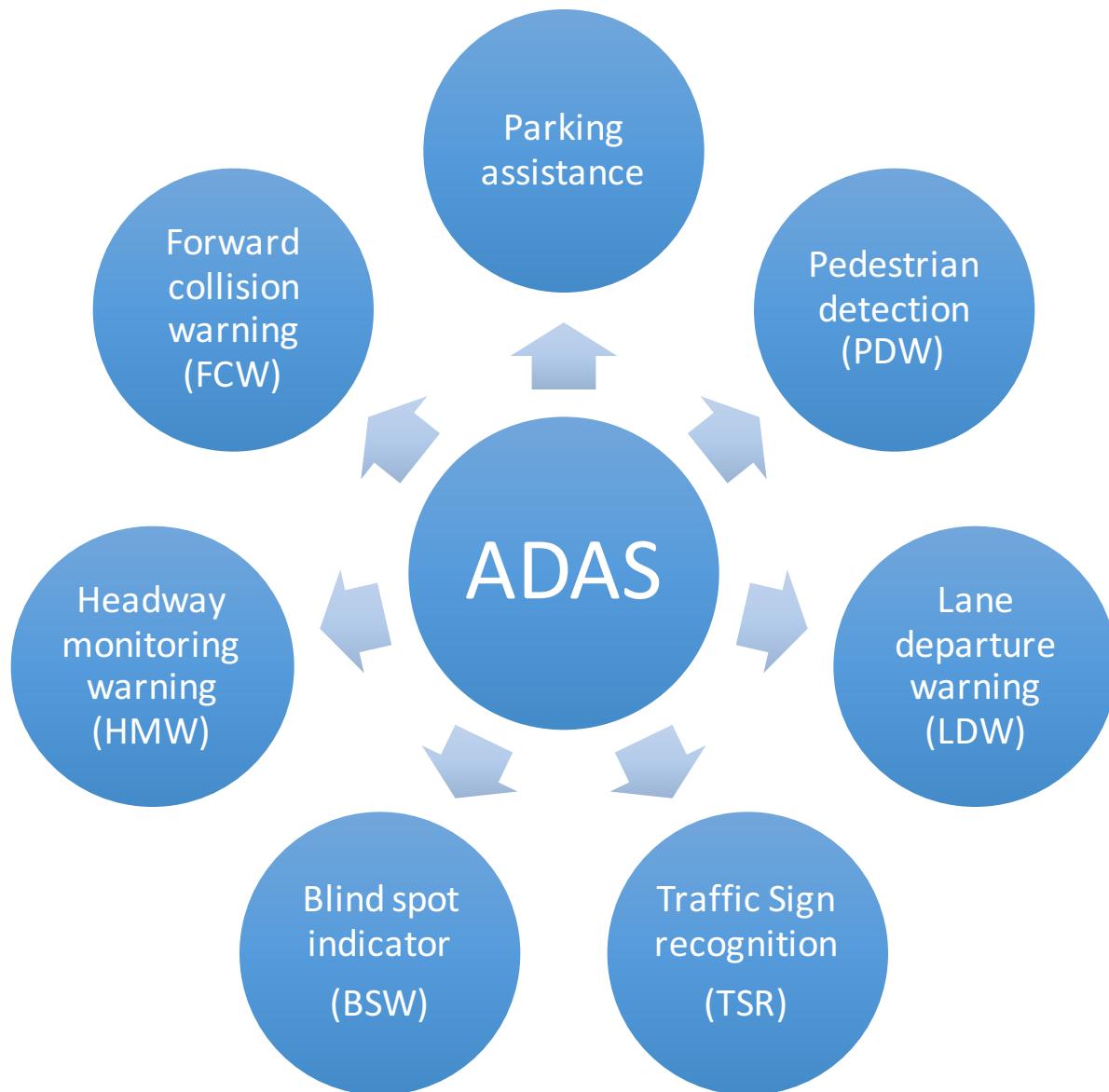
MOTIVATION

- **ADAS** are one of the fastest-growing segments in automotive electronics;
- **ADAS** systems enhance vehicles to make them safer and easier to drive thus more enjoyable;
- **ADAS** technology can be based upon vision/camera systems, sensor technology, car data networks, Vehicle-to-Vehicle (V2V), or Vehicle-to-Infrastructure systems;
- Number of **accidents** is still increasing.

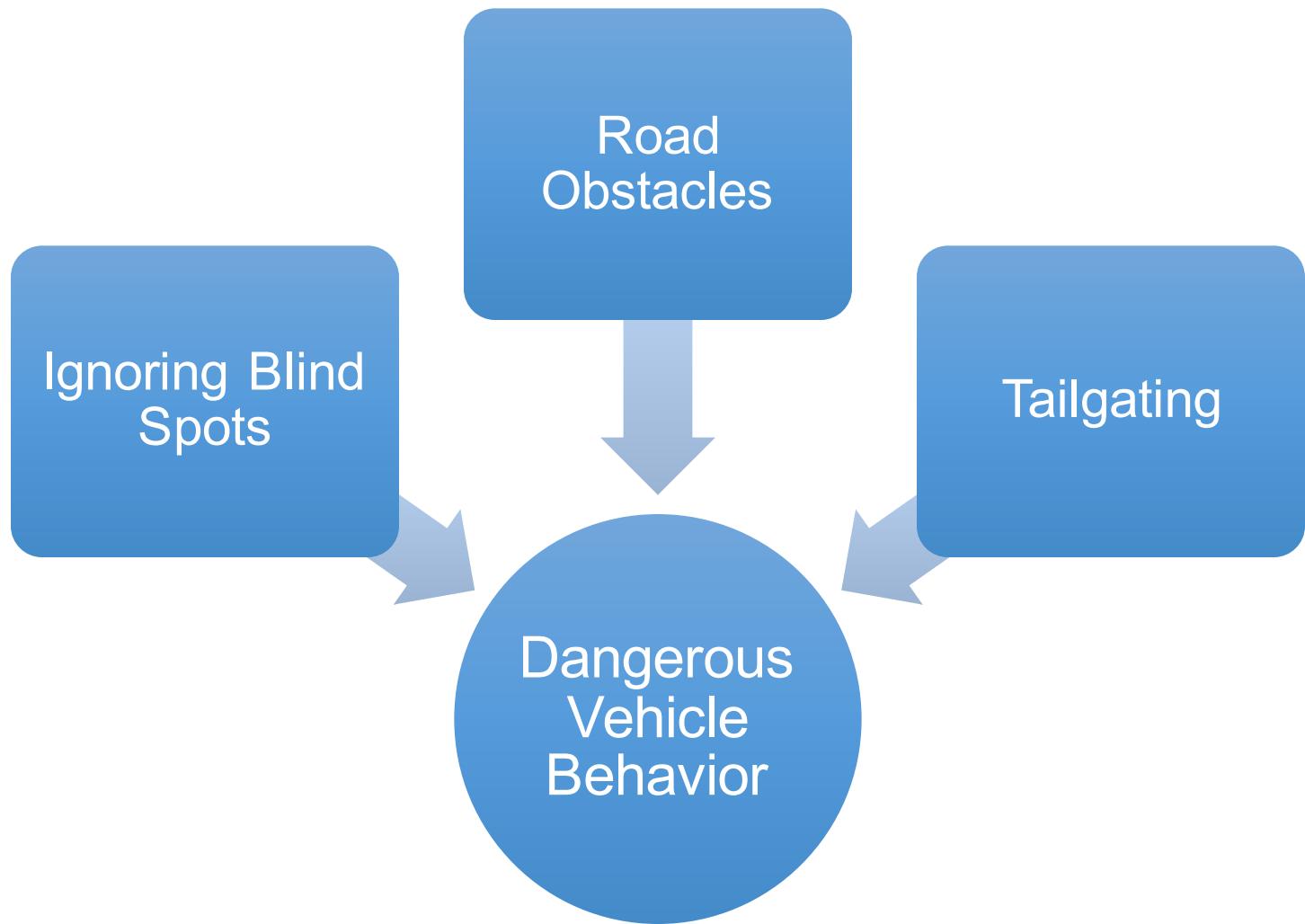
EXAMPLE OF A CAR EQUIPPED WITH ADAS



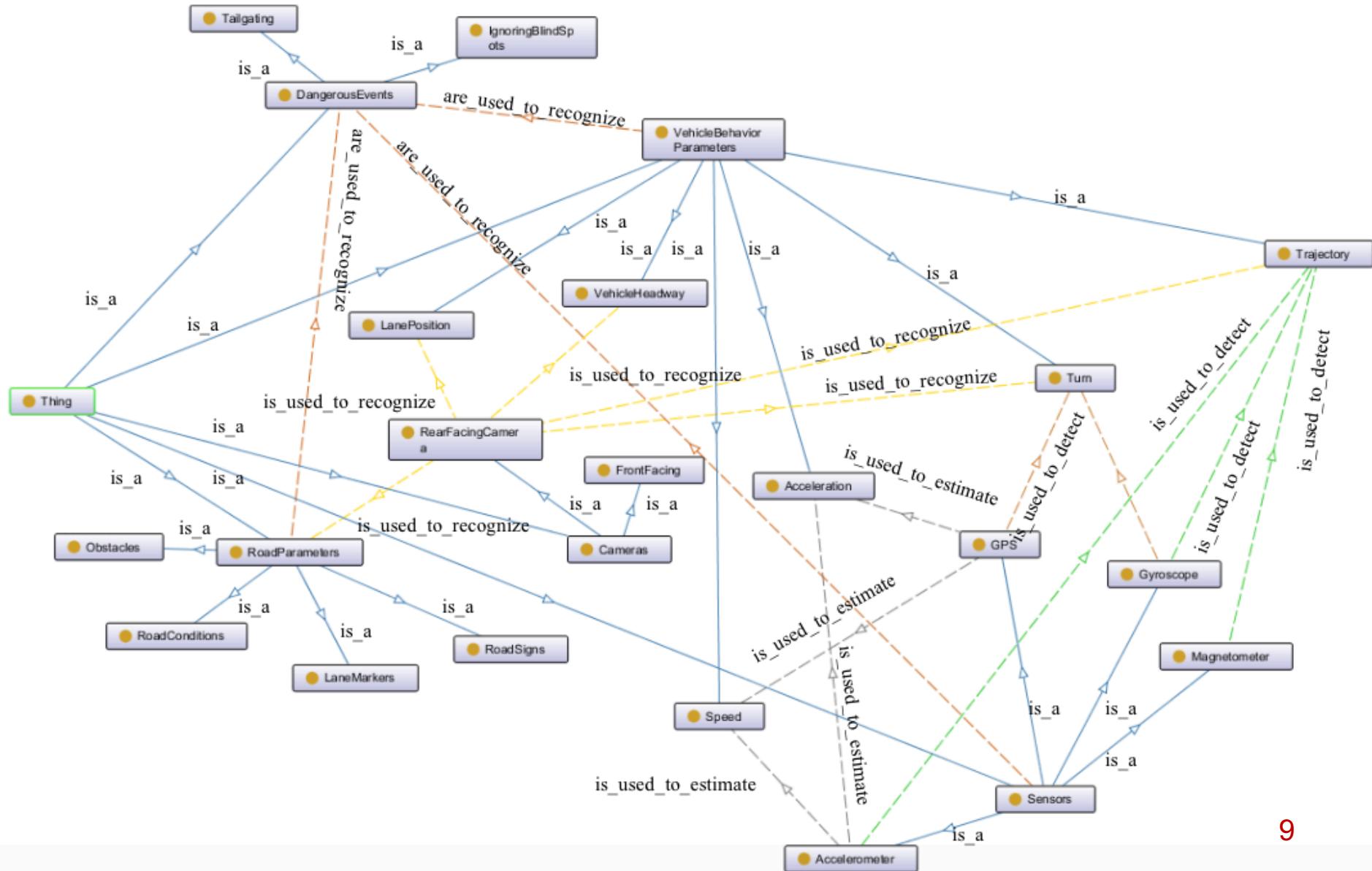
ADAS TECHNOLOGIES



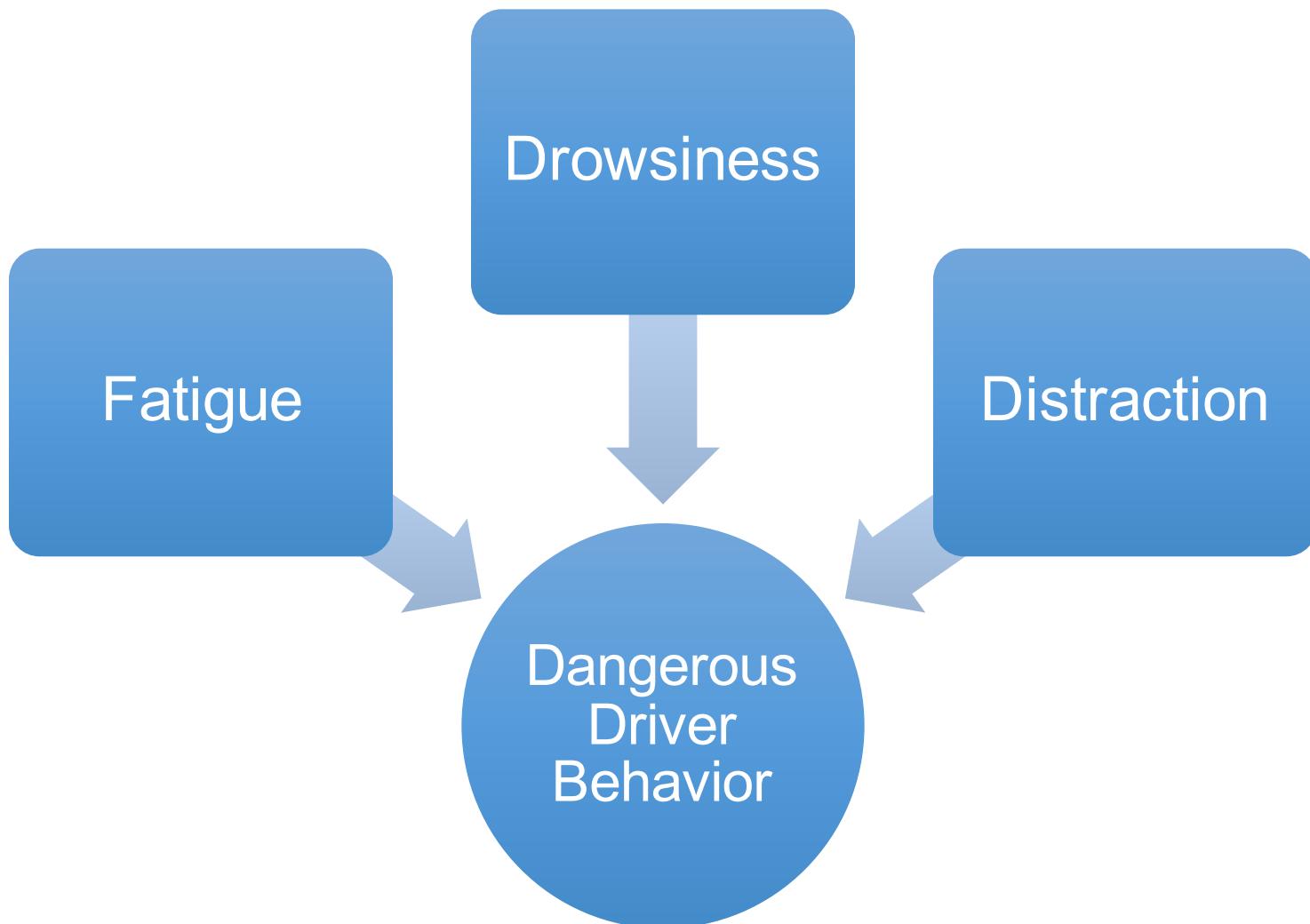
VEHICLE BEHAVIOR



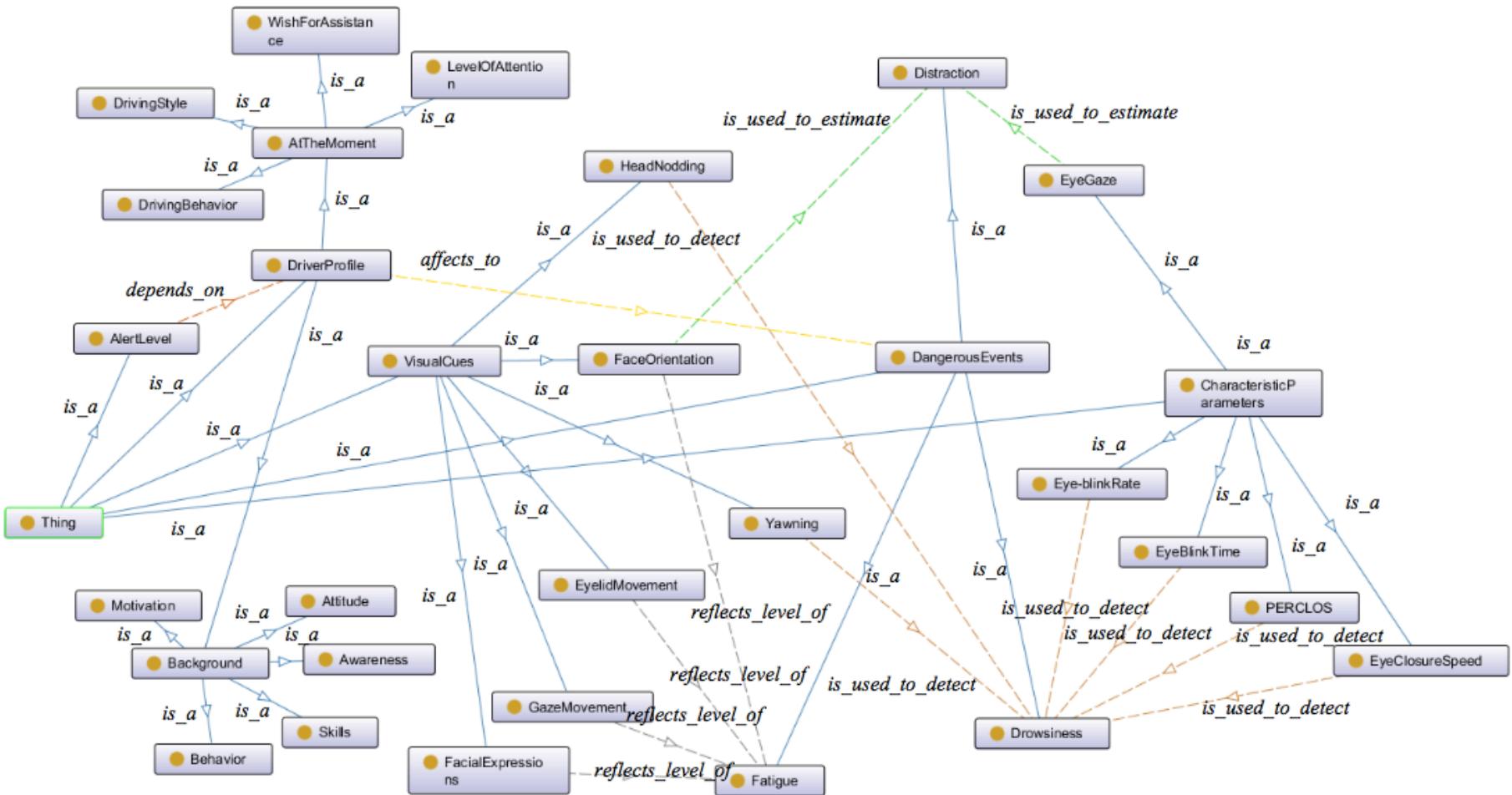
DEVELOPED VEHICLE ONTOLOGY MODEL



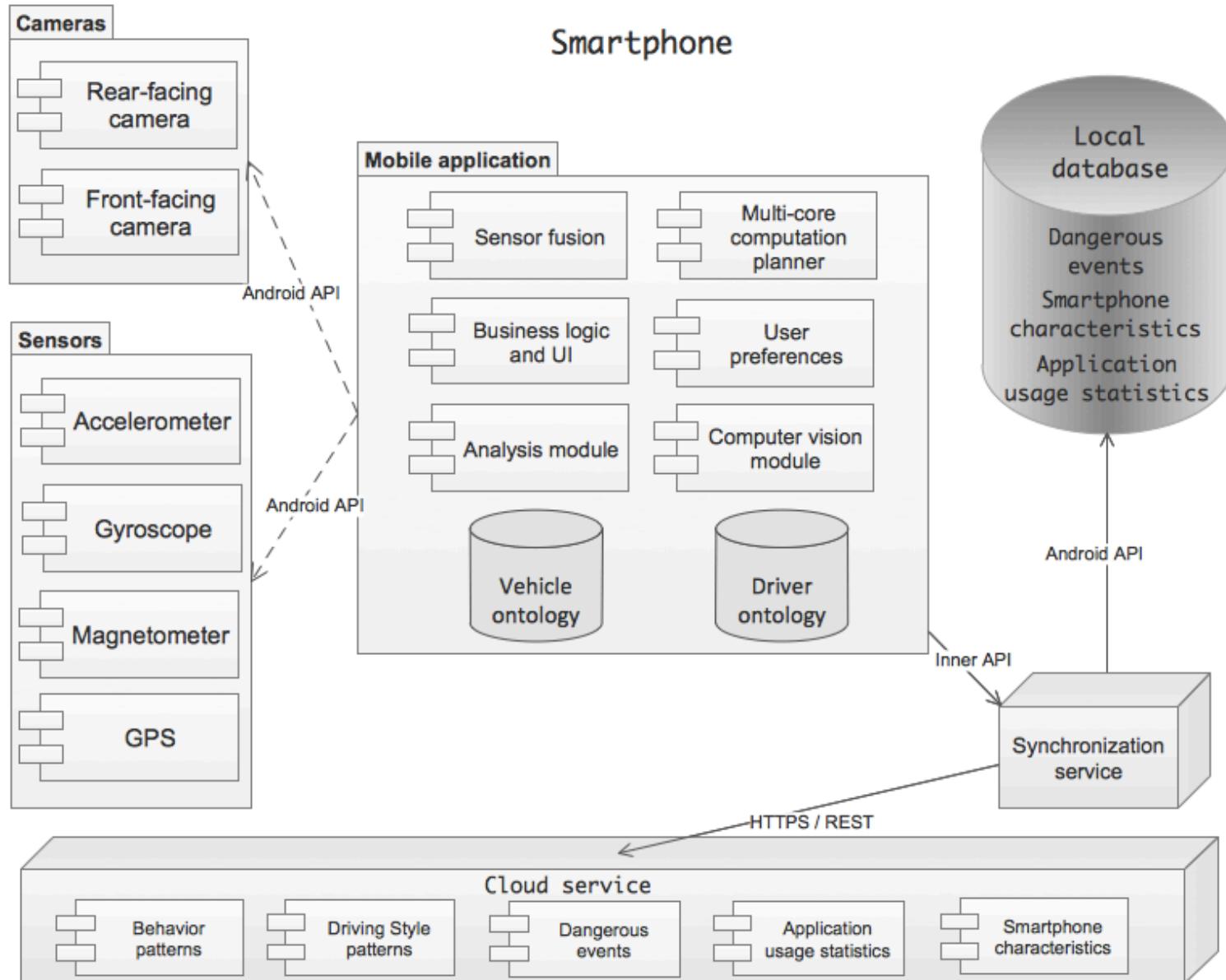
DRIVER BEHAVIOR



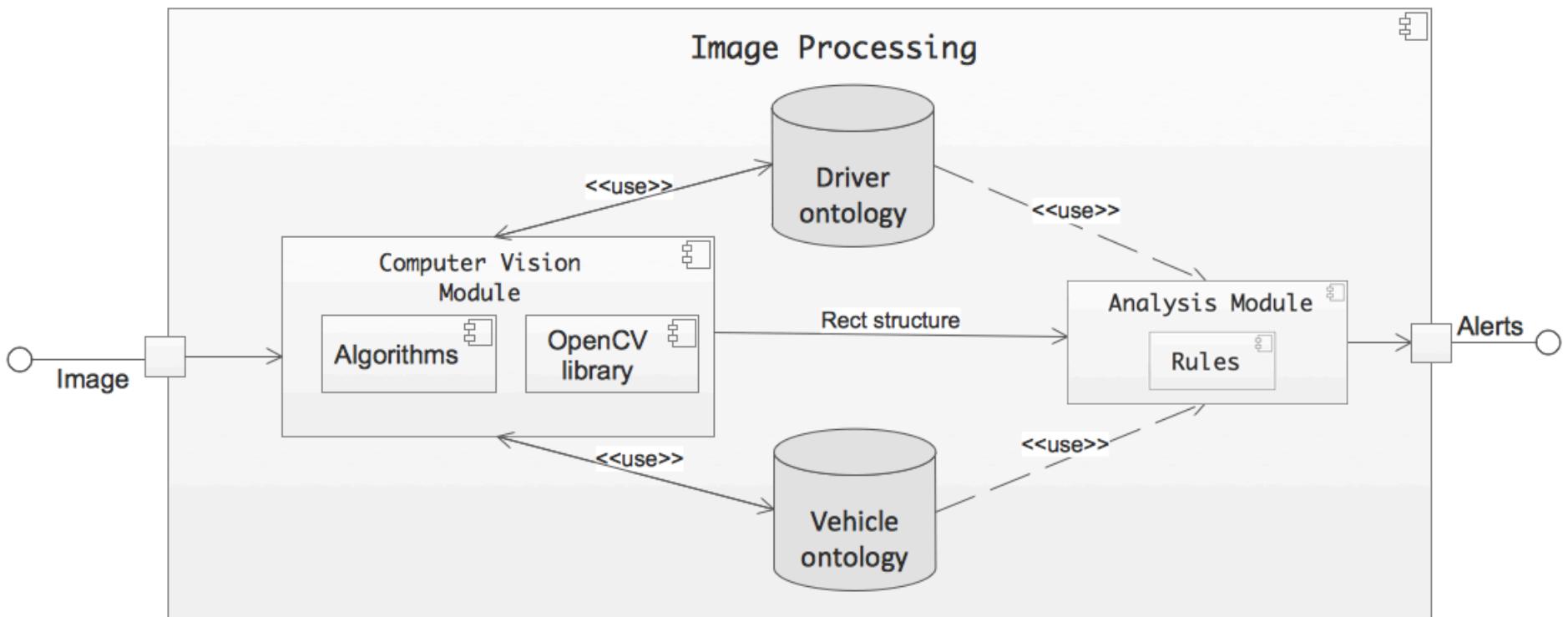
DEVELOPED DRIVER ONTOLOGY MODEL



ARCHITECTURE: REFERENCE MODEL

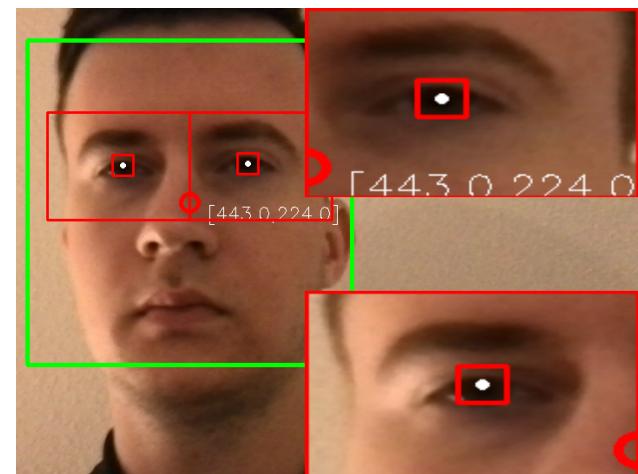


ARCHITECTURE: IMAGE PROCESSING MODEL

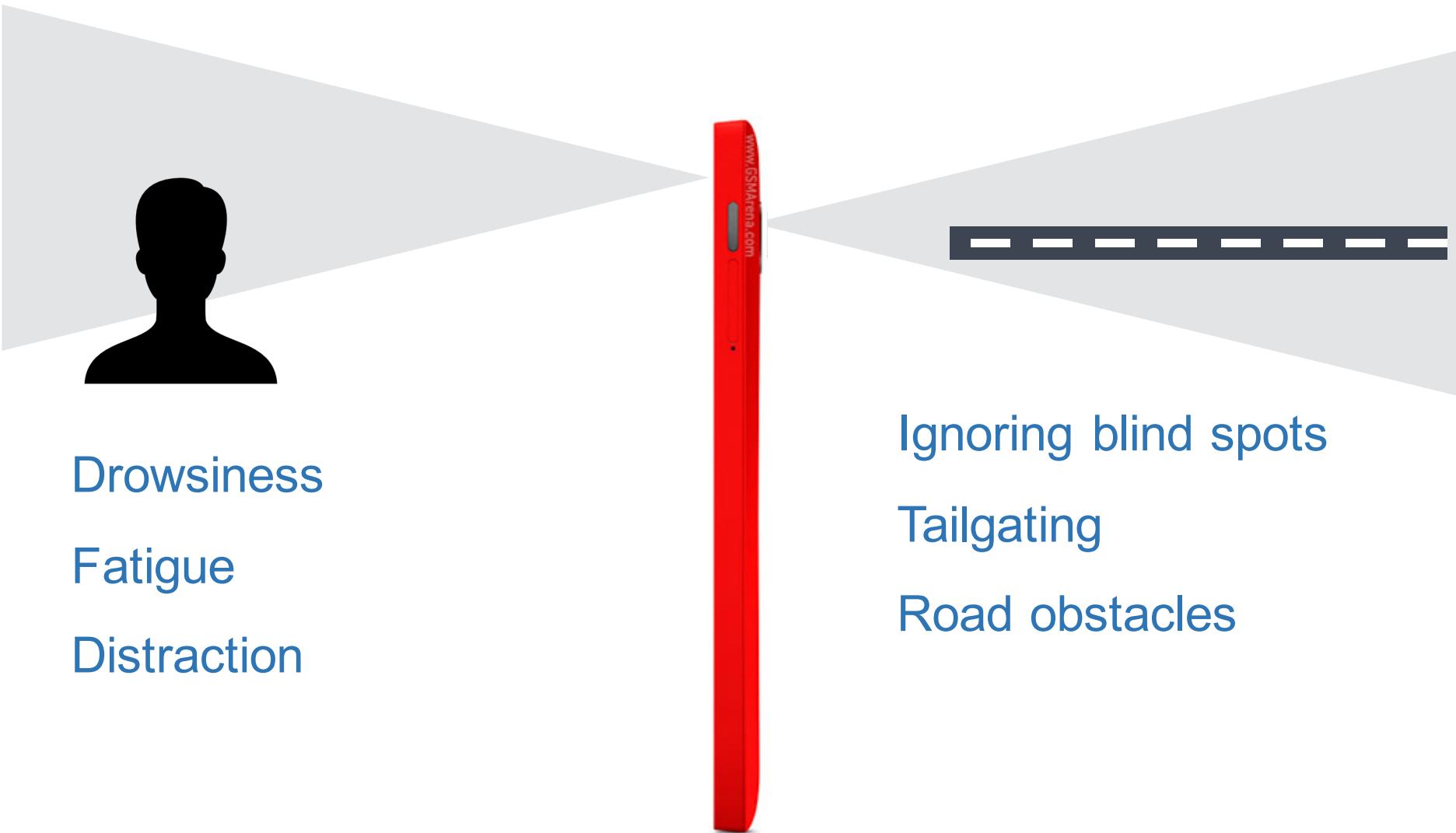


EXPERIMENTS: IMAGE PROCESSING

Face				Left eye				Right eye				Time, ms
X	Y	W	H	X	Y	W	H	X	Y	W	H	
243	108	372	372	429	190	163	124	266	190	163	124	119
243	108	372	372	429	190	163	124	266	190	163	124	60
243	108	372	372	429	190	163	124	266	190	163	124	59



DUAL-CAMERA APPLICATION



Drowsiness

Fatigue

Distraction

Ignoring blind spots

Tailgating

Road obstacles

Camera

GPS

Accelerometer

Gyroscope

Magnetometer

CONCLUSION

- Reference model
- Image processing model
- Defined Driver & Vehicle behavior
- Driver and vehicle models are closely related
- Ontology-based system
- Cloud-based system

Thank you for your attention!

Questions are welcome!

Igor Lashkov, Ph.D. student
St. Petersburg, Russia, E-mail: igor-lashkov@ya.ru