Autonomous Driving

Sensing

Environmental Model

awareness 360

Mapping
REM))

Drivable Paths
foresight and
redundancy

Driving Policy + RSS
(Planning)

Negotiating in a multi
agent game while
ensuring safety

The Challenge of Autonomous Driving Safety

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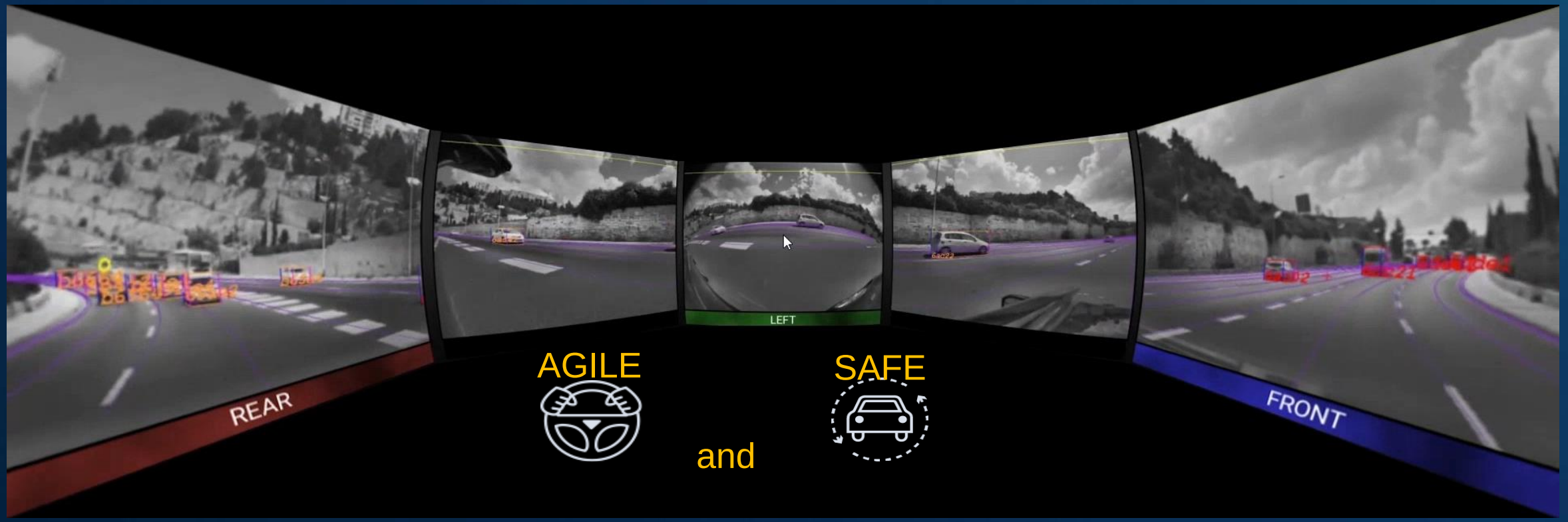
The AV's **Planning module** must operate under the hard constraint of guaranteeing safety while delivering effective and agile driving decisions

AGILE

and

SAFE

The Challenge of Autonomous Driving Safety



How would we disambiguate AGILE from DANGEROUS?

Human Approach to Driving Safety

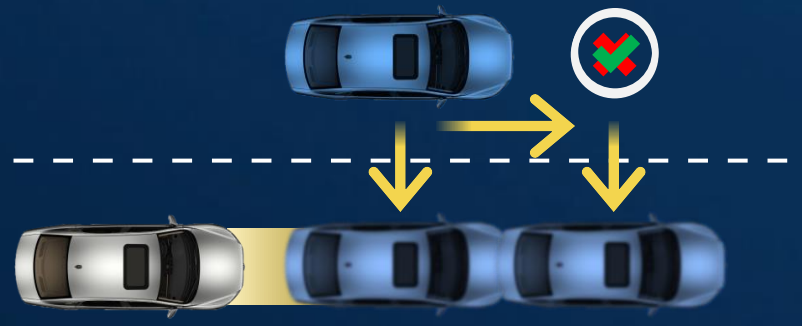
Standing still , we assume not to get hit by another vehicle.

Driving at a set distance behind another vehicle, we consider a maximum plausible deceleration of the target.

Driving by an occlusion, our speed/lateral offset reflect assumption of maximum plausible speed of objects appearing from behind the occlusion.

By these “common sense” assumptions of the PLAUSIBLE worst case,
Drivers implicitly outline an agent’s agreed **envelope of responsibility**

Responsibility-Sensitive Safety



FORMALIZE

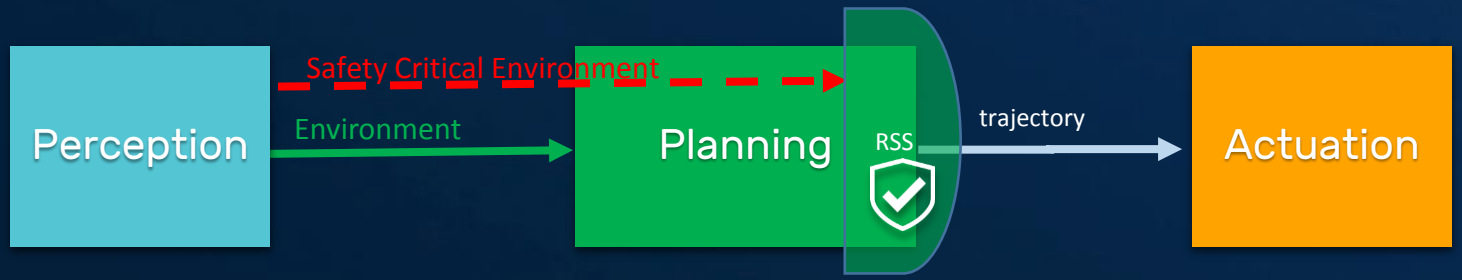
Human common sense of Responsibility envelope

DERIVE

A formal definition of a Dangerous situation
and the appropriate responses
to fulfill the responsibility

IMPLEMENT

Monitor the safety critical environment and
adjust the driving policy planned actions as needed



Surround Computer vision

Comprehensive modality. Covering all environment model elements

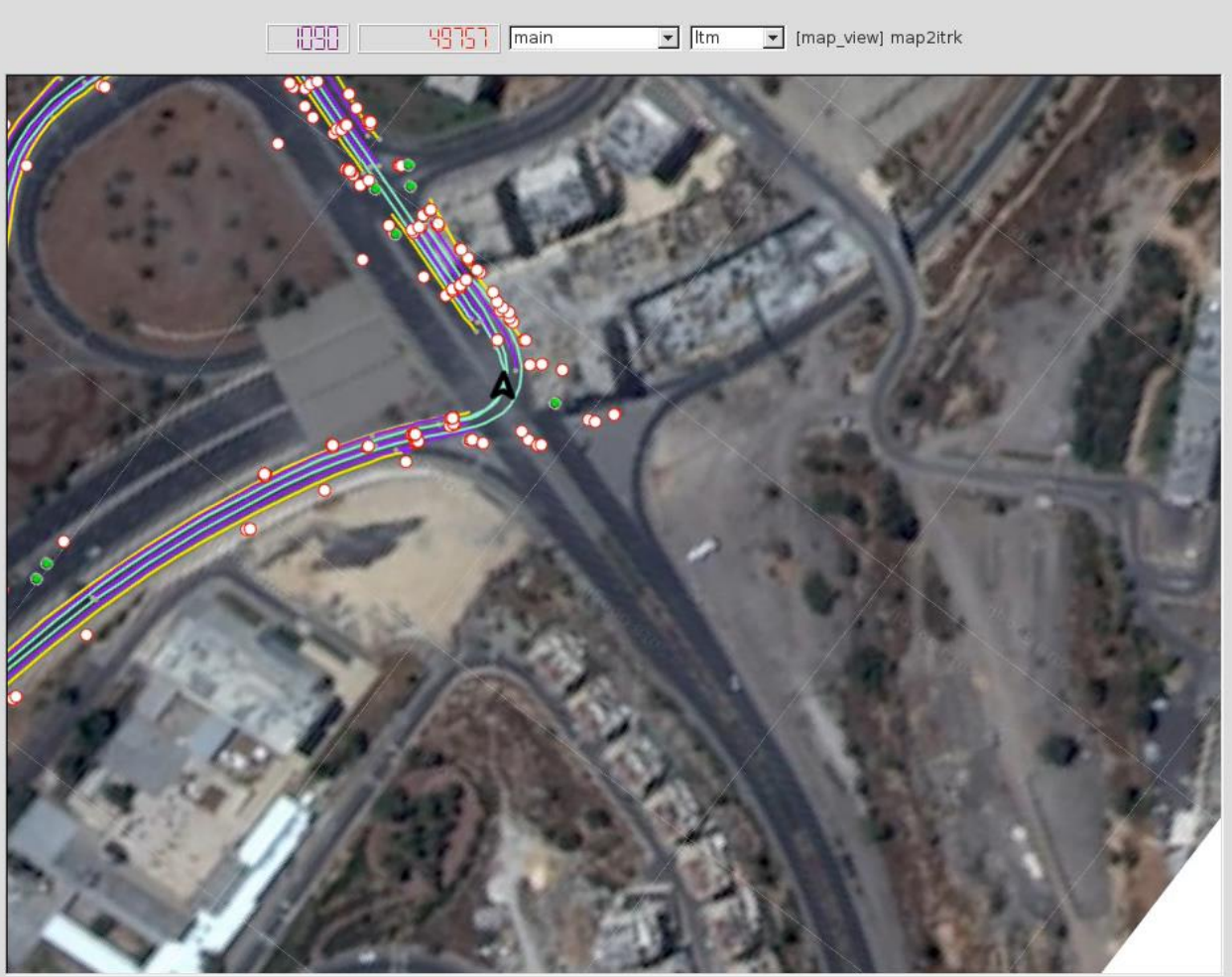
- Drivable area and boundaries
- Driving path geometry
- Road users
- Semantics

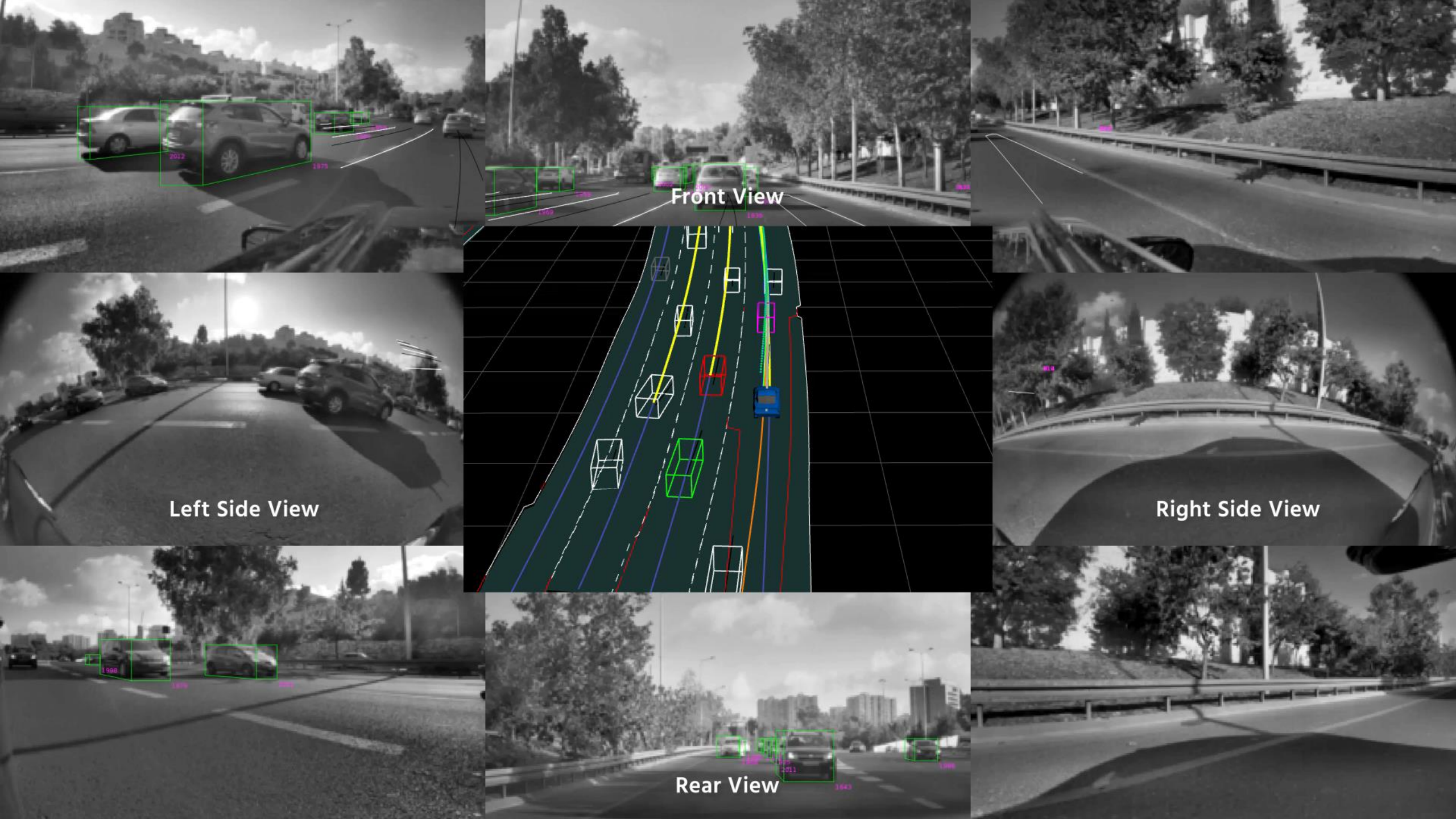
Surround Visual Perception

Crowd sourced mapping and localization

1.Harvesting by Single-camera vehicles : vast device proliferation to assure extremely high refresh rates
2.Map aggregation in the cloud : ingesting dynamic updates and auto-validation of the cured map
3.Road-Book consumption through Self-localization

REM Localization, Urban, Challenging Visibility




Front View
Left Side View
Right Side View
Rear View

Mobileye's AV design principles

Safety:

- RSS Provides a **decision making** 'safety seal' ;
  Guarantee that the host will not make a decision leading to an accident of its fault
- RSS disambiguates a sub-set of "safety-critical" **perception** issues from the broader "comfort" perception goals

Economical scalability:

- Design for safety is not open-ended "best practice" : RSS is leveraged to
  - focus the system-spec (sensors/compute)
  - simplify the technical safety concept
  - reduce validation process burdens
  - Allow an expressive ML driving policy (semantic space), alleviated from safety concerns
- Crowd sourced mapping solution, leveraging ADAS fleet

Single effort and architecture:

- Reducible/expandable to serve L2➔L2+➔L3➔L4➔L5
- Built bottom up, Leveraging legacy, battle-tested technologies and (sub) systems.