Intelligent vehicles and autonomous driving

PERCEPTION SYSTEMS

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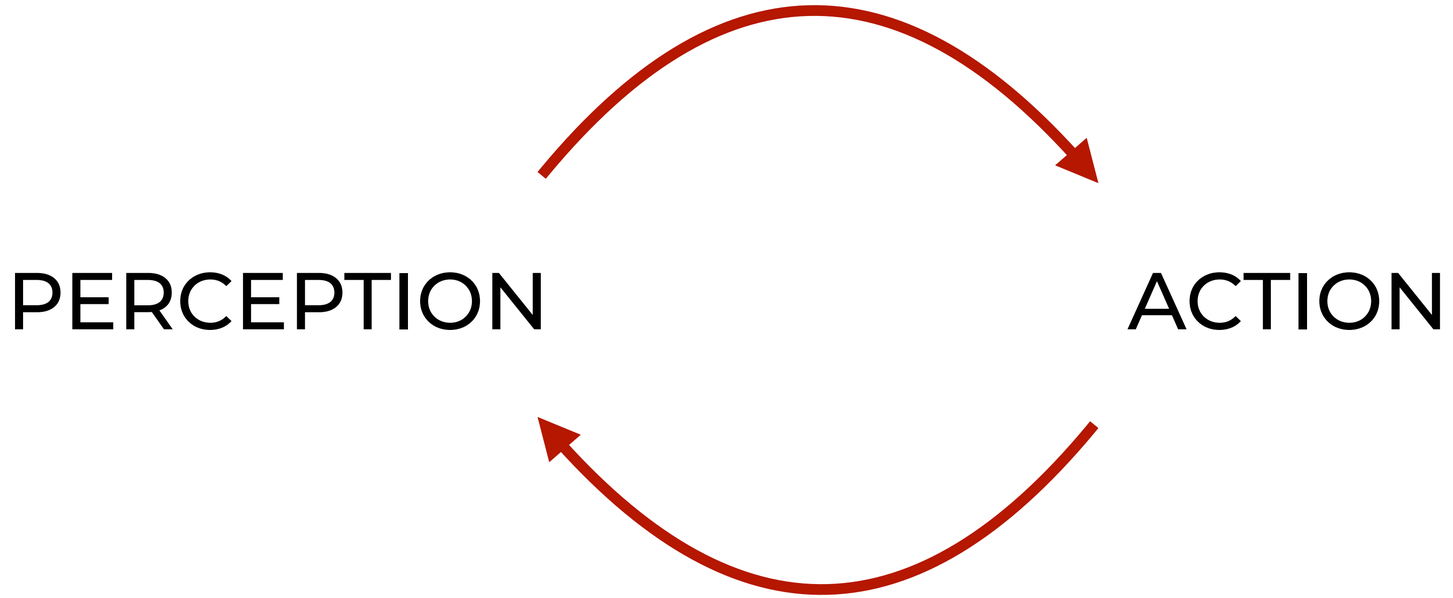
AUTONOMOUS DRIVING



PERCEPTION

Perceive the environment that we're driving in.

Detect and ***track*** the elements in the world around us:

- drivable road surface
- vehicles
- vulnerable road users
- traffic signs

Why perception is so challenging? Consider the human example.

CHALLENGES

CHALLENGES

CHALLENGES

CHALLENGES

CHALLENGES

PERCEPTION

ENVIRONMENT & EGO STATE

- SENSORS
- HD MAPS
- V2V, V2I, V2X

+

INFORMATION PROCESSING

- NEURAL NETS
- GPUs

SENSORS

A sensor is a device that measures or detects a property of the environment, or changes to a property.

EXTEROCEPTIVE

- SONAR (ULTRASONIC)
- RADAR
- LIDAR
- CAMERA

PROPRIOCEPTIVE

- GNSS / IMU
- ODOMETRY

SENSORS

A sensor is a device that measures or detects a property of the environment, or changes to a property.

EXTEROCEPTIVE

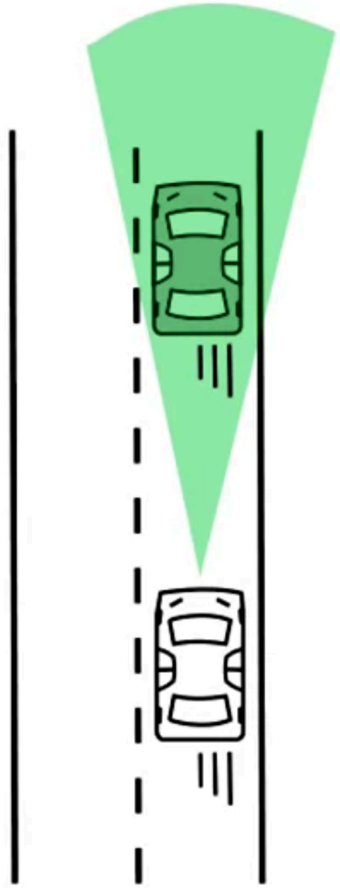
- SONAR (ULTRASONIC)
- RADAR
- LIDAR
- CAMERA

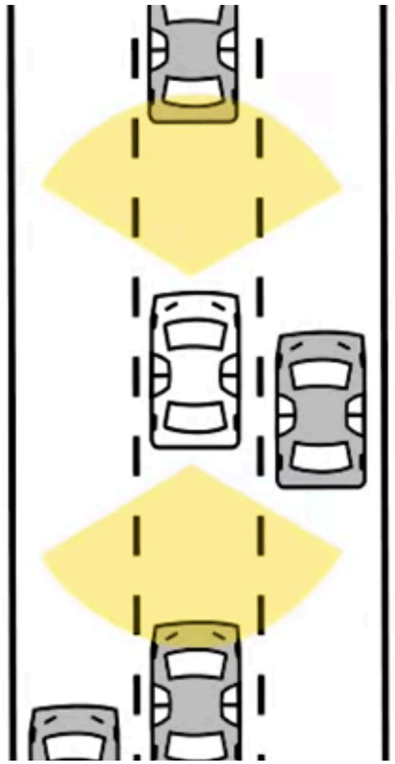
SONAR (ULTRASONIC), RADAR, LIDAR:
- **ACTIVE SENSORS**
- **TIME-OF-FLIGHT SENSORS**

SENSOR SETUP

EXAMPLE : **Highway**

1. car following
2. emergency stop

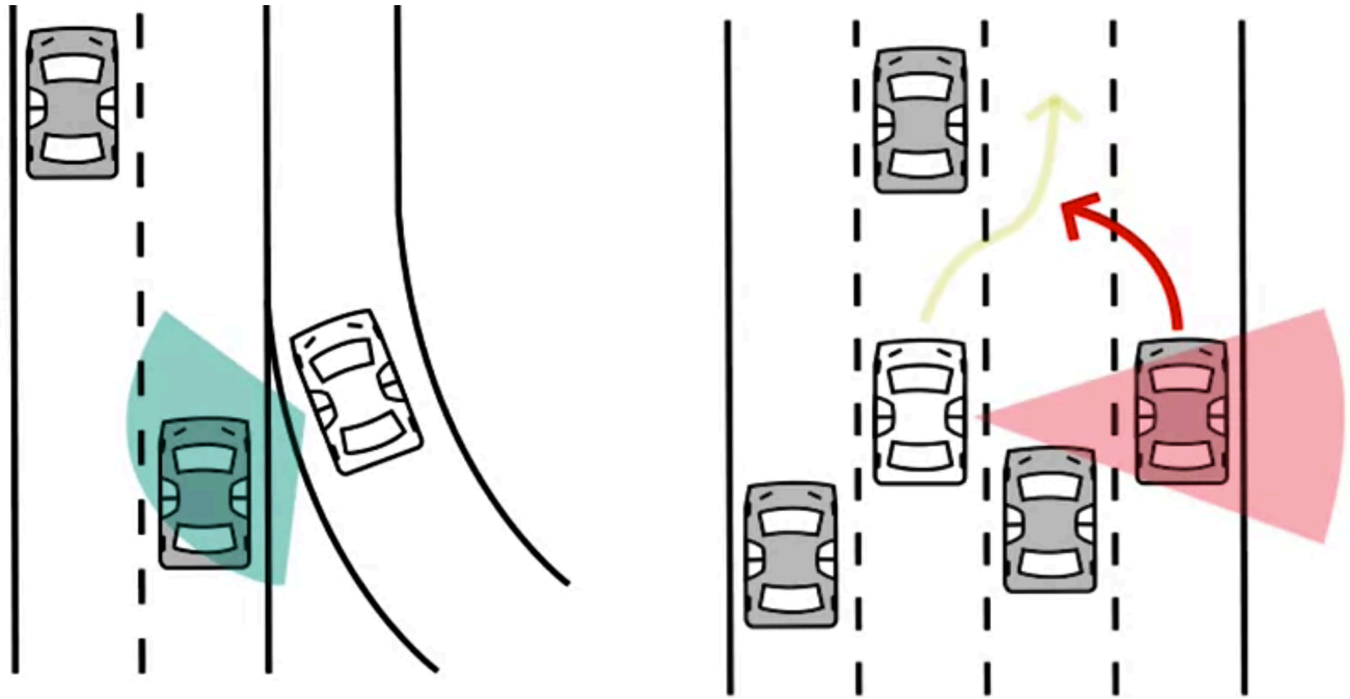




SENSOR SETUP

EXAMPLE : **Highway**

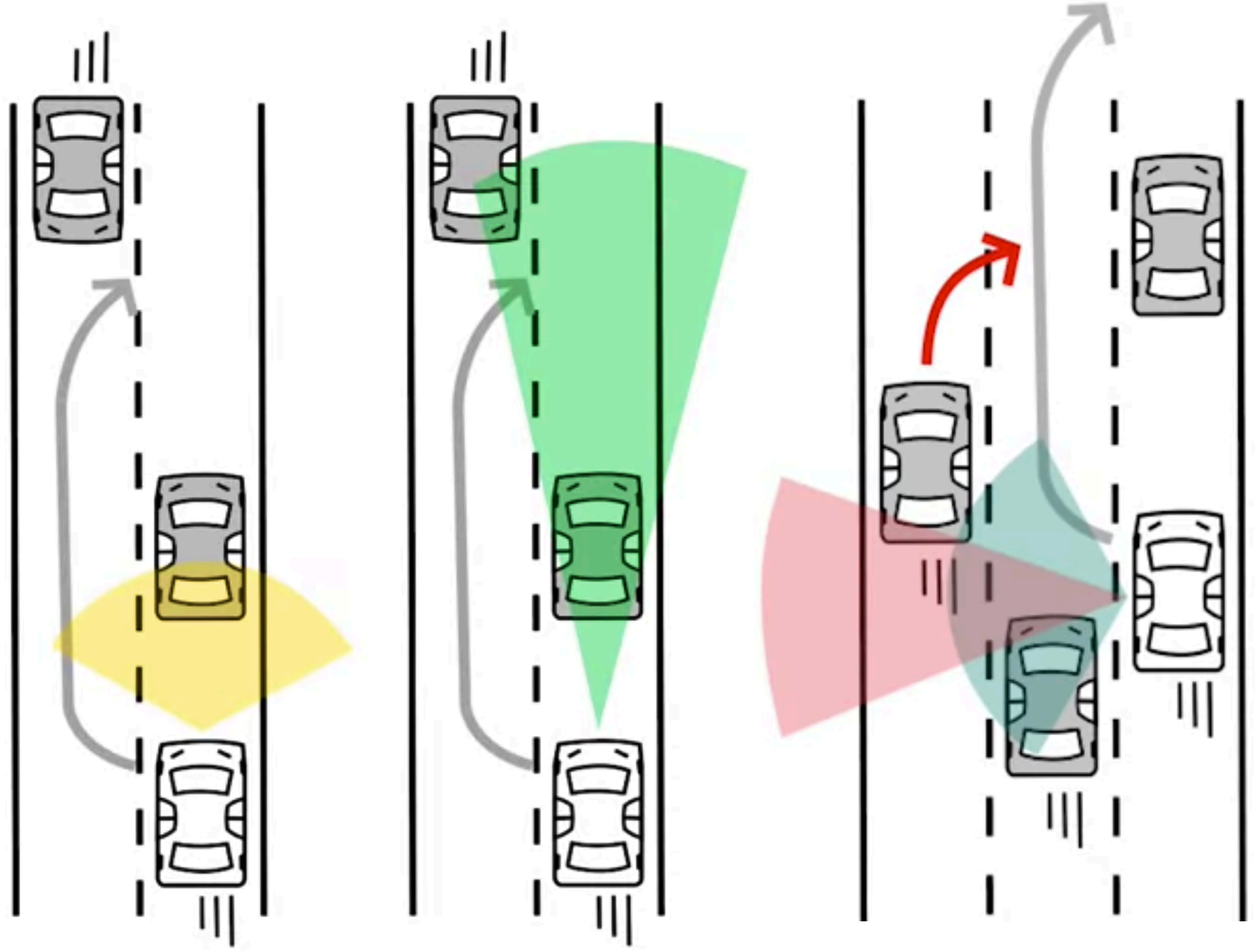
1. car following
2. emergency stop
3. merge
4. lane change



SENSOR SETUP

EXAMPLE : **Urban scenario**

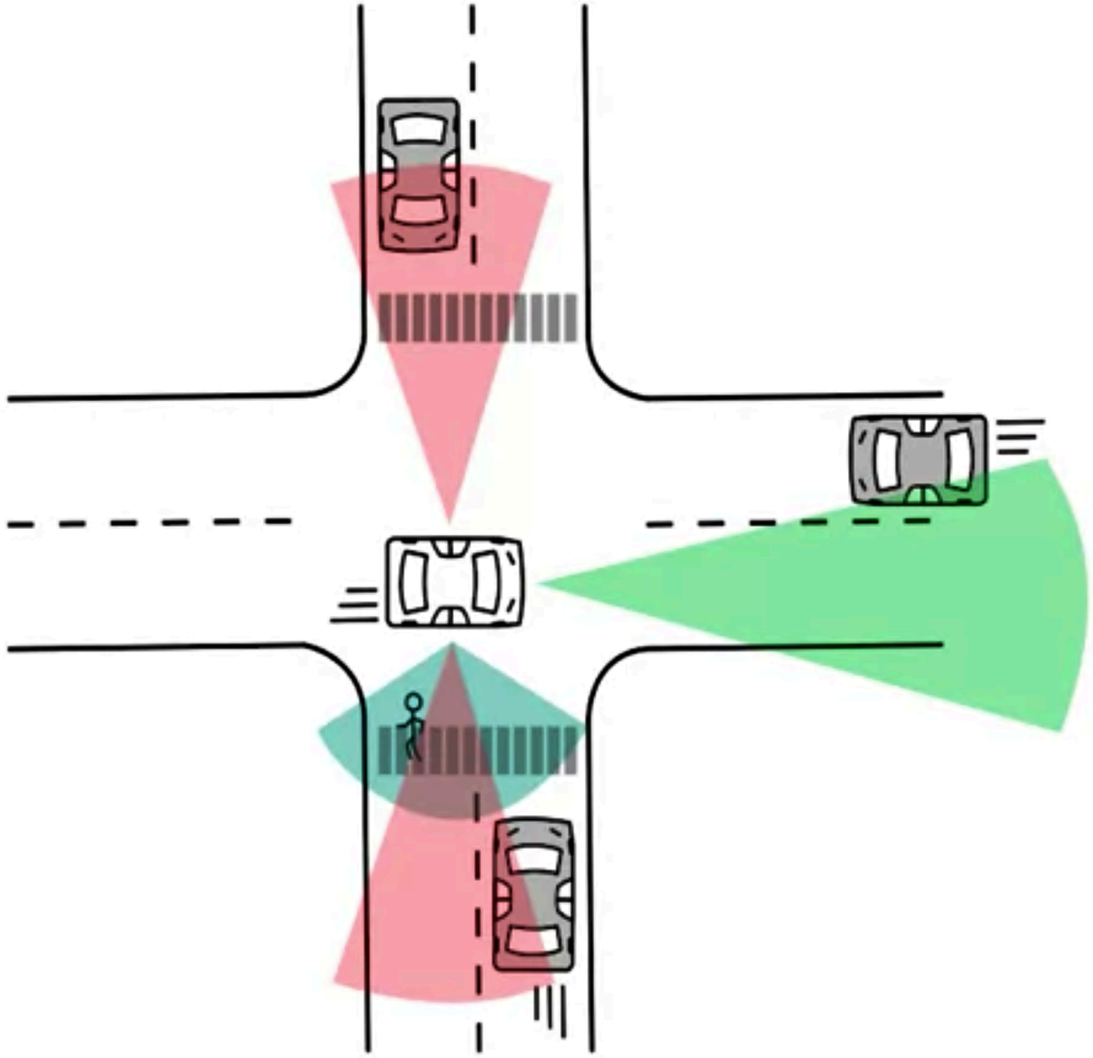
1. overtake parked car



SENSOR SETUP

EXAMPLE : **Urban scenario**

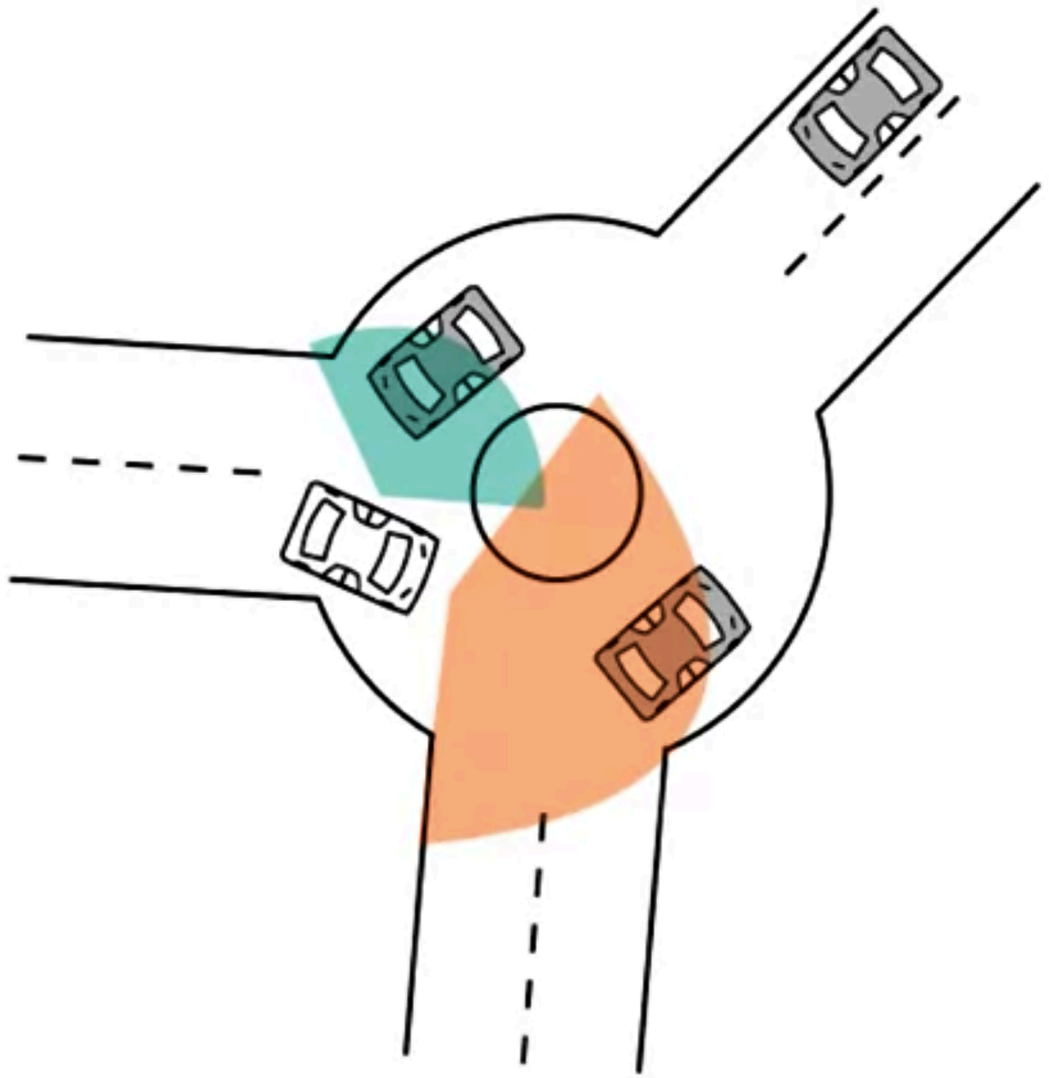
1. overtake parked car
2. intersections



SENSOR SETUP

EXAMPLE : **Urban scenario**

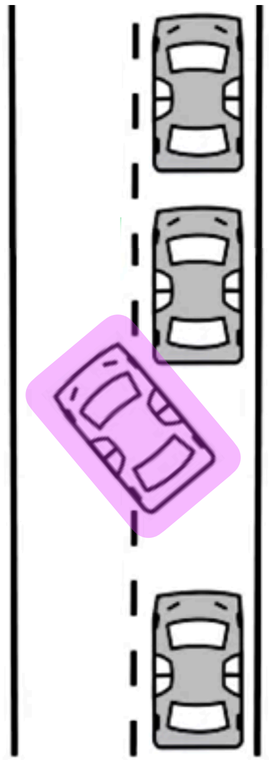
1. overtake parked car
2. intersections
3. roundabouts



SENSOR SETUP

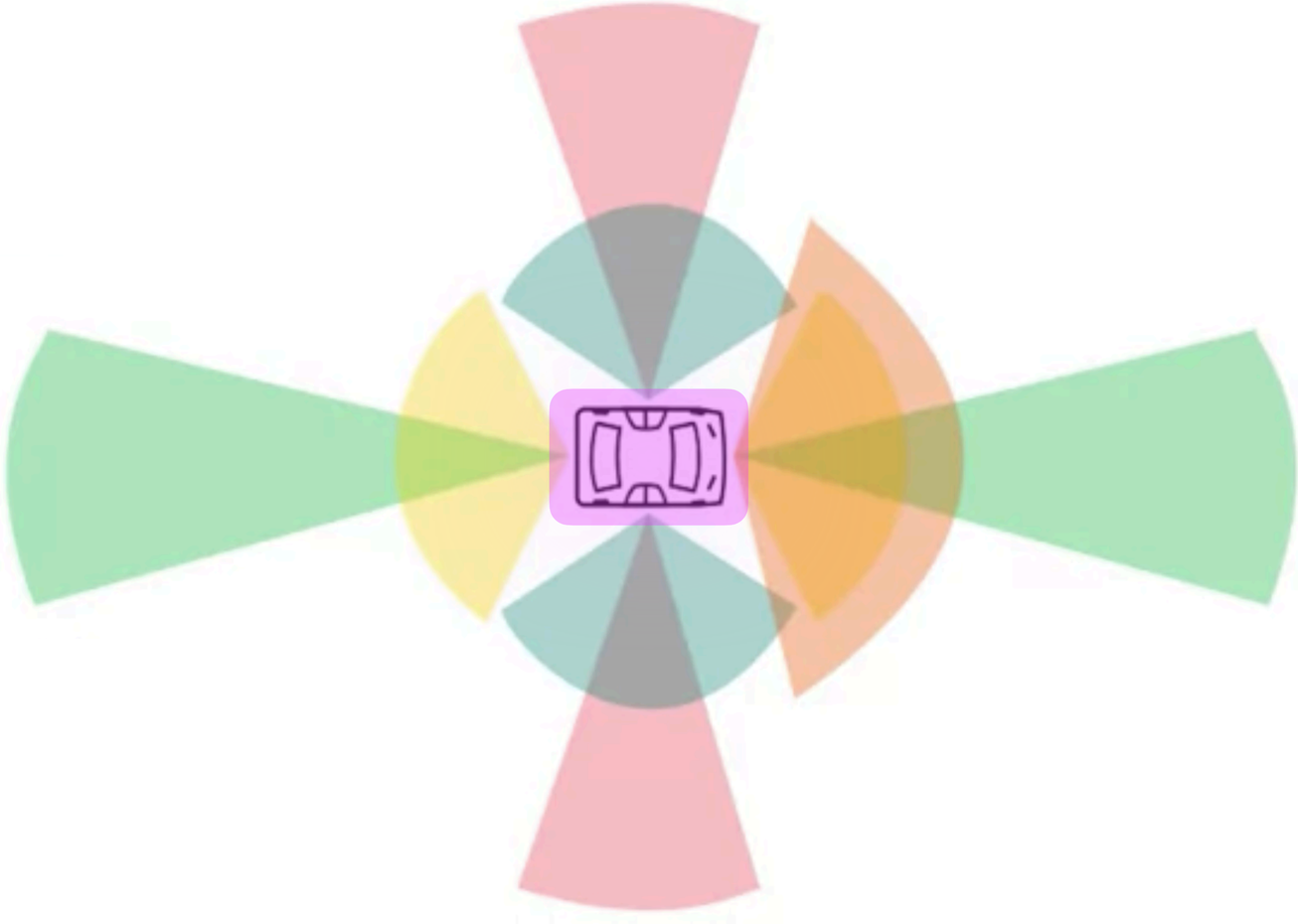
EXAMPLE : **Urban scenario**

1. overtake parked car
2. intersections
3. roundabouts
4. parking



SENSOR SETUP

- LONGITUDINAL COVERAGE
- LATERAL COVERAGE
- LONG RANGE
- SHORT RANGE
- NARROW FIELD-OF-VIEW
- WIDE FIELD-OF-VIEW



NEXT TOPICS

- HD MAPS
- GNSS / IMU / ODOMETRY
- SONAR (ULTRASONICS)
- RADAR
- LIDAR
- CAMERA
- INFORMATION PROCESSING