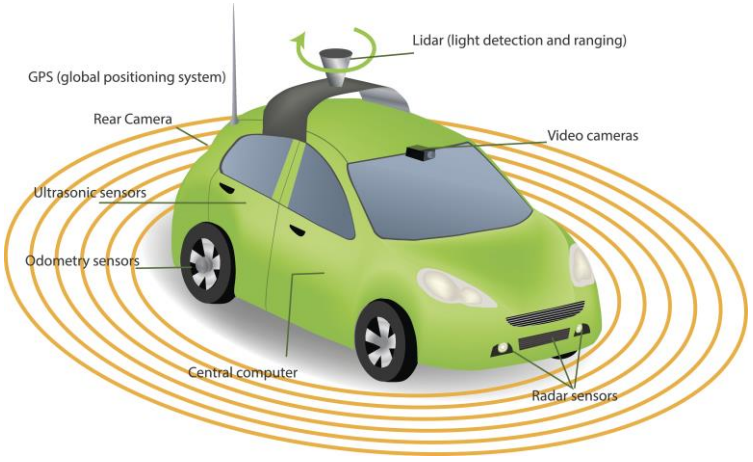
Sensors in Motion™



Autonomous Vehicles are Happening

For these systems to autonomously drive, fly and maneuver in the physical world, they need to determine the whereabouts of the objects around them.

Detection and Classification

In order to make accurate object avoidance decisions, autonomous vehicles need to understand not only the location of the objects around them are, but also what they are. This classification information is critical to establishing the probability of what each object will do next.

The Sensors in the Toolbox

There are a variety of sensor types in play including LiDAR, Radar, cameras and ultrasonic sensors. Each of these has respective strengths and weaknesses - no one sensor can do everything well. Factors like weather, range, resolution and cost weigh in. For that reason, the automotive industry is using sensor suites and data fusion to get the best possible composite sensor "view" at a practical cost point.

So The Sensor Problem is Solved, Right?

Not exactly. Autonomous vehicles are not ready for prime time in the public eye. Part of the reason is the maturity of electronic decision making. And part is that none of the sensors can deliver the fidelity required in demanding environments.

For example, highway driving in large vehicles requires about 500m of range for smooth lane change decisions in congested traffic. This is beyond current sensor capability. Complex traffic scenarios involving congested traffic, cyclists, pedestrians and poor weather requires extremely detailed sensors for accurate classification. Sensors need to improve to succeed in these challenging situations.

Designing a Better Sensor

All types of sensors are limited by:	
• **Signal to Noise**	• **Temperature Variation**
• **Power Consumption**	• **Digital Sample Rate**

These factors are mainly determined by analog electronics. InventionShare's Sensors in Motion™ technology portfolio offers state of the art analog design solutions. Sensors designed with these technologies will deliver a range of benefits.

Measurement	Improvement
Signal-to-Noise	**10 to 20 dB**
Temperature variation	**Linear performance over military spec**
Speed	**Analog operating at digital CMOS speeds**
Power consumption	**1/100 to 1/1000**

An Example, Ultra-Low Noise Radar

The current state of the art for radar is called 4D which can sense 3-dimensional positioning plus velocity using a technique called micro-Doppler. The subtle nuances in the radar signals also carry information required for more detailed classification. But those nuances become obscured by inherent electronic noise in the radar receiver. Reduce the noise, and the subtleties in the signals become recoverable. More sensitive micro-Doppler can detect subtle movements such as pedals on a bicycle and limb and torso movement on pedestrians. This would be 5D. And extremely sensitive radar is believed to be capable of sensing the type of materials on objects. This would be 6D.

Nextgen Sensor Projects

InventionShare is seeking development and investment partners for 6D sensor projects. Leveraging the Sensors in Motion™ technology portfolio to upgrade existing sensor designs to 6D to build nextgen sensors. These 6D sensors will be ultra-sensitive, low power, temperature invariant and very high speed. Ideal for addressing the massive automotive and drone markets.

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