We use sensors to become aware of the vehicle’s location and pass on the necessary information to the control systems.

Here are some of the commonly used sensors for autonomous vehicle technology:

**LIDAR:**

LiDAR is a remote sensing technology that is used for measuring distances. It works on the principle of time of flight (TOF) by sending out a pulsed laser of light and measuring the time it takes for the pulse to be reflected back.

Advantages:

* High precision and accuracy
* It is a high speed sensor as it uses light to sense the environment

Disadvantages:

* It is very expensive
* Low availability
* Inability to measure distance through rain, fog and snow

Uses:

* Land surveying
* Mining
* Power-line inspection

**RADAR:**

Radar is a technology that uses radio waves to measure the distance, angle and velocity of objects. It works on the principle of electromagnetic radiation that can be used in multiple frequency bands. Radar systems designed to provide cruise control functions as well as collision detection are commonly found.

Advantages:

* Less expensive
* Readily available
* Capable of detecting relative motion
* Can penetrate mediums such as rain, fog and snow

Disadvantages:

* It cannot resolve multiple targets
* It cannot differentiate between colour of objects
* It cannot resolve objects obstructed by conducting material
* Not very accurate

Uses:

* Tracking aircrafts and ships
* Measure the speed of automobiles

**CAMERA:**

Advantages:

* Able to see colours and textures(for road signs, traffic lights, etc.)
* Low cost
* High availability

Disadvantages:

* Sensitive to low light
* Affected by adverse weather conditions

Uses:

* Fundamental for autonomous navigation

**ULTRASONIC:**

An Ultrasonic sensor is a device that uses sound waves to measure the distance to an object.

Advantages:

* Cheap.
* Robust in adverse weather conditions.
* Accurate for close proximity applications.

Disadvantages;

* Heavily affected by disturbance in sound waves.
* Heavily affected by environmental changes.

Uses:

* Parking sensors.
* Used to measure liquid levels in beverage industry.

**GPS:**

It is a satellite based radio navigation system.

Advantages:

* Easily available
* Widely used

Disadvantages:

* There are many factors which lower positioning accuracy
* Requires a direct line of sight with satellites.

**IMU:**

It can measure a body's force, angular rate and magnetic field.

Advantages:

* Can accurately describe the motion of a body.

Disadvantages:

* Gives no information about location of vehicle.

Uses:

* Commonly used in smartphones
* Used for controlling autonomous systems

**SENSOR FUSION:**

Sensor Fusion involves the fusing of multiple sensors data to increase the vehicles perception and create a more reliable and accurate system.By combining the information from all of the sensors, a higher quality output can be achieved. The aim is to fuse the best features of different sensors for better output.

Some commonly used sensor fusions are:

* LiDAR/Radar
* GPS-IMU
* Camera – LiDAR