



# Understanding Autonomy *(Autonomous Car)*



# INTRODUCTION

- *Driver error is the most common cause of traffic accidents*
- *India contributes 6 % of the world's road accident deaths*
- *Cell phones in-car ,entertainment systems, more traffic and more complicated road systems making it more frequent*



# What is a driverless car ?

- It is a vehicle that can drive itself from one point to another without assistance from a driver; in other words, with an autopilot system.*





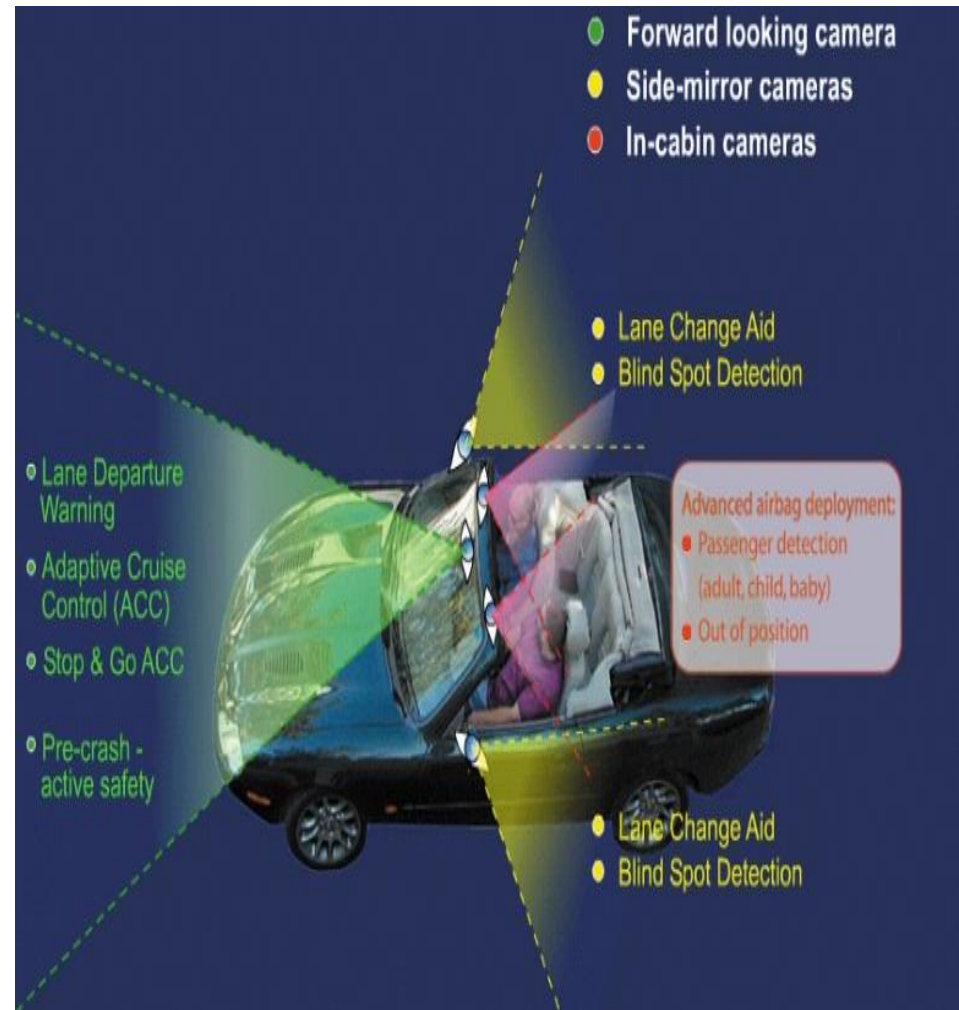
## How will the car detect the traffic lights ?

- A sensor “actinometer” is used to detect the intensity of radiation
- Light of different colors will radiate different intensity of radiation
- If the detected intensity is of red colour or yellow colour then controller will send a command to stop the vehicle .
- The command will be followed by robot (to convert the computer command into mechanical input)



# *The Autonomy*

- *Anti-lock brakes(ABS)*
- *Electronic stability control (ESC)*
- *Cruise control*
- *Lane Departure Warning System*
- *Self Parking*
- *Automated Guided Vehicle Systems*

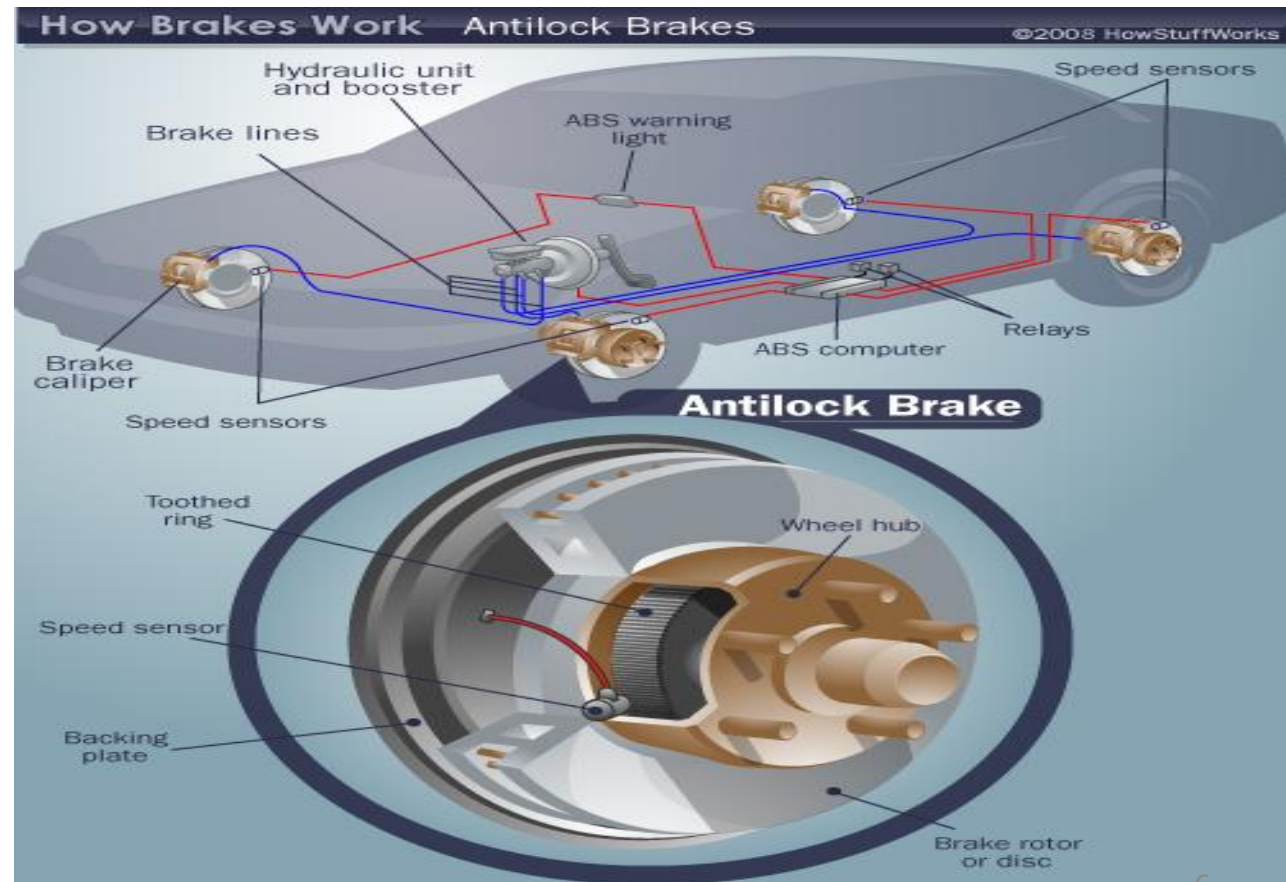






# Anti-lock brakes System (ABS)

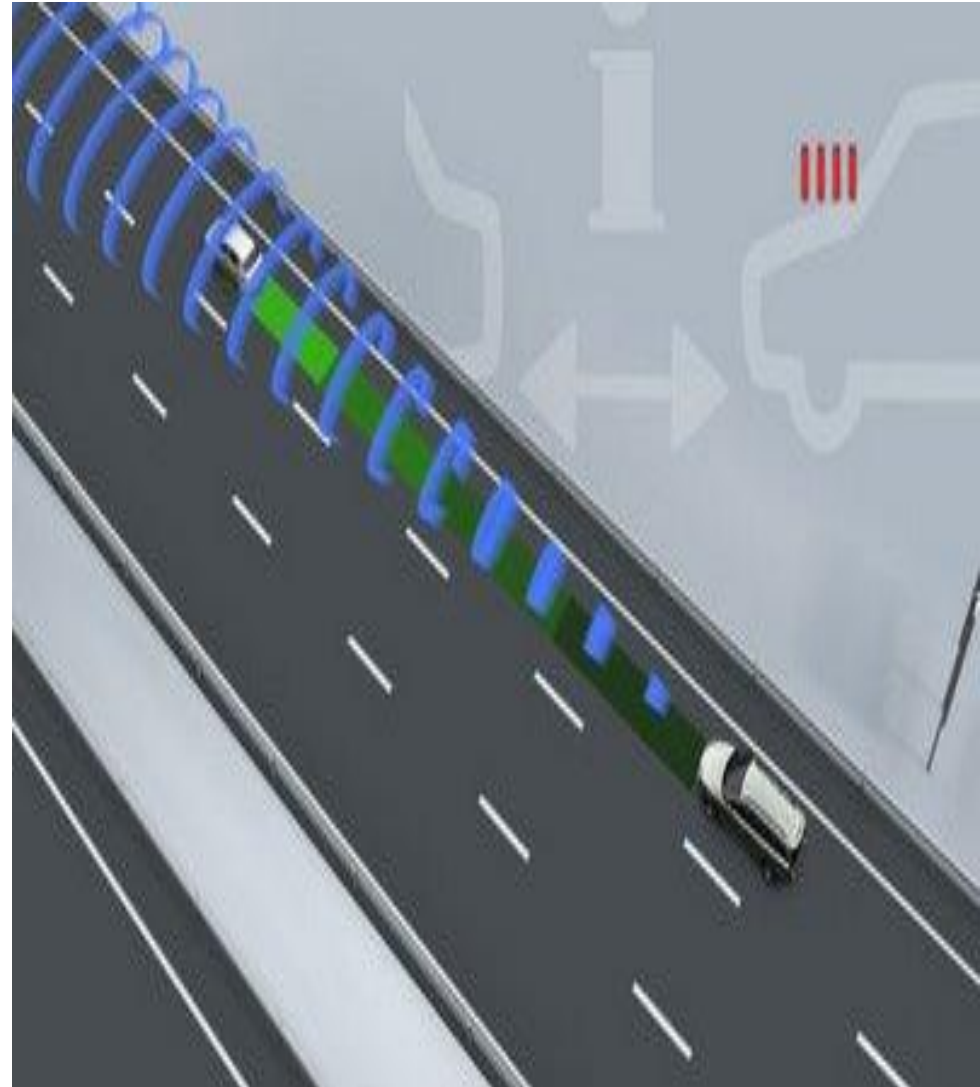
- An ABS generally offers improved vehicle control and decreases stopping distances on dry and slippery surfaces for many drivers.





# Automatic Braking

- *Senses an imminent distance with another vehicle or a velocity related danger.*
- *Responds by either precharging the brakes or by applying the brakes to slow the vehicle without any driver input.*
- *Detects by radar, video, infrared, ultrasonic, GPS sensors.*
- *Introduced by Toyota.*





# Electronic Stability Control (ESC)

- A computerized technology improves vehicle's stability by *detecting and minimizing skids*.
- *Automatically applies the brakes.*
- *Helps to minimize a loss of control.*
- *ESC compares the driver's intended direction to the vehicle's actual direction*

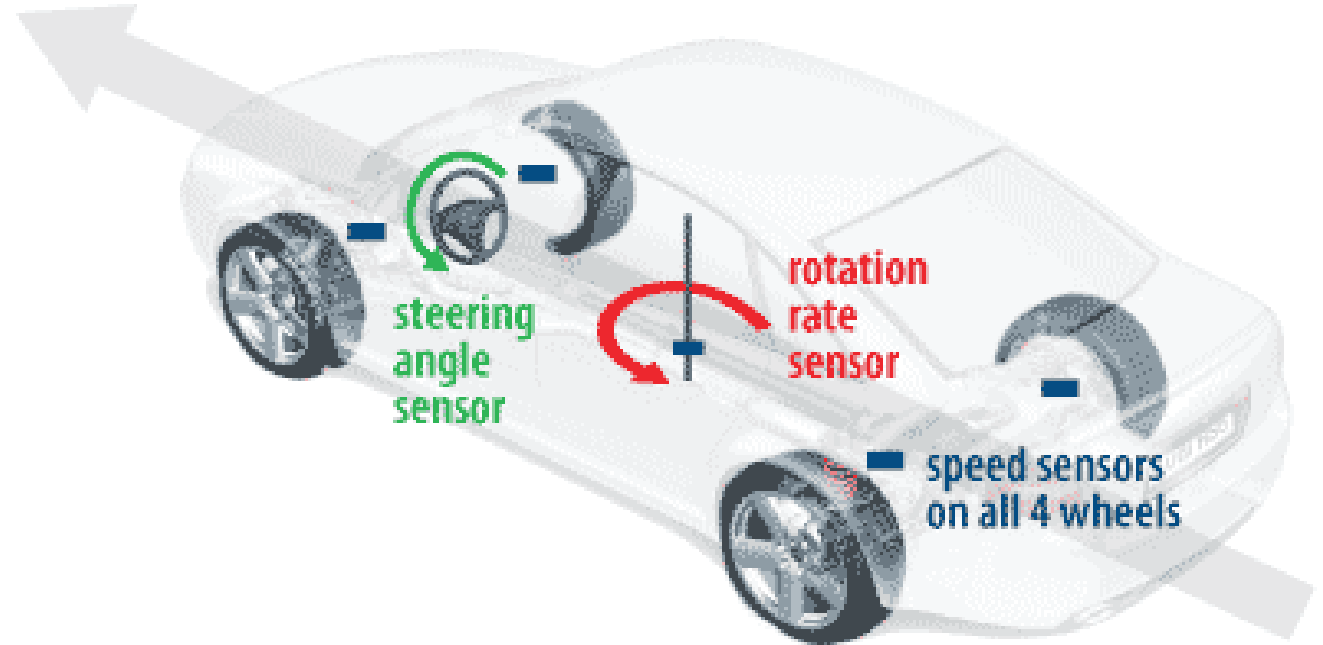






# Components

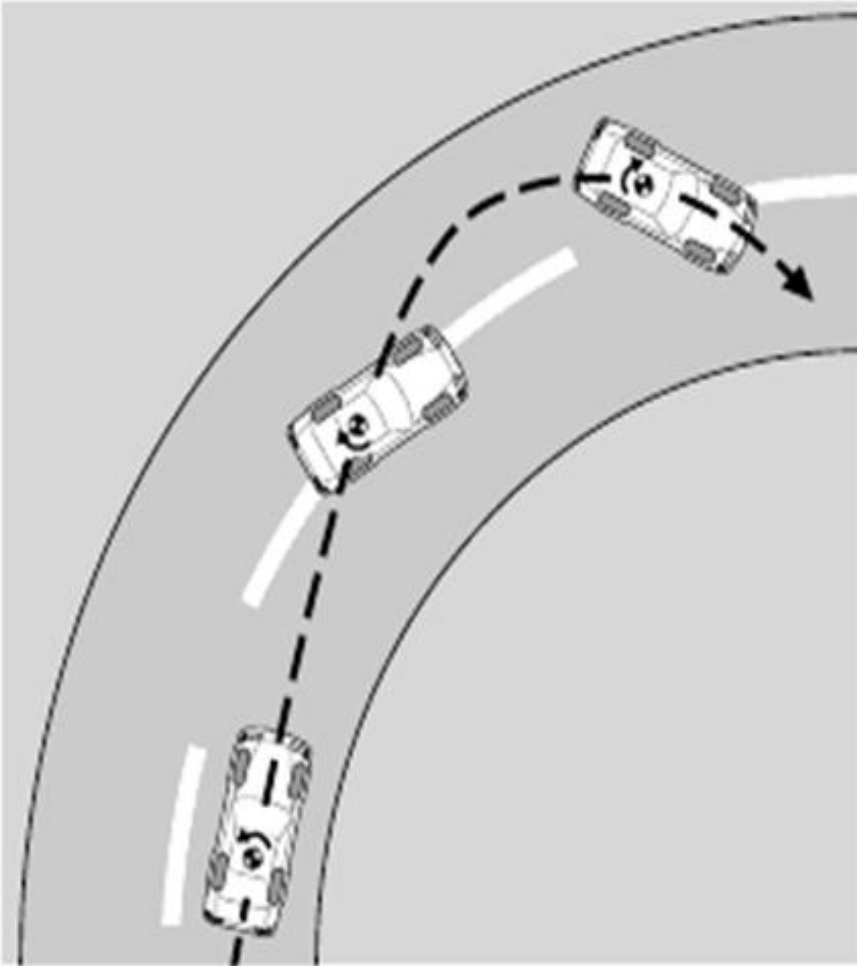
- ✓ *Wheel-speed sensors*
- ✓ *Steering-angle sensors*
- ✓ *Rotational-speed sensor*



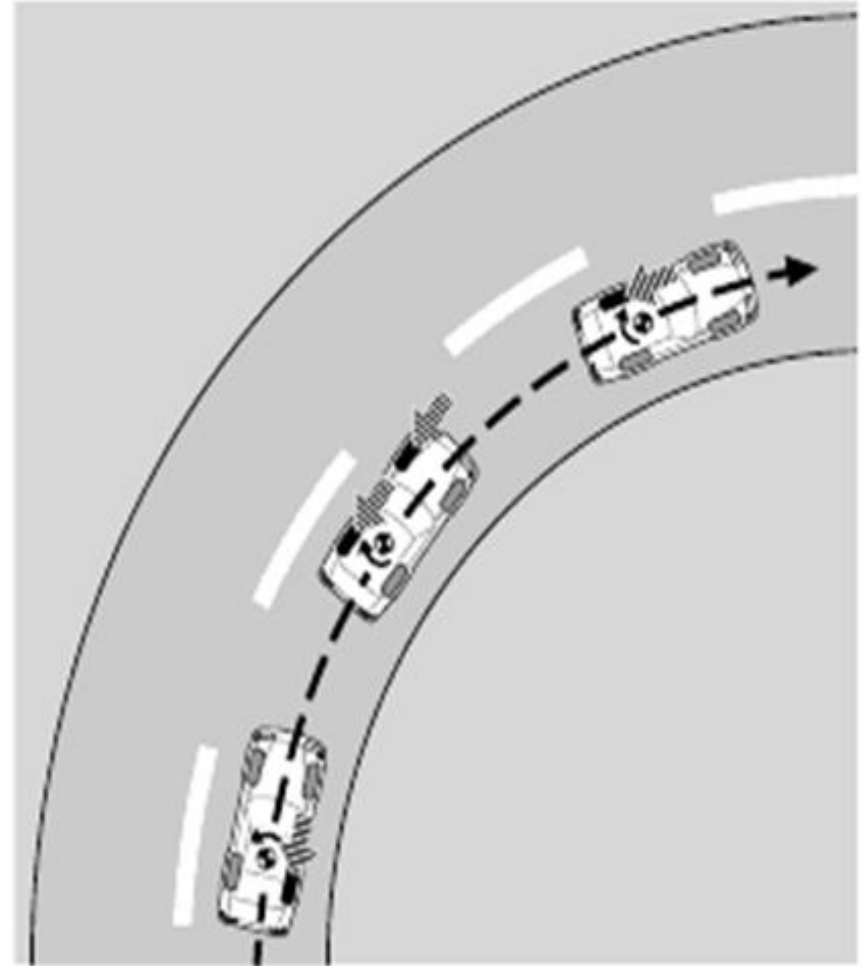


# Electronic Stability Control

1 Vehicle without ESC



2 Vehicle with ESC





# Cruise control

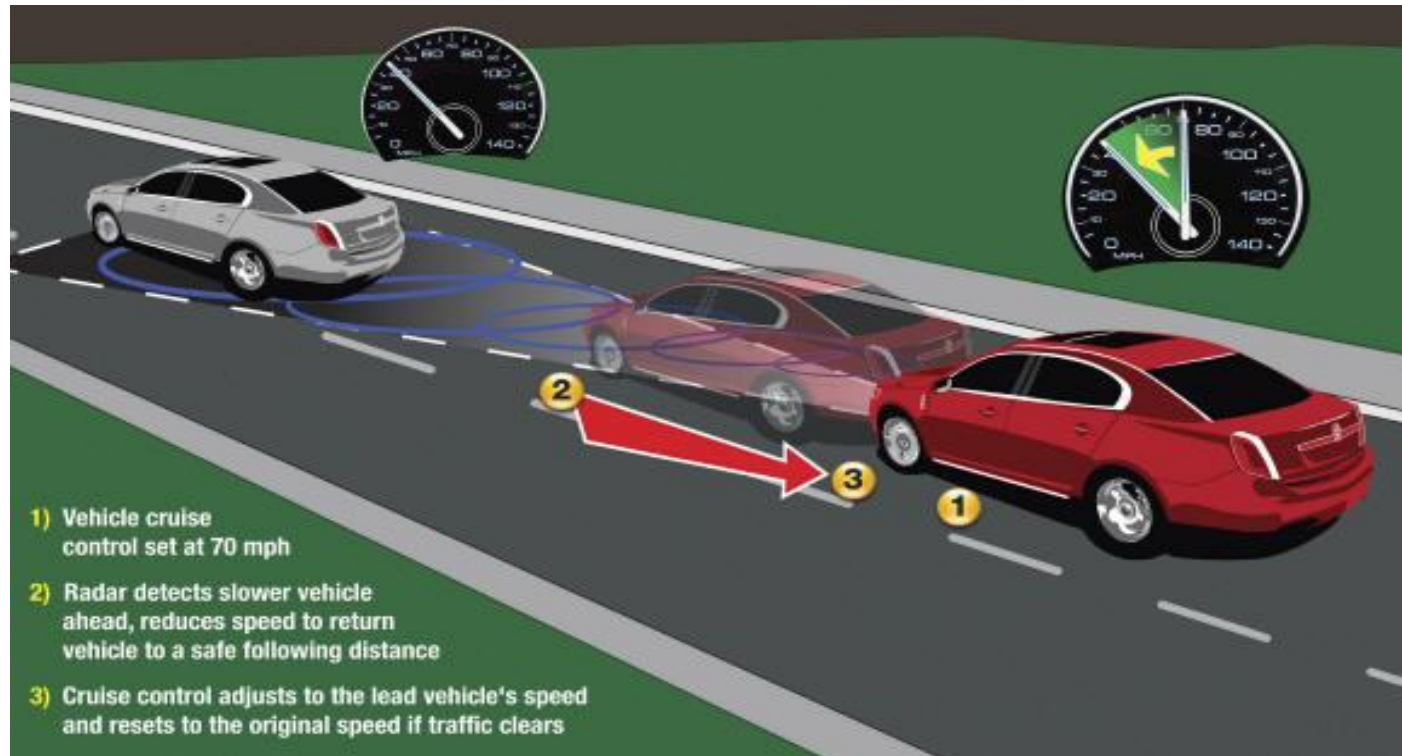


- Cruise control *keeps the car at a constant speed* by taking over the throttle of the car
- It also *maintain a set distance* between it and the car in front of it



# Autonomous Cruise Control

- Uses either a *radar* setup allowing the vehicle to slow when approaching another vehicle and accelerate again to the preset speed when traffic allows





# Automotive Night Vision

- Increases a vehicle driver's perception and seeing distance in darkness or poor weather beyond the reach of the vehicle's headlights.*







## Cars currently using A.N.V.

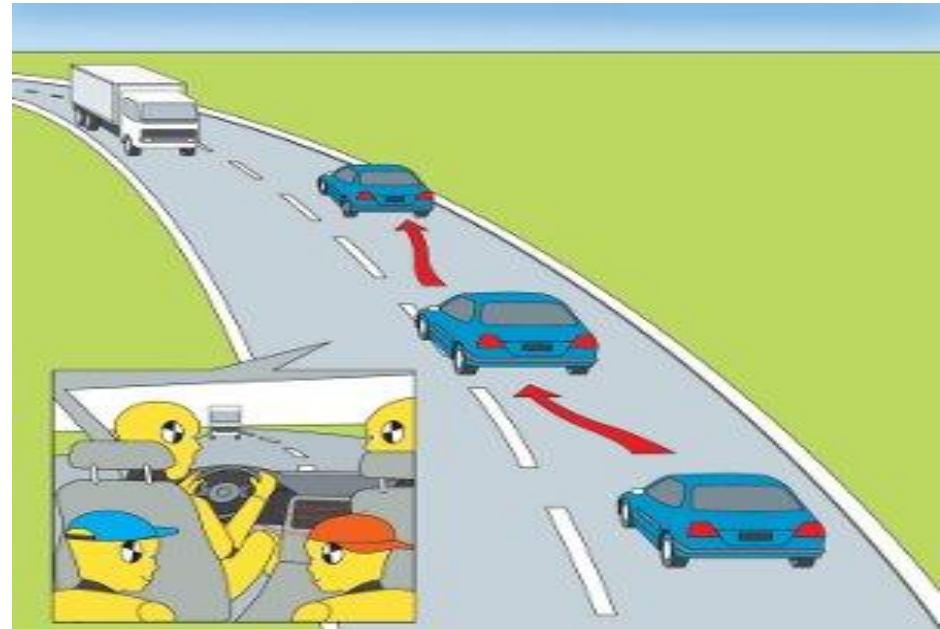
*Active systems use an infrared light source*

- *2002-2007 Lexus LX 470*
- *2009 Lexus LS*
- *2006 Mercedes CL-class*
- *2009 Mercedes E-class*
- *2005 Mercedes S-class*
- *2009 Mercedes S-class*
- *2008 Toyota Crown Hybrid*
- *2002 Toyota Land cruiser Cignus*



# Lane Departure Warning System

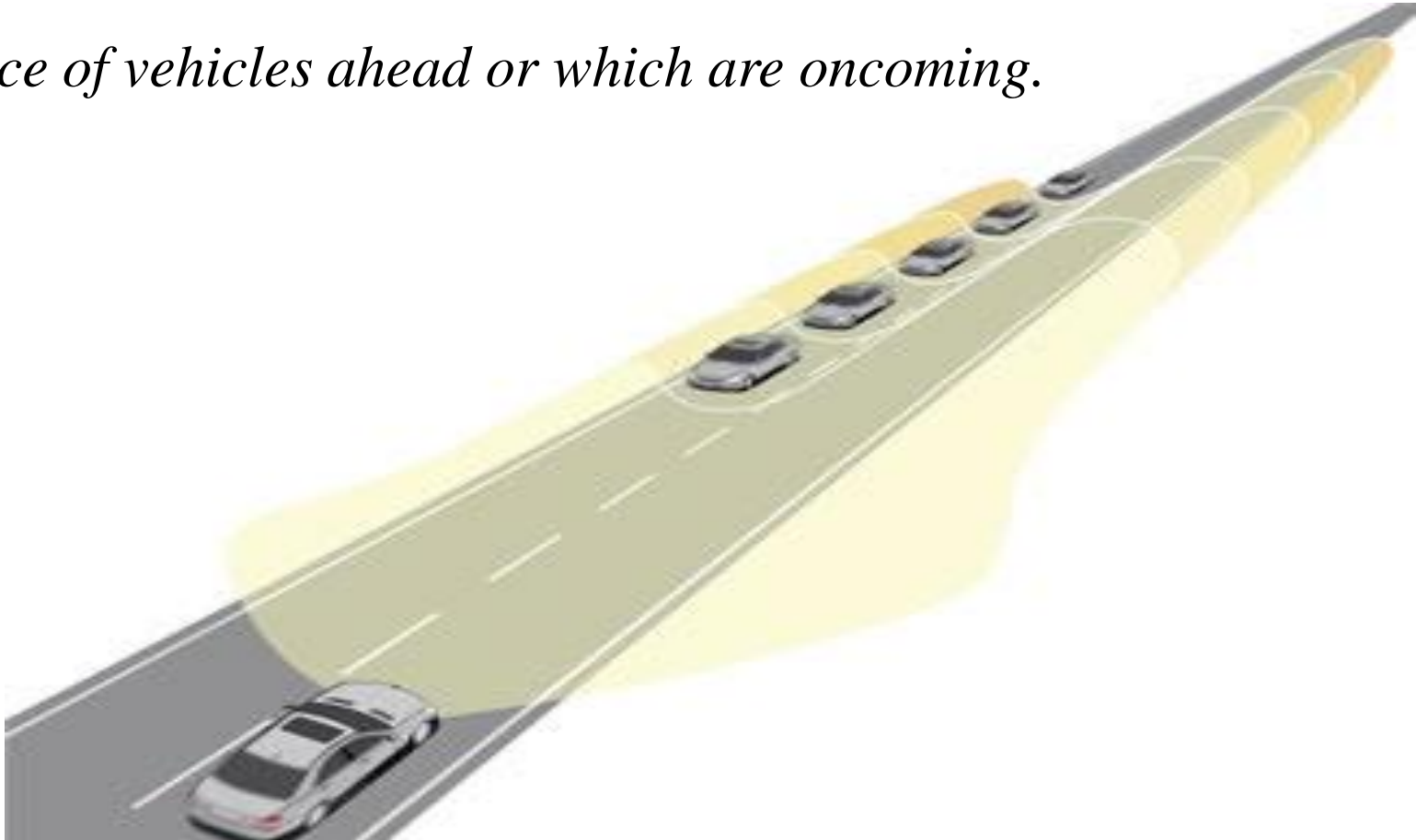
- *A mechanism designed to warn a driver when the vehicle begins to move out of its lane*
- *Designed to minimize accidents by addressing the main causes of collisions: driving error, distraction and drowsiness.*





# Adaptive Highbeam

- *Automatically and continuously adapts the headlamp range to the distance of vehicles ahead or which are oncoming.*





## Contd...

- *The range of the beam can vary between **65 and 300 meters**, depending on traffic conditions.*
- *2011 Audi A8*
- *2010 E-Class*
- *2010 S-Class*





# Self-parking Cars

- *System uses sensors all around the car to guide it into a **parallel parking space***
- *Lexus LS 460 L with Advance Parking Guidance System*
- *The driver has to find a parking space,*
- *Position the car next to it, and use the in-cabin navigation screen to tell the car where it should go.*
- *The parking space needs to be **6 feet (1.8 meters)** longer than the car*



# How Driverless Cars Work

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# Backup Camera & Parking Sensors

- *Special type of video camera attached to the rear of a vehicle to aid in backing up.*
- *Parking sensors are proximity detectors which can alert the driver to unseen obstacles during parking.*

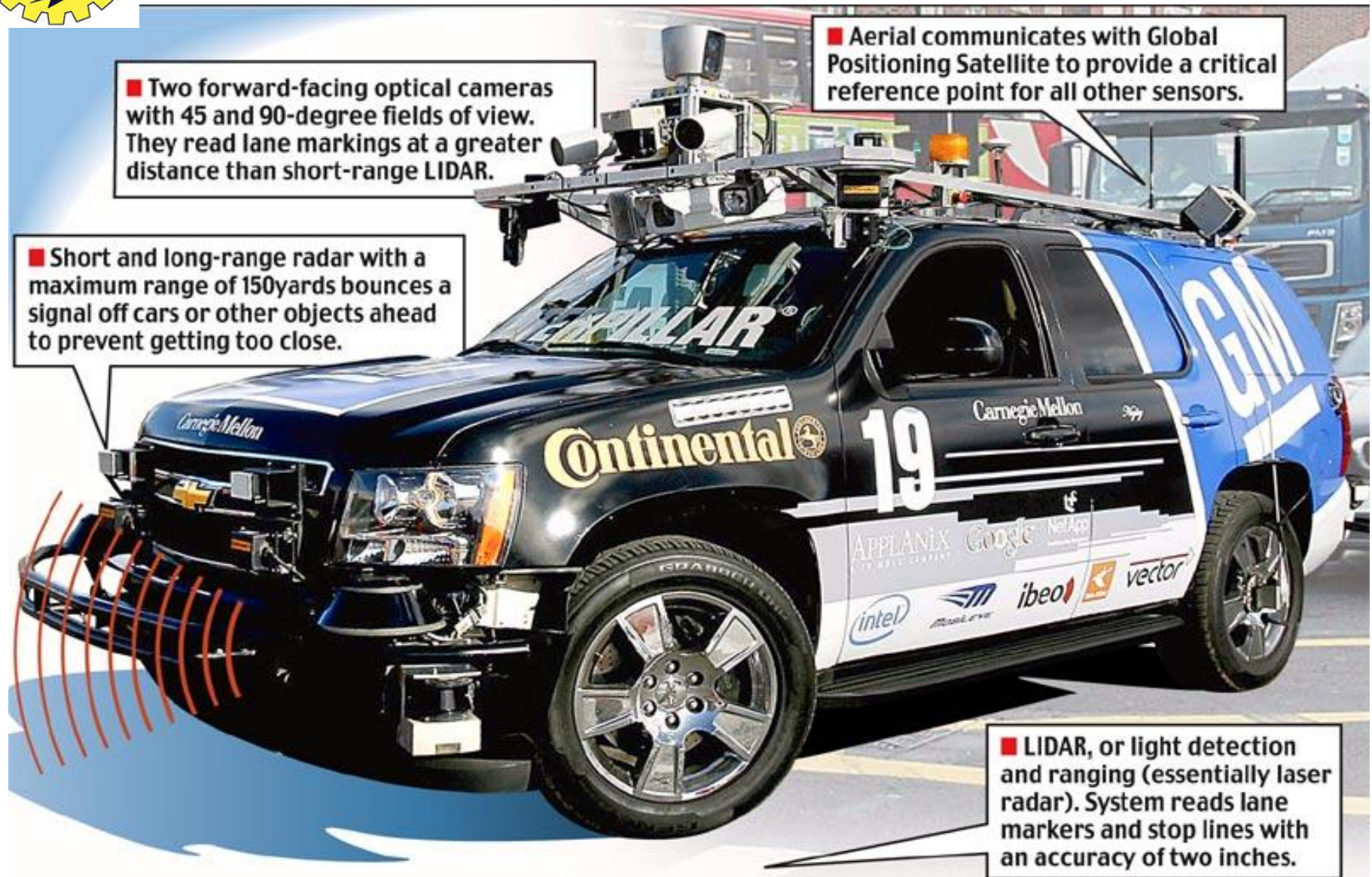




# Control of vehicle

- *Functions of the underlying engine, gearbox etc. are no longer directly controlled by the driver by mechanical means.*
- *It is controlled via a computer, which receives instructions from the driver as inputs and delivers the desired effect by means of electronic throttle control.*

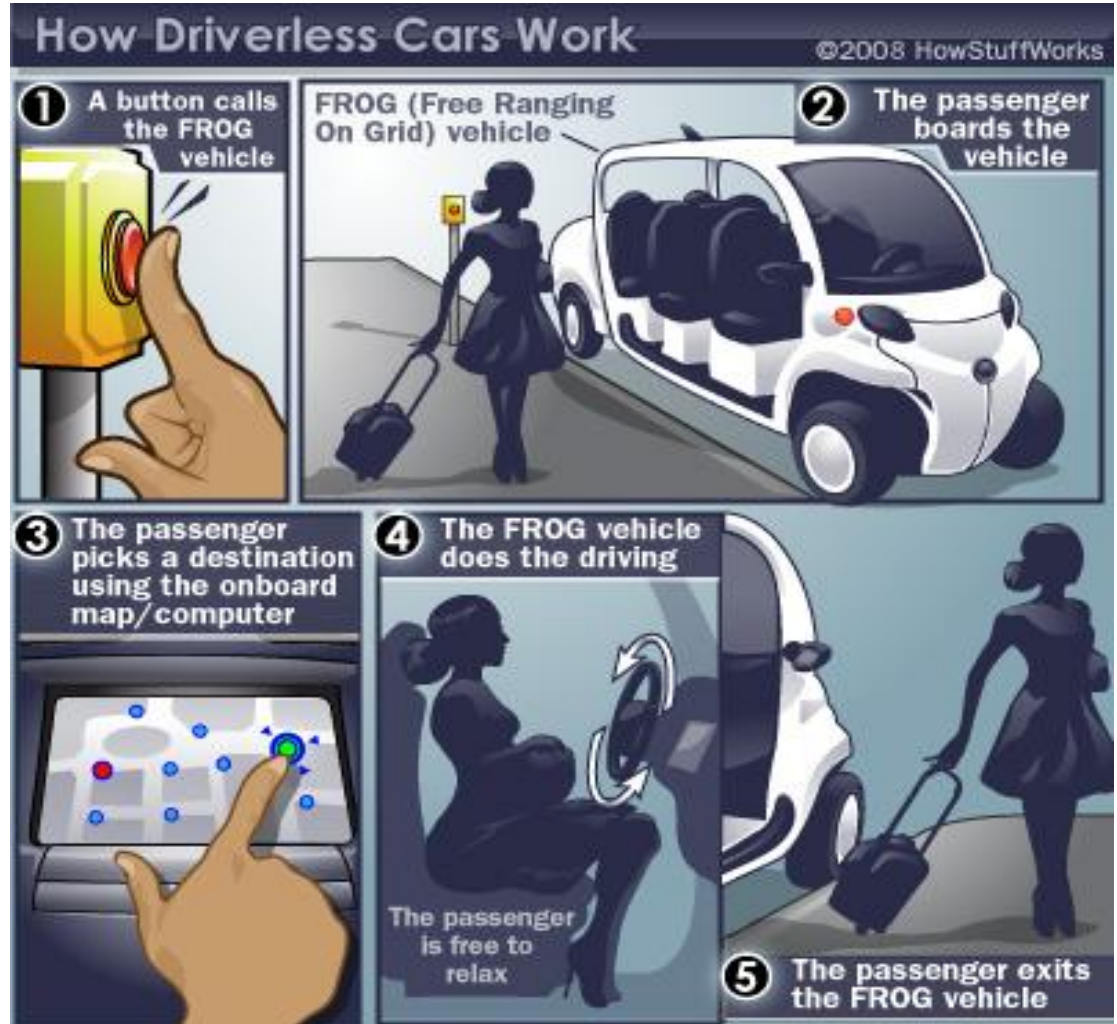






# Automated Guided Vehicle Systems

- Uses **FROG** (Free Ranging On Grid) technology
- FROG vehicles are equipped with a computer that contains a map of the area







## Advantages

- Managing traffic flow to increase road capacity.
- Relieving vehicle occupants from driving allowing them to concentrate on other tasks or to rest during their journeys.
- To avoid accidents .
- Increasing roadway capacity by reducing the distances between cars.
- The current location of vehicle can be determine using global positioning system (G.P.S) .



## Disadvantages

- *If the vehicle is using internet which is have less security then  
From the hackers point of view in some cases the vehicle can  
be switched off on the road(in rare cases)*
- *Hackers can change the route which is plotted in the system(in  
rare cases)*
- *failure of main sensor and backup sensors the vehicle can  
create a chance of accident.*



## Conclusion

- *Improves vehicle's stability helps to minimize loss of control.*
- *Minimize accidents by addressing the main causes of collisions: driving error, distraction and drowsiness.*



# References

- [http://en.wikipedia.org/wiki/driverless car](http://en.wikipedia.org/wiki/driverless_car)
- <http://autocontrols.com.au/>
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stability control





Thank you