UNIT - 1

INTRODUCTION

AUTONOMOUS CARS:

An autonomous car can be defined as a car which is able to perceive its environment, decide what route to take to its destination, and drive it.

*Understanding Autonomy:

→ Remaining technological barriers to achieving such a revolution are lower than many may realise, but this doesn't mean that entirely self-driving cars are expected to become common place on roads in the short, or even medium-term future.

→ Obstacles remain for full implementation of completely autonomous cars, such as adequate regulation, achieving reliable safety standards, and public resistance to handing over personal safety and responsibility to the vehicle.

"Drive by wire"

- Modern cars contain a large number of ECUs [Electronic Control Unit] which control everything from a car's engine to onboard entertainment system.

- Some of the assisted driving functions controlled by ECUs are

* Satellite Navigation
* Cruise Control
* Anti-Lock Braking System
* Automatically activated safety mechanism

were already mandatory / commonly used in passenger cars since 2007.

* Review of the role of Control in autonomy

Levels of Autonomy	Existing Examples
* Driver only - The vehicle is entirely under human control but may have some automated systems	→ Cruise Control → Electronic stability Control → Anti-lock brakes.
* Driver assistance - The steering and/or acceleration are automated but driver must control other functions.	→ Adaptive Cruise control: - distance to car in front maintained. → Parking Assistant: - steering is automated drivers controls accelerator and brakes.

Levels of Autonomy	Existing Examples.
* Partial Autonomy - The driver doesn't control steering or acceleration, but is expected to be attentive at all times and take back control instantaneously when required	→ Adaptive cruise control with lane keeping. → Traffic jam assistance
* High Autonomy - Vehicles are able to operate autonomously for some portions of journey. - Transfer of control back to human drivers happens with some warning.	→ Prototype Vehicles.
* Full autonomy - Vehicle is capable of driving unaided for the entire journey with no human- - intervention - potentially without a human in the car.	→ None.

* Speed Control [Cruise Control]

- Sometimes known as speed control / Auto cruise.

Cruise Control is a system that automatically controls the speed of a motor vehicle.

The Cruise Control system is a servomechanism that takes over the throttle of the car to maintain a steady speed as set by the driver.

Operation:

⇒ The cruise control takes its speed signal from a rotating drive shaft, Speedometer cable, Wheel speed sensor from the engine's RPM, or from internal speed pulses produced electronically by the vehicle.

⇒ Most systems do not allow the use of cruise control below a certain speed - typically around 25 mph (40 km/h).

⇒ The vehicle will maintain the desired speed by pulling the throttle cable with a solenoid, a vaccum driven servo mechanism or by using the electronic systems built into the vehicle (fully electronic) if it uses a drive by wire system.

⇒ All cruise control systems must be capable of being turned off both explicitly and automatically when the driver depresses the brake, and often also the clutch.

⇒ When the cruise control is engaged, the throttle can still be used to accelerate the car, but once pedal is released the car will slow down until it reaches the set speed.

⇒ On the latest vehicles fitted with electronic throttle control, cruise control can be easily integrated into the vehicle's Engine Management System.

⇒ The cruise control systems of some vehicles incorporate a Speed limiter function, which will not allow the vehicle to accelerate beyond a pre-set maximum - this can usually be overridden by fully depressing the accelerator pedal. (Most systems will prevent the vehicle accelerating beyond the chosen speed, but will not apply the brakes in the event of overspeeding downhill).

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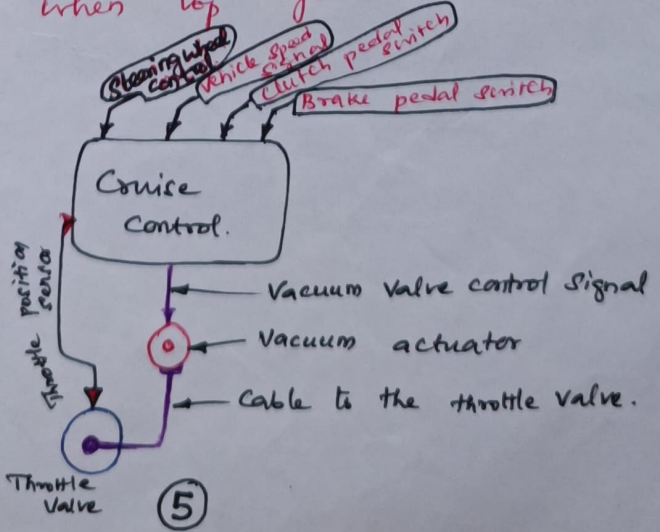
- Vehicles with a manual transmission, cruise control is less flexible because the act of depressing the clutch pedal and shifting gears usually disengages the cruise control."

- "Resume" feature has to be used each time after selecting the new gear & releasing the clutch.

* Therefore Speed control (cruise control) is of most benefit at highway speeds when top gear is used virtually all the time.



Suspension Control:

Suspension:

Suspension is the term given to the system of components, springs, shock absorbers and linkages that connects a vehicle to the road surface via the wheels & tyres.