## EVOLUTION OF AUTOMOTIVE ELECTRONICS

Electronics have been relatively slow in coming to the automobile primarily because of the relationship between the added cost and the benefits. Historically, the first electronics (other than radio) were introduced into the commercial automobile during the late 1950s and early 1960s. However, these features were not well received by customers, so they were discontinued from production automobiles. Two major events occurred during the 1970s that started the trend toward the use of modern electronics in the automobile:

(2) the introduction of government regulations for exhaust emissions and fuel economy, which required better control of the engine than was possible with the methods being used; and

(3) the development of relatively low cost per function solid-state digital electronics that could be used for engine control and other applications.

**Trends in automotive systems**

| | **CAR Technology** | **TRAFFIC** | **DRIVER SKILLS** |
|---|---|---|---|
| > 1891 | mechanical system | very low | very high technical skills |
| > 1920 | + pneumatic systems<br>+ hydraulic systems | low | high technical skillslow driving skills |
| > 1950 | + electric systems | increasing | good technical skills increasing driving skills |
| > 1980 | + electronic systems<br>+ optronic systems | Congestion starts | low technical skillshigh driving skills |
| > 2010 | + micro-electronics<br>+ biotronic systems | Congested optimizatio nstarts | very low technical skillsdecreasing driving skills |
| > 2040 | + robotics<br>+ nanotechnology | maximal and optimized | no technical skillsno driving |

| | | | |
|---|---|---|---|
| | | | skills |

**Why is advancement in automotive systems important?**

- The century-old automobile – the preferred mode for personal mobility throughout the developed world – is rapidly becoming a complex electromechanical system. (Google – "Autotronics").
- Technologies are being added to automobiles to improve operational safety, reduce congestion and energy consumption, and minimize environmental impact.
- There is a huge demand for safer, smarter & energy-efficient transportation system.
- Automotive electronics plays a crucial role for realization of these mechatronic systems. Examples include hybrid powertrains, electronic engine and transmission, controls, cruise control, antilock brakes, differential braking, and active/semi-active, suspensions.

**Timeline of automotive electronics**

This evolution (some might say "revolution") of automotive electronics also is enabled by recent advances in relevant technologies, including solid-state electronics, computer technology, and control theory.

| **Year** | **Examples of automotive electronics available** |
|---|---|
| 1965 | Solid-state radio, alternator rectifier |
| 1970 | Speed control |
| 1975 | Electronic ignition, digital clock |
| 1980 | Electronic voltage regulator, electronic engine controller, electronic instrument cluster, electronic fuel injection |
| 1985 | Clock integrated with radio, audio graphic equalizer, electronic air suspension |
| 1990 | Antilock brakes. integrated engine and speed control, cellular phones, power doors andwindows |
| 1995 | Navigation systems. advanced entertainment / information systems, active suspensions |
| 2000 | Collision avoidance, autonomous cruise control, vehicle stability enhancement, CVT |
| 2005 | Hybrid electric vehicles. driver monitoring. drive-by-wire, integrated vehicle controls |
| 2010 | Driver-assist systems (e.g.. automated parallel parking). integrated telematics (i.e..location-aware vehicles via mobile devices), plug-in hybrid electric vehicles |

## APPLICATIONS:

Electronics are being used now in the automobile and probably will be used even more in the future. Some of the present and potential applications for electronics are

1. Electronic engine control for minimizing exhaust emissions and maximizing fuel economy
2. Instrumentation for measuring vehicle performance parameters and for diagnosis of on-board system malfunctions
3. Driveline control
4. Vehicle motion control
5. Safety and convenience
6. Entertainment/communication/navigation

The various systems are given below

**1. Autotronic braking system/Electronic braking system**

The braking system in such a system is denoted s EBS (electronic braking system). A braking system is defined by its stopping distance. The system with shortest stopping distance is considered the best braking system. So, the development phase in the braking system is to minimize the stopping distanceof vehicle but without compromising the safety.

The ECB solve these purposes with an advance control system. The anti-lock braking system and traction control system are the essential components of ECB.ABS is responsible for maneuver control by deciding the braking pressure and wheel rotation control. Traction means providing movement or acceleration to a vehicle. So, to control the acceleration, the control on traction system should be applied. This system controls the movement of wheel and its steadiness.

**2. Control of steering system**

In the vehicle the power steering system is used. Which maintains the communication between pressure applied by steering system on the hydraulic pump and the speed of the automobile.

The EPS (electric power steering) uses sensors and motors, which controls the manoeuvre. Motor controls the steering motions and sensors gives signalto the wheels by analysing the speed and torque.

**3. Suspension system**

Suspension system makes the ride on vehicle shock free, comfortable and safe. There are three types of suspension system 1. Passive, 2. Semi active, and 3. Active suspension system.

The important task of the system is to dissipate the heat produced in the system due to friction. The conventional method of suspension is called passive suspension and when we add electronic sensors and hydraulic system then its performance increases and it is called active suspension system.

**4. Transmission control**

The transmission of gearing system controls the shifting of gears. Using the electronic gear transmission improves the shifting operation and increases the fuel efficiency by reducing the losses.

**5. Electronic control of fuel intake in engine**

The electronic system used to analyze the amount of fuel to supply to the cylinder of engine so that the maximum efficiency can be achieved with minimum loss of energy.