



ROLE OF EMBEDDED SYSTEMS IN AUTOMOBILE INDUSTRY

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Abstract

We know that automobile industries mainly manufacture cars, bikes, buses, etc. In India, if we look back into the past two decades, only rich people have their own cars but now there are a lot of automobile users which are increasing rapidly in the country due to there being many automobile industries available. But in the present situation, ordinary people are also showing a lot of interest in buying automobiles due to the fact that embedded systems' role in automobiles has increased. In 1968, Volkswagen invented the application of an embedded system in the automobile. The embedded systems used in automobiles mainly include security, audio systems, and ignition. So, this can make the car safer, energy- efficient, and network savvy. An embedded system plays a key role in automobiles due to its flexibility as well as versatility. The electronics revolution has controlled the design of automobiles like fuel ignition, protection from power train crashes, etc. An embedded system used in automobiles can assist in pollution control, system monitoring, etc.

Introduction

Electronic innovation has made extraordinary steps and these days the nature of electronic parts—execution, power, and unwavering quality—empowers utilizing them notwithstanding basic frameworks. In the meantime, the diminishing expense of electronic innovation permits them to be utilized to support any function in a car. In automotive systems more and more equipment is being changed from the mechanical systems to electronic systems. Embedded system is the heart of a vehicle's electronic system because of its versatility and flexibility. The revolution of electronics has manipulated automotive design including the fuel combustion, power train crash protection, etc. Advanced usage of embedded systems in vehicles can help in controlling the pollution, increasing the facility to provide systems monitoring features that consumers demand. An embedded system is a combination of hardware and software which creates a dedicated computer system that performs specific, predefined tasks and which is generally encapsulated within the device it controls. Every year, automobile manufacturers worldwide pack new embedded systems into their vehicles. Tiny processors under the hood and in the deep recesses of the car gather and exchange information to control, optimize, and monitor many of the functions that just a few years ago were purely mechanical. A typical vehicle today contains an average of 25-35 microcontrollers

with some luxury vehicles containing up to 70 microcontrollers per vehicle. Flash-based microcontrollers are continuing to replace relays, switches, and traditional mechanical functions with higher-reliability components while eliminating the cost and weight of copper wire. Today, a typical automobile on the road has computer controlled electronic systems, and the most commonly used embedded systems in a vehicle include airbags, anti-lock braking system, black box, adaptive cruise control, drive by wire, satellite radio, telematics, emission control, traction control, automatic parking, in- vehicle entertainment systems, night vision, heads up display, back up collision sensors, navigational systems, tyre pressure monitor, climate control, etc.

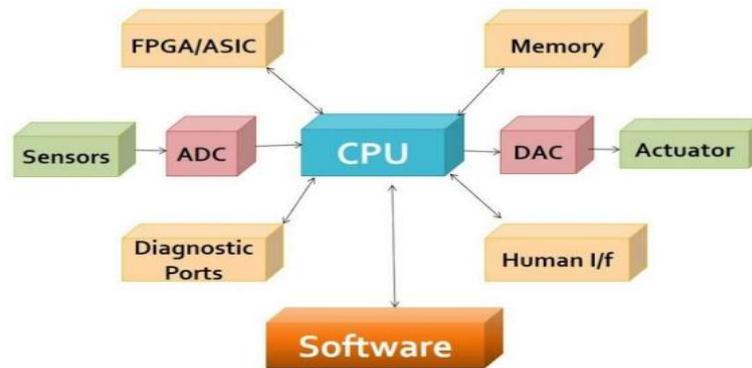
What are embedded systems?

Any sort of device which includes a programmable computer but itself is not intended to be a general-purpose computer an embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations. Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed. An embedded

system application ranges from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems. An embedded system plays a key role in automobiles due to its flexibility as well as versatility. The electronics revolution has controlled within the design of automobiles like the fuel ignition, protection of power train crash, etc. An embedded system used in automobiles can assist in pollution control, system monitoring, etc.

How an embedded system works?

Block diagram



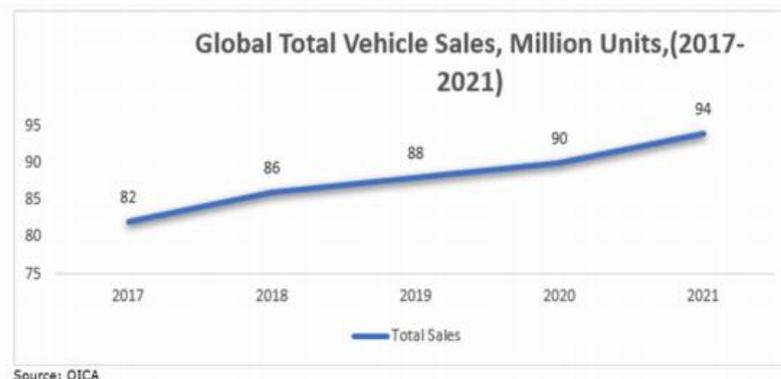
Embedded systems are managed by microcontrollers or digital signal processors (dsp), application-specific integrated circuits (asic), field-programmable gate arrays (fpga), gpu technology, and gate arrays. These processing systems are integrated with components dedicated to handling electric and/or mechanical interfacing. Embedded systems programming instructions, referred to as firmware, are stored in read-only memory or flash memory chips, running with limited computer hardware resources. Embedded systems connect with the outside world through peripherals, linking input and output devices.

Major investments

1. The german automaker volkswagen is planning to enlarge production
2. Capacity and introduce a new model. To set up a diesel engine manufacturing facility, the group is planning to invest around rs. 1500 crores over the next five years.
3. To buy the germany's kuepper group of companies, amtek auto has signed an agreement of rs 16.78 billion.
4. Infosys has signed a contract with the volvo cars to provide application development services.
5. Piaggio vehicles is planning to assemble its super bikes locally and to sell.

Impact of embedded systems on the Automobile market

Growing vehicles sales: An extensive range of industries are involved in the designing, development and selling automobiles. Every year the sales and production of vehicles are increasing globally due to growing demand of consumers. Every vehicle manufactured is equipped with embedded system, this will drive the **global automotive embedded system market**.



As per techsci research, “global automotive embedded system market by vehicle type

(passenger cars, lcv and hcv), by type (embedded hardware and embedded software),

by component (sensors, microcontrollers, transceivers and memory devices), by region, by company, competition, forecast & opportunities, 2025”, global automotive embedded system market is projected to grow over 7% cagr for the forecast period. Rising focus on vehicle safety features and increasing demand from consumers for electric vehicles as well as strict emission standards are the contributing factors strengthening the market growth. Based on the application, the market has been segmented into infotainment & telematics, body electronics, safety & security, and powertrain & chassis control. Due to the rising demand for safety features such as anti-lock. Braking systems (abs) in the vehicles, the market for safety and security applications is expected to grow at the highest rate in the forecast period.

Impact of covid-19 on global automotive embedded systems market

recent covid- 19 outbreak across the world which has been declared as pandemic by world health organization has affected several countries adversely. Leading authorities across various economies-imposed lockdown restrictions and released a set of precautionary measures to contain the spread of novel coronavirus. Manufacturing units were temporarily shut down which led to disruption in supply chain and adversely affected the manufacturing process, delivery schedules and sales of products in global market. Automotive embedded systems market is expected to be negatively impacted due to travel bans, delay in product deliveries and product launches.

Increasing focus on vehicle safety features

The demand for safety features in vehicles has been incorporated by different companies based on the requirement by the end user and further motivated by the regulations imposed the regulatory bodies. During recent years, the number of traffic fatalities has come down throughout the developed economies. These number are becoming stagnant and the whole credit goes to widespread use of safety systems. To include safety feature in the vehicles, oems are focusing on technological advancements which includes many sensors and advanced technical systems in the vehicle. To inbuilt all the sensor and technical features in vehicle the need of embedded system arises. These technological advancements are further fuelling the global automotive embedded system market. Major example of active safety system could be recognised as pedestrian recognition, adaptive

speed control, blind spot detection, lateral collision warning, cooperative lane changing indication, merging assistance, car breakdown warning, integrated car safety, etc. These features are anticipated to minimize the accident and accident-related deaths. This is one of the major reasons for the growth in the demand for embedded system market globally.

Increasing demand of automation

As the demand for safety and security of drivers and passengers along the roadside is increasing, the demand for connected car devices is also soaring globally. The connected car devices are also considered helpful in analysing accidents and breakdown data to provide valuable inputs both to car makers and road infrastructure designer and designer. Moreover, projects such as galileo, egnos, european emergency call in europe, brazil’s siniav & simrav, russia’s era glonass united states’ dynamic speed harmonization (spd- harm), queue warning (q-warn), cooperative adaptive cruise control (cacc), etc. Will be enhancing the demand for connected car devices across the globe. The increasing demand for connected car will drive the automotive embedded system market globally due to increasing demand for sensors and engineering systems in the vehicles.

Advantages

1. Increasing focus on vehicle safety features.
2. Growing vehicles sales.
3. Better demand of automation.
4. They are easy to manage.
5. Fast performance.
6. They are smaller in size

Limitations

1. Increasing focus on vehicle safety features.
2. Growing vehicles sales.
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future scope

1. The future scope in the system would be india, china is well on their way towards large scale implementation of modern embedded systems in automotive and consumer electronics industries. The demand for embedded systems in the automotive industry is expected to take up 18.3% of the market value by 2021
2. Cars today are now electromechanical machines, instead of being just mechanical machines. It is good to have an electrical background for the future. It is clear that manufacturers are working on removing the driver from car.

conclusion

The continuously expanding automobile sector needs some major breakthrough technologies in order to cope with the demands and expectations of its customers. Modern cars need to be best in all sectors like performance, handling, ride & comfort, entertainment and safety in order to appeal to the masses. And the only available option to achieve this is the use of embedded systems. Embedded systems were introduced to the world of automobiles in the year 1968 when the volkswagen 1600 used a microprocessor in its fuel injection system. In 1978, cadillac seville used a microprocessor chip, a modified 6802, that drove the car's "trip computer," a flashy dashboard bauble that displayed mileage and other real time information. As time went by, the role of embedded system increased immensely and started expanding its applications in every area of the automotive universe. New cars now frequently carry 200 pounds of electronics and more than a mile of wiring. Processors and their peripherals have squeezed into the side- and rear-view mirrors, wheel rims, headliner, gas tank, seat cushions, headrests, bumpers, and every other crevice of a modern car. Amongst current examples, the present bmw 7 series and mercedes s-class boast about 100 processors each. A relatively low-profile hatchback also has 50 to 60 baby processors on board. Looking further in the future, these trends seem to continue. Google has already produced a fully automatic driverless car which can drive without any interference from the driver. Cyber cars or driverless cars need to know the state of the whole vehicle to control the vehicle in an optimal way. This can only happen when there is central software. In the far future, there might be a trend towards communication between cars and between cars and road infrastructure. This will help in manipulating stop lights in order to overcome the problem of traffic. The exchange of data between different cars is via 'ad hoc' networks that are formed between vehicles over short distances. These wlan require no extra external infrastructure. Transmission occurs at a frequency of 5.9ghz over a distance of up to 500 meters. Of course, this distance is expanded if different cars are communicating with each other and messages are passed on. Therefore, in the coming decade, embedded systems will further spread its footprints in the automotive sector to provide comfort, convenience, performance and safety to the customers.

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