THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Analysis of Developing New Smart Systems in Automobile Transmissions

P. Sarath Babu
Assistant Professor, Department of Mechanical Engineering,
Vel Tech. Dr. RR & Dr. SR Technical University, Avadi, Chennai, India

Abstract:
We have technology now to design New Mechatronic Systems in automobiles. Mechatronic systems in automotive engineering, such as Automated Manual transmission, break and steering systems, automatic transmissions, suspension systems, and engine management distinguish themselves through complex Mechanic-Electronic-Computing interaction. These Mechatronic systems will work as small intelligent units capable of competing and/or co-operating with each other on specified tasks and making decisions under conditions of uncertainty through a process of negotiation. In highly dynamic environments, such distributed systems are capable of achieving considerably better results in terms of performance/cost ratio and reliability than conventional centralized large Systems and structures.

Keywords: *Automobile transmissions, intelligent mechatronic, electronics, HCS12 microcontroller*

1. Introduction

Through the years, there have been many efforts to improve the transmission for better fuel economy, drivability and other quality of vehicle operations. In a road vehicle, the functions of transmission are to match the running state of engine to the motion states of the vehicle. Among these studies, many were focused on modifying the transmission designs to keep the vehicle safe and controllable, and to make passengers more comfort introducing Mechatrinic Systems [1] in Automobile Transmissions.
Mechatronic is the engineering discipline concerned with the construction of systems incorporating mechanical, electrical and information technology components. Today, mechatronic is an area combining a large number of advanced techniques from engineering, in particular sensor and actuator technology, with computer science methods.

2. Transmission

The purpose of transmission system is to provide high torque at the time of starting, hill climbing, accelerating and pulling a load. The vehicle will have to face the resistances like wind resistance, gradient resistance and rolling resistance. The tractive effort is different at various speeds. The variation of total resistance to the vehicle motion should be equal to the tractive effort of the vehicle at any given speed.
In an automobile, there are three types of transmissions namely

- Manual
- Automatic
- Continuously variable

3. Manual Transmission

A manual transmission system is fundamentally a more efficient system because there is a complete mechanical linking of engine, gearing and wheels. The manual transmission is placed amid the drive shaft and the clutch, and designed to provide the torque necessary for the movement of the vehicle by transferring the power of the engine to the drive wheels. During the transmission of power, gears on shafts are meshed with each other. The driver shifts [2] the gears, with use of the gear stick.

4. Automatic Transmission

Automatics are less fuel-efficient by design - they don't maintain a continuous mechanical link between engine and wheels since the system always includes a fluid filled torque converter. A torque converter is a hydraulic fluid coupling between engine and gearing. Automatic transmission [3] is less fuel efficient than manual transmission primarily due to pumping losses in the torque converter and hydraulic actuators [4]. In addition, a hydraulic control system demands power from the engine. In the case of automatic transmission there is a mechanism that changes the gear ratio automatically. This means that the driver does not have to change the gear manually.

5. Continuously Variable Transmission

CVT (continuously variable transmission) is not well understood but offers fuel efficiency benefits over both manuals and automatics. This type of transmission is becoming more widespread because of its advantages. Like a manual system it has a direct mechanical link between engine, gearing and wheels. Unlike a manual system it requires no clutch, no gear changing but infinite gearing ratios. At the heart of the design is a single cone shaped gear replacing the various different cogs in a manual

gearbox. If the vehicle is traveling slowly the wider end of the cone is used and at fast speeds the smaller end is used. In effect the cone offers us an unlimited number of gears.

6. Mechatronics System

The name Mechatronics stems from mechanical engineering, computer science, control engineering and information technology and is a relatively new approach to product design and development, merging the principles of mechanical, electrical, computer and industrial engineering. Mechatronic systems are typically composed of traditional mechanical and electrical components but are referred to as "smart" devices or systems because of the incorporation of sensors, actuators and computer control systems. Over the years, the term "mechatronics" has come to mean the integrated methodology for designing products that exhibit fast, precise performance. A key factor for the design process involves integrating modern microelectronics and the engineering of software into mechanical and electromechanical systems. Mechatronic devices or "smart" devices have become common in our technologically advanced society. Mechatronic devices can be found in automobiles, medicine and surgery, agriculture, buildings, homes, the toy and entertainment industry.

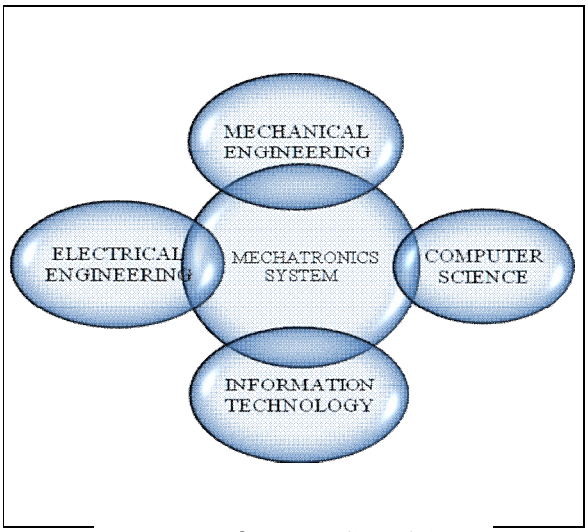

Figure 1: Mechatronics (Smart) System

7. Nead of Smart System in Automobiles

An automobile is any vehicle used for transportation that can move itself without being pushed by an external force such as an animal. Automobiles are also called cars. A vehicle needs a way to handle its rotary energy efficiently. It needs a way to transmit the engine generated power and to transmit it effectively. A car needs a drivetrain.

The heart of the drivetrain is the transmission. A transmission provides speed and torque conversion from a rotating power source to another device using gear ratios. The driver is responsible for coordinating the engine revolutions to the road speed required. If the transition between the gears is not timed correctly they clash, creating a loud grinding noise as the gear teeth collide. In order to overcome all these problems we propose our New Mechatronic System**.**

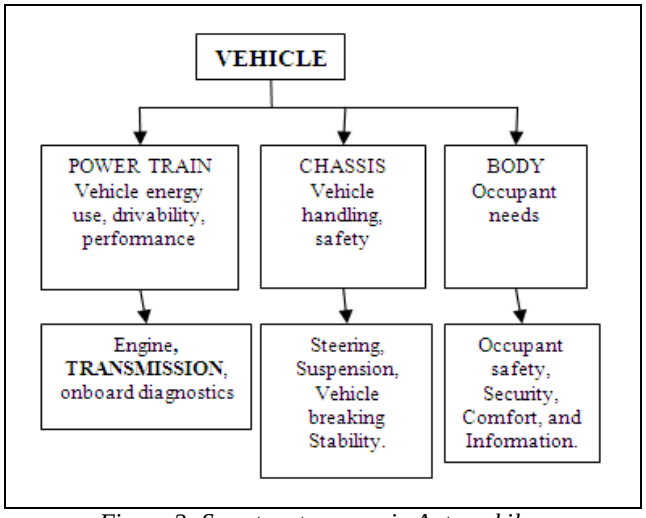

Figure 2: Smart system uses in Automobiles.

8. Marits of Smart System in Transmissions

1. Mechatronic System increases efficiency and opens up a whole new range of comfort and safety functions.
2. Smart systems in the internal combustion engine powertrain that allow controlling and improving its performance both in terms of energetic efficiency and mass reduction.
3. Mechatronic System increases Drives Safety, Convenience and Forced attention to the road.
4. With integration of smart systems in vehicle will respond intelligently when you accelerate.
5. Smart Systems will prevent the annoying slow-down on hills.
6. It increases Driver control on vehicle.

9. Smart System Flow Chart

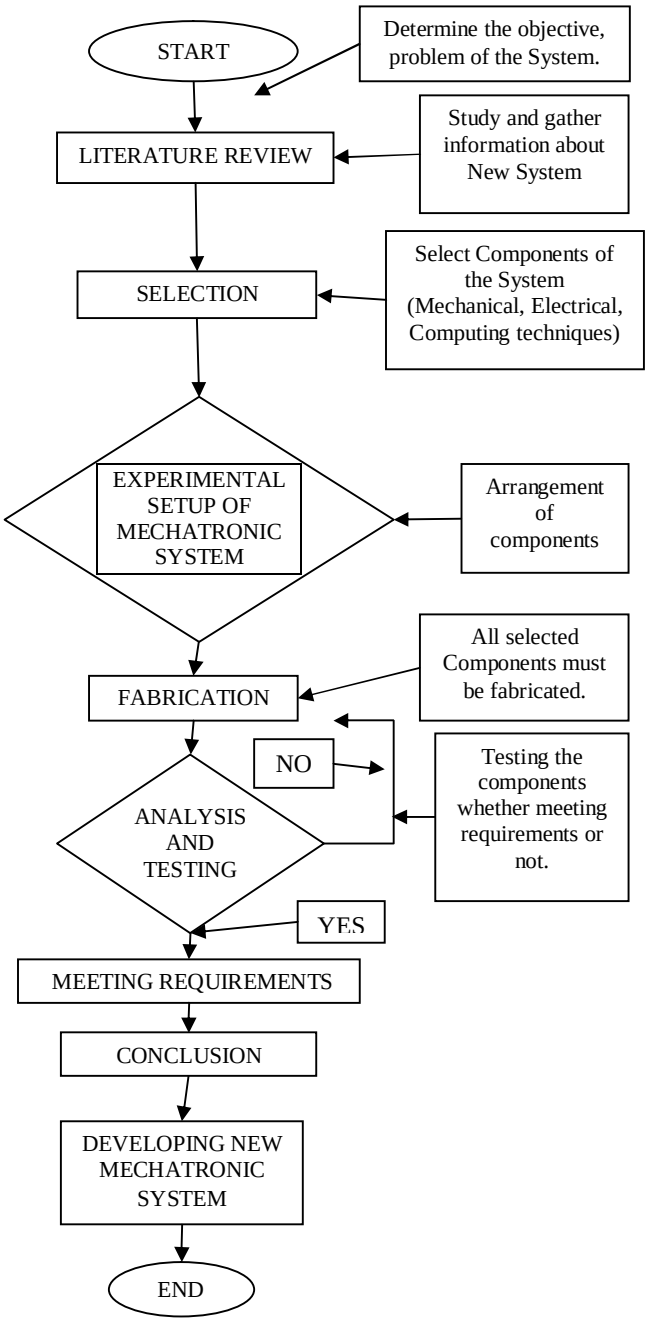

Figure 3: Flow Chart

10. Conclusion

In this article, I have sketched current and future trends in the how to develop new Mechatronic systems or Smart Systems in Automobile Transmission. In particular, I have discussed the challenges involved in the construction of future advanced Smart systems. The challenges arising from the collaboration of several different disciplines (which is already an issue today), and those due to the aspect of self-coordination which seems to be a main characteristic distinguishing current from future Smart Systems.

11. Acknowledgement

This work forms part of the Research and development activities of Dept of Mechanical Engineering, Vel Tech Dr RR & Dr SR Technical University, Avadi, Chennai-600062.

12. References

1. George Rzevski, Magenta Corporation Ltd, London EC3V 3ND, UK, "On Conceptual Design of Intelligent Mechatronic Systems'', Mechatronics 13 (2003) pp 1029 – 1044, Copyright 2003 Elsevier Ltd, Department of Information Systems and Computing, Brunel University, Uxbridge UB8 3PH, UK.
2. M. Tideman, M. C. van der Voort, and F. J. A. M. van Houten, June 14-17, 2004,"Design and Evaluation of a Virtual Gearshift Application", IEEE Intelligent Vehicles Symposium University of Parma, Parma, Italy.
3. Lu Xi, Xu Xiangyang, Liu Yanfang, 2009, "Simulation of Gear-shift Algorithm for Automatic Transmission Based on MATLAB", IEEE World Congress on Software Engineering, DOI 10.1109/WCSE.2009.198, 978-0-7695-3570-8/09.
4. Muntaser Momani, Mohammed Abuzalata, Igried Al-Khawaldeh and Hisham Al-M ujafet, 2010, "Pneumatic, PLC Controlled, Automotive Gear Shifting Mechanism" Maxwell Scientific Organization, Research Journal of Applied Sciences, Engineering and