POWER ASSISTED HYBRID GEAR SHIFTING SYSTEM IN AUTOMOBILES

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Abstract—**The project provides solution for gear shifting for the cars. The passenger cars that now ply on the road have transmission either of manual or automatic type of gear changing. The manual type of transmission is preferred for the perfect performance without a loss in power but a compromise for comfort. In this type automatic system of power transmission there is easiness of gear shifting.**

The main objective of this project is to create a mechanism to reduce the inconvenience caused when changing gears in the car. The gear shifting here is by mere pressing of touch screen present on the dash board.

In this project the shifting of gear is done automatically as well as manually.

In automatic shifting system the gear will be shifted in accordance with speed of the car. Speed of the car will be sensed and signal is transmitted to microcontroller which shifts gear to the desired speed, when the system is switches to manual control mode shifting mechanism can be controlled manually. For this a dash board with touch buttons will be provided on steering of car. When input is given to system it senses and transmit signal to microcontroller which shifts gear to the desired speed.

Key words—**hybrid gear shifting mechanism, manual and automatic gear shifting system, touch screen,**

I. INTRODUCTION

An automobile is a vehicle which is capable of propelling itself. Several attempts have been made to design and construction of a practically operative automobile. Nowadays automobiles play an inconceivable role in the social, economic and industrial development of the country.

1.1 Overview

The topic of interest is in the area of controller development for automatic transmissions with a finite number of gearshifts which transmits the gears automatically and manually with respect to speed. Gearshifts in automatic transmissions involve a change in the power flow path through the transmission. Advantages of these automatic transmissions include simplicity of mechanical design and savings in transmission weight and size, which are beneficial in terms of fuel economy and production costs. This enables gain in fuel economy while meeting drivability and performance goals, these savings become more significant.[1]

The designed automatic transmission is done in an auto-clutch featured bike which can be applied effectively and efficiently in a clutch featured bikes with suitable control techniques.

The ultimate goal of our project is to transmit the gears without the human interference and to attain efficient, safe and easy driving in cost effective way. Microcontroller is the heart of the system which handles all the sub devices connected across it.

1.2 Automation

Automation is the use of control system to control a process replacing the human operators.

It is a step beyond mechanization, where human operators are provided with the physical requirements of work.

Automation is now often applied primarily to reduce the human effort thereby to attain desired operation. Another major shift in automation is the increased emphasis on flexibility and convertibility in different process.[2]

One safety issue with automation is that it is often viewed as a way to minimize human error in the system, increasing the degree and the levels of automation also increase the sequence of error that accidently created in automated systems. Different types of automation tools that exist in today's environment are Programmable logic controller, Microcontroller and more.

1.3 Embedded System

All embedded system uses a microcontroller. The software for the embedded system is called firmware. The firmware will be written in assembly language or using higher level languages life 'C' or 'Embedded C'. The software will be simulated using micro code simulation for the target processor. Since they are supposed to perform only specific tasks, the programs are stored in ROM.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular function. An embedded system that is programmable is provided with programming interfaces, and embedded system programming is a specialized occupation.[3]

An Embedded system is a special-purpose computer system, which is completely encapsulated by the device controls. It has specific requirements and performs pre-defined tasks, unlike a general purpose personal computer.

1.4 Aim of the project

The project provides solution for gear shifting for the cars. The passenger cars that now ply on the road have transmission either of manual or automatic type of gear changing. The manual type of transmission is preferred for the perfect performance without a loss in power but a compromise for comfort. In this type automatic system of power transmission there is easiness of gear shifting

1.5 Objectives

The objectives of the project are transmission of gears in automobile using automatic gear shifting system and to create a mechanism which reduces the inconvenience caused during shifting of gears in the automobile.

- The gear shifting here is by mere pressing of touch screen provided on the dash board.
- To achieve automatic and manual gear shifting system in automobile
- To utilize advanced technology in the field of automobiles.

II. RELATED WORKS

Transmission system in an automobile helps to transmit mechanical power from the engine to give kinetic energy to the wheels. It is an interrelated system of gears, shafts, and other electrical gadgets that form a bridge to transfer power and energy from the engine to the wheels

2.1 Types of Transmission

- Manual transmission
- Automatic transmission

A. Manual Transmission

A manual transmission or sequential type is a type of transmission used on motorcycles and cars, where gears are selected in order, and direct access to specific gears is not possible.

With traditional manual transmissions, the driver can move from gear to gear, by moving the shifter to the appropriate position. A clutch must be disengaged before the new gear is selected, to disengage the running engine from the transmission, thus stopping all torque transfer.

B. Automatic Transmission

An automatic transmission is one type of motor vehicle transmission that can automatically change gear ratios as the vehicle moves, freeing the driver from having to shift gears manually and to achieve efficient driving.[4]

2.2 types of gear livers
Gear lever is a metal rod attached to the shift assembly in a manual transmission-equipped automobile and is used to change gear. In an automatic transmission-equipped vehicle, the same device is usually known as a gear selector.[5]

- gear sticks
- Dodge ram –gear stick
- Ditching shift levers-"rotary e-shift" design.
- peddles
- Starter in gear stick

III. POWER ASSISTED HYBRID GEAR SHIFTING SYSTEM

3.1 Hardware Components used for basic model
1. PIC16F877A microcontroller
2. touch
3. servo motor
4. Voltage controller board
5. variable resistors
6. 12v motor and rpm SENSOR
7. connecting rod /wires/wheel/reset switches
8. battery 12 v

3.2 Methodology and implementation
In the project there are two parts automatic and manual transmission systems for gear shifting in automobiles. Thus shifting of gear is done automatically as well as manually.
In automatic shifting system the gear will shifted in accordance with speed of the car. Speed of the car will be sensed and signal is transmitted to microcontroller which shifts gear to the desired speed, when the system is switches to manual control mode shifting mechanism can be controlled manually. For this a dash board with touch screen will be provided on steering of the car. When input is given to system it senses and transmit signal to microcontroller which shifts gear to the desired speed.[6]

There are two parts automatic and manual transmission systems for gear shifting in automobiles:
A. Manual gear shifting system by touch screen
B. Automatic gear shifting system
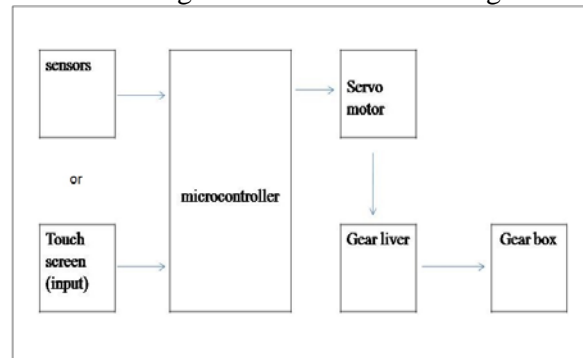The block diagram is as shown in the figure

Figure 1: Block Diagram of power assisted hybrid gear transmission in automobiles

The block diagram is as shown in the figure
- Sensor will give the input to the system by sensing speed of vehicle.
- Manually operator will give input to system in the form of signal.
- Microcontrollers are used to control the system automatically. It has relays, timers and counters. Some types have real time operation. It can be used for simple operations; it also a reliable and durable device.
- Microcontroller will receive the input from the sensor or from the touch screen and operates stepper motor.
- Motor moves the gear liver to desired position which is controlled by programmed microcontroller.

Thus embedded system operates gear shifting in automobiles.[7]
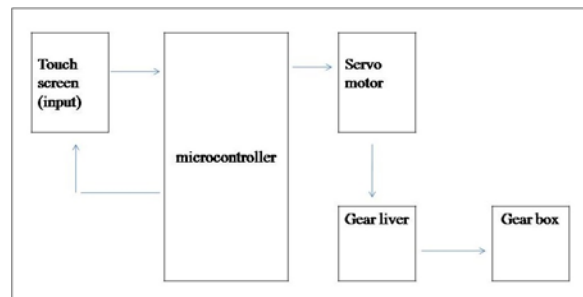*A. Manual gear shifting system by touch screen*

Figure 2: Block diagram of manual gears shifting system by touch screen

The above figure shows the block diagram of manual gear shifting system

- Touch screen gives the input to the microcontroller by applying clutch, without applying the clutch the touch screen will not provide input signal to the microcontroller.
- Microcontrollers are used to control the system automatically. It has relays, timers and counters. Some types have real time operation. It can be used for simple operations; it also a reliable and durable device.
- Microcontroller will receive the input from the touch screen and operates servo motors.
- Motor moves the gear liver to desired position which is controlled by programmed microcontroller.
  Thus by giving input from the touch screen provided in steering of the automobile, gear liver will be operated and gear shifting is achieved.

Note : if the automobile is at higher gear then shifting of gear to lower gear will possible after getting the feedback from the microcontroller and also possible by applying clutch.

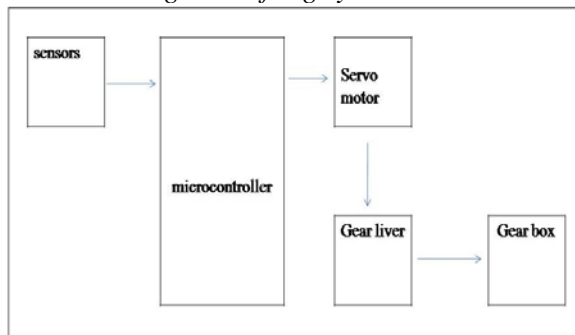*B. Automatic gear shifting system*

Figure 2: Block diagram of automatic gear shifting system

The figure 2 shows the block diagram of automatic gear shifting system

- Sensor will gives the input to the microcontroller by sensing wheel speed of automobile, sensor will provide input signal to the microcontroller.
- Microcontrollers are used to control the system automatically. It has relays, timers and counters. Some types have real time operation. It can be used for simple operations; it also a reliable and durable device.
- Microcontroller will receive the input from the sensor and operates servo motors.

- Motor moves the gear liver to desired position which is controlled by programmed microcontroller.
  Thus by giving input from the sensor provided in wheels of the automobile, gear liver will be operated and gear shifting is achieved.

IV. TESTING AND RESULT

All the components are fabricated according to detail design and after fabrication all the component are installed and tested to evaluate system functionality. Test showed that the system can be operating normally in a certain time. But for the maximum usage condition, an external power source must be attached to the system.

Working of power assisted hybrid gear transmission in automobiles.

- Connect the circuits to the board using desired pin configurations so that it will operate hybrid gear shifting system.
- Apply the power supply to the microcontroller circuit, reset it before processing.
- In automatic shifting system the gear will shifted in accordance with speed of the wheel.
- Speed of the car will be sensed and signal is transmitted to microcontroller which shifts gear to the desired speed.
- Once the system is switches to manual control mode shifting mechanism can be controlled manually.
- The dash board with touch screen will be provided on steering of the automobile. When input is given to system it senses and transmit signal to microcontroller which shifts gear to the desired speed.

V. CONCLUSION

Although an automatic transmission provides a superior driving comfort over a manual gear box, in particular in a very dense traffic or an urban driving, where frequent gear changes are required, the intrinsically automatic logic of an automatic transmission can affect the attitude of a vehicle in marginal conditions (for example during cornering or in slippery road conditions). Since the shifting is proportional to

the engine speed and accelerator input, the automatic transmission will tend to change gears even if not wanted by the driver. For example, when a vehicle with an automatic transmission descends downhill on a slippery road in a high gear without applying throttle whereby vehicle's engine moderately decelerates the descent, an unwanted down-shift will effectively increase the resistance on the vehicle's drive train eventually leading to a loss of the traction control over the vehicle

Automatic transmissions were earlier almost always less energy efficient than manual transmissions due mainly to viscous and pumping losses, both in the torque converter and the hydraulic actuators. A relatively small amount of energy is required to pressurize the hydraulic control system, which uses fluid pressure to determine the correct shifting patterns and operate the various automatic clutch mechanisms. However, with technological developments some modern continuously variable transmission are more fuel efficient than their manual counterparts.

Manual transmissions use a mechanical clutch to transmit torque, rather than a torque converter, thus avoiding the primary source of loss in an automatic transmission. Manual transmissions also avoid the power requirement of the hydraulic control system, by relying on the human muscle power of the vehicle operator to disengage the clutch and actuate the gear levers, and the mental power of the operator to make appropriate gear ratio selections. Thus the manual transmission requires very little engine power to function, with the main power consumption due to drag from the gear train being immersed in the lubricating oil of the gearbox.

The on-road acceleration of an automatic transmission can occasionally exceed that of an otherwise identical vehicle equipped with a manual transmission in turbocharged diesel applications. Turbo-boost is normally lost between gear changes in a manual whereas in an automatic the accelerator pedal can remain fully depressed. This however is still largely dependent upon the number and optimal spacing of gear ratios for each unit, and whether or not the elimination of spool down/accelerator lift off represent a significant

enough gain to counter the slightly higher power consumption of the automatic transmission itself.

According to the achieved results, the suggested mechanism is realizable and workable. Using the simplest PIC microcontroller and required hardware enables to convert the old traditional gear shifting mechanism to power assisted hybrid gear shifting system. The application of this mechanism leads to make the driving process easier, reduces the risk of destabilizing the car, the lap/stage time, and the chance of miss shifting.

ACKNOWLEDGMENT

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