

Voice Operated Electromagnetic Gear Shifting Mechanism

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ABSTRACT: Without an efficient transmission system the idea of an efficient vehicle is incomplete. During running of the vehicle especially in case of heavy vehicles the transmission system has to face different situations during which the system possibly can lose its efficiency. As in the other point of view some handicapped peoples also face some difficulties to ride a two wheeler. So in this recognition Gear shifting mechanism of the transmission system is one of the responsible agents for losing rotational speed of the system. Also the gear shifting mechanism that involved in the fabrication process is voice operating gear shifting mechanism. In this scenario the conducted research is concentrated on the voice operated electromagnetic gear shifting mechanism.

I. INTRODUCTION

Transportation decisions impact many aspects of urban life. Young and old alike are affected by the viability and relative ease of travelling to destinations on foot, by bike, transit, or reliance on private vehicles. Transportation investments are arguably the single largest shaper of urban spaces and of development patterns. The safety, speed, and comfort for a particular mode of travel are a function of the investments that have been made in specific types of travel options. Regions, and parts of regions, vary considerably in terms of their supports of travelling in ways that are health promoting (active) and environmentally sustainable. Transmission system transmits mechanical power from the engine to give kinetic energy to the wheels. It is an interconnected system of gears, shafts, and other electrical gadgets that form a bridge to transfer power and energy from the engine to the wheels. The complete set up of the system helps to maintain the cruising speed of the vehicle without any disturbance to the performance. The oldest variant of the transmission system in India is the manual transmission that has undergone various modifications and alterations to form the present day automatic transmission. A transmission or gearbox provides speed and torque conversions from a rotating power source to another device using different gear ratios. The transmission reduces the higher engine speed to the slower wheel speed, increasing torque in the process. A transmission will have multiple gear ratios with the ability to switch between them as speed varies. This switching may be done manually or automatically. Directional control may also be provided, such as forward and reverse gears.

A manual transmission is a type of transmission used in motor vehicle applications. It uses a driver-operated clutch engaged and disengaged by a foot pedal or hand lever, for regulating torque transfer from the engine to the transmission; and a gear selector operated by hand or by foot. Manual transmissions often feature a driver-operated clutch and a movable gear pedal. Most automobile manual transmissions allow the driver to select any forward gear ratio at any time, but some, such as those commonly mounted on motorcycles and some types of racing cars, only allow the driver to select the next-higher or next-lower gear. This type of transmission is sometimes called a sequential manual transmission.

An automatic transmission, also called as self-shifting transmission, is a type of motor vehicle transmission that can automatically change gear ratios as the vehicle moves, freeing the driver from having to shift gears manually. Like other transmission systems on vehicles, it allows an internal combustion engine, best suited to run at a relatively high rotational speed, to provide a range of speed and torque outputs necessary for vehicular travel.

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. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines and toys are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with programming interfaces, and embedded system programming is a specialized occupation. An Embedded system is a special-purpose computer system, which is completely encapsulated by the device controls. It has specific requirements and performs predefined tasks, unlike a general purpose personal computer.

II. LITERATURE SURVEY

When the engine is ignited and cam shaft rotates the rotary motion of camshaft is transmitted to the crank shaft which act as driver unit and transmit its motion to gear unit or driven shaft of gear. A load device is also connected to the crank which senses the load on automobile.[1]

This paper is about Design and fabrication of a semiautomatic gear. Shifting mechanism for a racing car like Go Kart a. This gear shifting mechanism had been design to overcome issues like –gear shifting. problem while gear shifting, to eliminate fully manual gear shifting ,so that driver can give more attention to steering, to reduce the effort and timing of gear shifting which is more important racing basically where few milliseconds. Make you a winner or a loser. The idea of pneumatic shifter rose when there was some going on discussion on different mechanism for shifting gear .Performing some analysis on basic design and on available data design was bought onto existence.[2]

This paper explains the maximum and minimum reductions per stage of planetary gear pairs and also the advantages of using planetary gear pair system over the other systems. Also allows us to study on determination of reduction ratio of this planetary gearbox. On the basis of certain parameters like torque density weight and volume the comparison between planetary gears and helical gears is done. The detailed study of planetary gear trains helps us to determine reduction ratio for each stage. [3]

To automate the manual transmission in two wheeler hydraulic and pneumatic drives are used. But these equipment results higher weight of vehicle. Also the response of this system gives sluggish response and leakages issue. To avoid this AMT is used. Electromechanical device based on DC motors is used to automate the gear system in two wheeler. Instead of using log for gear shifting gear shifted automatically based on speed. This mechanism is reliable and quick as compare to hydraulic and pneumatic drive. The cost of this system is very low. Also it gives comfort to the rider.[4]

The automatic gear shifting mechanism takes advantage over manual gear shifting system. but in situation where we have to change gears frequently the fully automated system is not much useful. In such condition the electromagnetic gear shifting system is used. This system is much better than button operated hydraulic and pneumatic system. The weight of this system is much lower than hydraulic and pneumatic system because of less equipment. also here is no need of compressor .hence the weight of setup is decreases. In this system the gears are operated using electronic switch. these switch are connected to battery. The battery is connected to electromagnetic actuator. The electromagnetic actuator is work on LVDT principle. There are two coils are fitted around the magnetic bar. As we push the button the current is passes through the coils. Due to supply of current there is generation of magnetic field in the coils. These magnetic field attract the magnetic bar. There is generation of specific torque in the bar. This torque is used to shift the gears. Electromagnetic system is better than hydraulic and pneumatic system because of low weight and less space requirement. It also better than fully automated system because it can be used in traffic and urban areas where we need to change gears frequently.[5]

In manual translation system the rider has to use clutch pedal to change the gear in two wheeler. It becomes difficult to understand to new rider. It also feel uncomfortable to the rider. In situation like traffic it becomes very difficult to change the gear frequently. To modify this and to give superior comfort to the rider AMT is used. Some cars like MARUTI, FERRARI already have this system but its not implemented in two wheeler because of bulky hydraulic and pneumatic equipment. This equipment increase the weight of setup. The space required for hydraulic and pneumatic equipment is more. In AMT we make the gearing system totally electronically controlled. It uses various sensors for getting input signal. These sensors sense input signals like speed, gear position. After sensing the signal it is send to the micro controller or PLC. PLC converts this signal with the help of programming and gives signal to the actuator. Actuator consist of stepper motor or DC motor. These actuators are connected to the gear pedal. After actuating it exerts particular torque based on gear box and the gear is shifted. The PLC is programmed such that after sensing particular speed it actuate the actuator. After proper speed the gears are automatically changed without any human interference. Automated gear shifter is very useful but situation like traffic or urban areas where we have to change the gear frequently this system becomes complicated.[6]

In the present world of automobile, gear shifting system are manually and automatic. Gear shifting system is important and easy way of varying speed. but automatic gear shifting system is costlier than manually gear shifts system. Manually gear shifting system is difficult to operate for handicap people. There is involvement of physical efforts. to reduce this effort they have introduce touch screen based automatic gear shifting system. In that system by touch on touch screen panel gear is shift. By applying this gear shifting system it gives cost reduction in compare of automatic gear shift system. It also reduces the possibility of transmission error of manual gear system. The purpose of this idea is to reduce physical effort of human being and they can concentrate only in driving and prevent the accidents. In present report they have studied literature review based on this review and define transmission system and gear shifting mechanism to modify a manual gear shifting mechanism. [7]

Supply Planetary gear trains are used for power transmission. This gear arrangement is fitted in the planetary

gearboxes. This planetary gearbox plays an important role in lowering the speed of the motor also inertia matching and the torque is boosted by this arrangement. Also the gearbox provides sturdy Mechanical interface for mechanical components like pulley drums cams etc.[8]

The fully automatic system is very costly and not afforded by middle class people. Also the semi- automatic gear system has advantage over fully automatic system and its cost is much lower than fully automatic system. In semi-automatic gear shifting the gears are operated with the help of electronic switch provided on the handle of bike. the two switch are provided to sift the gears. The electronic switch actuates pneumatic cylinders. The two pneumatic cylinders are fitted above the gear pedal for shifting the gear as the pneumatic cylinders actuate it gives forward or reverse stroke to the gear pedal and the gear is actuated. This system gives confidence to the rider.[9]

At present the gear transmission is done manually through mechanical linkages from foot pedal. This technique takes time for gear shifting and sometimes the gear don't mesh properly due to which life span of gears are reduced. So to avoid this automatic transmission is done with the help of pneumatic gear transmission.[10]

They have used electronic devices for automatic gear changing in two wheeler which is very useful for the gear changing mechanism in automobile vehicles. And which can give more accuracy and simplicity in changing gear while driving. [11]

Stepper motors are electromechanical devices which converts electrical pulses into mechanical movements. In this paper we have used a micro stepper motor and a control system for two phase hybrid stepper motor. For improving the positioning accuracy we have used lm3s6965 arm processor which will divide the step to micro step for required number of steps of the stepper motor. The current in each winding of the stepper motor is adjusted by sine cosine micro stepping method. This paper explains running of motor at different speed changing the number of samples per rotation and position control by number of samples. Thus the experiment showed that the control system used for controlling the stepper motor is reliable.[12]

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 Mechatronic Systems in Automobile Transmissions. Mechatronics is the engineering discipline concerned with the construction of systems incorporating mechanical, electrical and information technology components. Today, mechatronics is an area combining a large number of advanced techniques from engineering, in particular sensor and actuator technology, with computer science methods.[13]

The previously used electronic gear shifting system the cost is very high. To reduce the cost the new electronic system is used. It consists of two motor. One is to automate the clutch and other is to automate the gear. The clutch wire assembly is also replaced by in this system these motors controlled by ATmega16 which enables gear shifting and clutch operation. The motors take power from batteries and actuated by an algorithm or program of different ICs to change the gear.[14]

In this paper the author used PLC and pneumatic actuator to change the gear of two wheeler as the speed increases the sensor sense the speed and change the gear of bike. Automatic gear system provides superior driving comfort over manual gearbox. Both system have been used in this paper that's why name given is hybrid gear shifting.[15]

The manual gear shifting process is must slower. To make it faster eccentric cam operated semi- automatic gear shifting system ids use. The electronic device is use to change gear automatically. To eliminate the disadvantage of manual gear changing system eccentric cam operation is use. This method is useful for reducing space required for the gear box it also reduce wear and tear by reducing setup equipment. The operation in this method is less noisy. The cost required for this setup is very low as compare to hydraulic semi-automatic system . As the equipment quantity is low and construction is simple the maintenance cost is also very low.[16]

Gears in automobiles are used through which the vehicle gets motion & also it gives power & speed as the load on the engine is increased or decreased. In two wheeler the gear boxes are used that are operated with the help of foot pedal. This pedal is connected via linkages to the gear box due to which gear shifting is done. But due to this the gear shifting takes time and also sometimes proper meshing if gears are not done which leads to damage of gear. With the help of an automatic transmission of gear with the help of electro pneumatic, hydraulic, pneumatic systems this problem can be solved.[17]

In earlier day the shifting of gears was done through hand operated mechanism which was little bi complicated and also the rider does no feel comfortable with hand operated mechanism. In today's era the gear shifting is done automatically with the help of electro pneumatic system. It include four speed gear box ,single pneumatic double acting cylinder, two position five way DCV , push button, compressor and power supply.[18]

With the help of pneumatic system along with PLC gear shifting can be done easily. With the speed variation gears can be automatically shifted this will help in proper meshing of teeth o gears at proper time for finding such automated manual transmission the proper torque is required.[19]

In automatic gearboxes various techniques are used for shifting gear which are mechanically controlled. This present paper have discussed the gear shifting using an embedded system has small dimensions, economical and low maintenance cost. there is no any human interference in shifting gear micro- controller does it all according to the speed

of vehicle. As per comparison between manual and automated transmission, manual transmission don't want much maintenance cost and support to save fuel. In automated transmission there is more comfort during driving situation and minimize daily normal driving difficulties which arrive in hills, traffic or situation where we required rapid gear shifting

. In this paper an experimental setup is designed and calculated the characteristic performance on different load condition. Different methods are discussed herein for power loss reduction in gearbox. No load losses can be reduced especially of low temperature and part load conditions. Low loss gears can contribute substantially to load dependent power loss reduction in the gear mesh. Since these ratios differ between gears in a fixed gear ratio transmission, the speed of the vehicle could change suddenly during shifting process.[20]

As the name suggest Automated manual transmission done manually with gear & clutch operating automatically with the help of electro pneumatic or hydraulic system. Providing sensors to the speedometer the gears are shifted according to the increase in speed. This will help in reduction of energy consumption of vehicle. It also provides comfort to the rider & increases the performance of the vehicle without harming the environment.[21]

This paper introduces how the energy can be save in shift schedule so that efficiency of torque converters efficiency high. The author focuses on the further study of saving energy shift theory. At the same time, This paper explains how one can use this theory what ways and shows various control methods for saving shift schedule energy and further author also explains the how to use delayed shift so the problem like shift cycle eradicate to increase accuracy of automatic shift control.[22]

Due to slow response of manual gear shifting system the fully automated system has advantage over manual gear shifting system. Fully automation is very useful in two wheeler. The automation is apply using embedded system. The several programs are used to sense the speed of the vehicle according to which the input signal is generated if there is necessity of changing gear.[23]

III. DISCUSSION

The clutch plate is attached with the electromagnetic solenoid. The solenoid is actuated by the micro- controller through the relay. The MIC and voice recognition module are used to receive the commands from the user. The programme of actuation is developed and stored in the micro-controller by using the universal programmer kit . The voice recognition board are used to store the data of maximum of five commands .

The commands of action are loaded by the mic through the voice recognition board. For example , the commands are gear up ,neutral and gear down .In working of circuits , the power supply section of components contain bridge rectifier, capacitor of 5v and 12v and regulator . The bridge rectifier is used to convert AC current to DC current. The capacitor of 5v is used to control the micro controller and lcd. The capacitor of 12v is used to control the electro magnetic relay , voice recognition module and electro magnetic solenoid.

Initially the clutch plate is in neutral position when give the command " gear up" through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is actuated and plunger pulled down . The clutch is in neutral position changes to the 1st gear position. The command of "neutral" is given to the mic . The electro magnetic solenoid is became to off in position .

The command " gear up" through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is actuated and plunger pulled down . The clutch is in neutral position changes to the 2nd gear position. The command of "neutral" is given to the mic . The electro magnetic solenoid is became to off in position .

The command " gear up" through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is actuated and plunger pulled down . The clutch is in neutral position changes to the 3rd gear position. The command of "neutral" is given to the mic. The electro-magnetic solenoid is became to off in position .

The command " gear up" through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is actuated and plunger pulled down . The clutch is in neutral position changes to the 4th gear position. The command of "neutral" is given to the mic . The electro magnetic solenoid is became to off in position .The maximum gear position is obtained .

The clutch plate is in gear position when give the command of " gear down" through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is

actuated and plunger pulled down . The clutch is in neutral position changes to the 3rd gear position. The command of “neutral” is given to the mic . The electro magnetic solenoid is became to off in position .
The command of “ gear down” through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is actuated and plunger pulled down . The clutch is in neutral position changes to the 2nd gear position. The command of “neutral” is given to the mic . The electro magnetic solenoid is became to off in position .

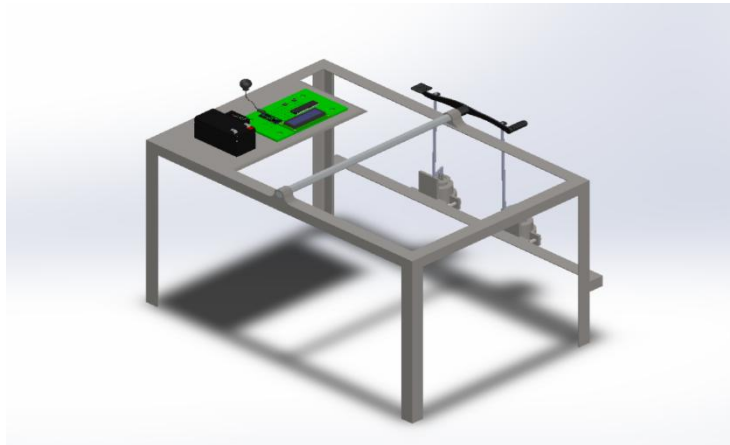


FIG 1.1: ISOMETRIC VIEW



FIG1.2: FRONT VIEW

The command of “ gear down” through the mic .It receives the command and transfer to the voice recognition module through the micro-control. Micro controller receives the data and supplies the current to the relay coil. The electromagnetic relay coil is closed the circuit and the electro magnetic solenoid is actuated and plunger pulled down . The clutch is in neutral position changes to the 1st gear position. The command of “neutral” is given to the mic . The electro magnetic solenoid is became to off in position .

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IV. CONCLUSION

Based on comprehensive literature review of various aspects in developing voice operated gear shifting mechanism, the following conclusion have been drawn.

This voice operating gear shifting mechanism is very flexible due to its reaction time. This system have quick response due to its simple mechanism and it is comfortable for physically handicapped person and also from women s point of

view. Due to its simple mechanism and quick response it has very good performance in gear shifting. It is very easier to operate over feet operating gear shifting

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