

# A review of automatic transmissions

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**Abstract:** The motorcycle's gear system transmission is a manual gear system. In all nations, motorcycles are a big help, especially in India. Both automated and manual gear systems are available in today's automotive industry. In an automobile, the gear-shifting procedure is crucial for adjusting speed and facilitating effortless movement from one location to another. In comparison to automatic gear shifting in vehicles, manual gear shifting methods are simple to use and less expensive. Those who are physically disabled or require physical effort to change gear should not use the manual technique. Eleven papers have been reviewed in this article. The operational parameters and design limitations of the automatic gear transmission system are the focus of the investigation.

Keywords: *Automatic Gear Transmission System, Similitude between AT and AMT, Strategy of Shifting of gear.*

## I. INTRODUCTION

Automatic transmission of gear refers to a technology that allows a vehicle to change gears at various speeds without the driver having any direct control over the process. The early "horseless carriage" gearbox, created in 1904 by the Sturtevant brothers of Boston, Massachusetts, is where the idea for modern automated shifting originated. While top gear was in the engine and the engine speed increased, the gearbox would shift back into gear when the vehicle's speed and engine revolutions per minute decreased. Sadly, the metallurgy of the period was inadequate, which is why the gear changes are so sudden. The gear gearbox will frequently and suddenly fail. Fernando Lehly Lemos and other Brazilian engineers created the first automatic gear-shifting device in 1932. The project was later sold to General Motors together with José Braz Araripe's prototype. The technology was first used in the 1940 Oldsmobile, which included a "Hydra Matic" transmission. Both General Motors and REO created semiautomatic gearboxes in 1934 that were easier to use than manual transmissions for shifting gears. These designs kept using a clutch to connect the engine's gears to the transmission. The Automatic Safety Transmission (AST) developed by General Motors was remarkable for using a hydraulically regulated, shifting power to planetary gearbox that was sensitive to anticipating future development road speed.

Although automatic transmission gear shifting won't give drivers of manual gear transmission vehicles the same sense of vehicle control, automatic transmission gear method vehicles offer a simple interface that novice drivers may find more comfortable with. In a manual gear transmission vehicle, new drivers must also learn how to operate a stick shift in addition to driving. When driving in certain conditions, such as stop-and-go traffic or going up hills, an automated gear transmission vehicle makes it easier for the driver to focus on the road rather than being distracted by the extraneous parts of a stick shift. The simplicity and mental clarity of automatic gear transmission automobiles are key selling qualities, making them the favoured choice of parents and families. According to a study, gearbox drivers who use automated transmissions experience less stress. By contrast, drivers of gear vehicles with stick shifts or manual gearboxes have higher heart rates than those of such vehicles with automated transmissions. The drawback is that they are more expensive to purchase there.

General Motors' Powerglide, Dynaflo, Hydra-Matic, Dual Range Hydra-Matic, Turbo glide, Whirl a way Hydra-Matic, Roto Hydra Matic, Jetway Hydra-Matic, 4L60-E, 4L80-E, TH400, and 700R4 are some of the most well-known automatic gearbox systems. [Holden] Powerglide is another.

Ford - C4, C6, Cruise-O-Matic, AOD/AODE, E4OD, ATX, AXOD/AX4S/AX4N, O-Matic, CD4E.

**II. METHODS OF AUTOMATIC GEAR SHIFTING:** Different method and modifications has been proposed to make automatic shifting of gear these methods are enlisted below.

### 1. Manual Transmission:-

This method widely applied in vehicle to shift a gear with the aid of hand. This type of method is easy and oldest type of transmission still in use. Manual transmission was trusty to shifting gear. This method uses a driver-operated clutch disengaged and engaged by a clutch, foot pedal, hand lever for bike. By using torque transfer from the engine to the transmission.

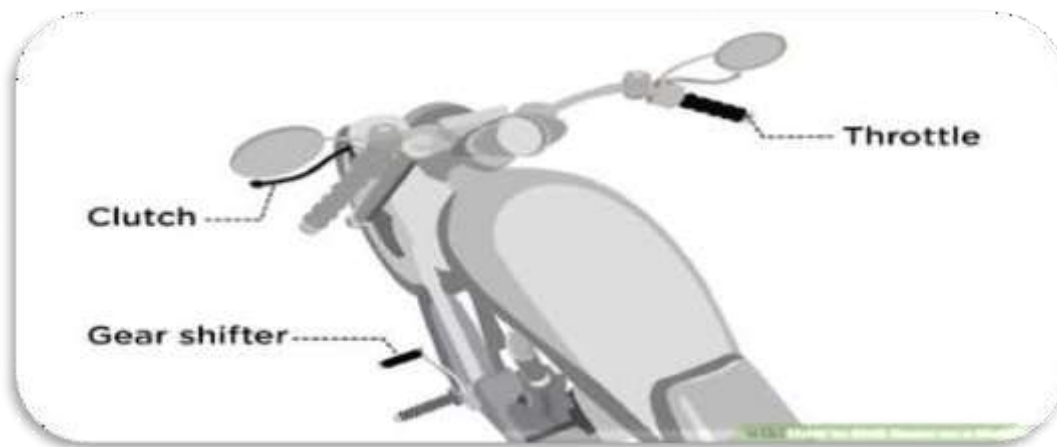


Fig 1.1 Manual transmission

2. Automatic Transmission:-

It is most common transmission system in vehicle. It usage a highly-intricate torque converter to transmit the engine's rotational power, while gear shifts. in the automatic transmission, both gear and the clutch operated automatically based on vehicle speed. Automatic transmission essentially consists of two or many epicycle gear set with a provision to fix any one member set of gear and obtain relative gear ratio. The function of this mechanism to operate gear set is control automatically bythe hydraulic system.

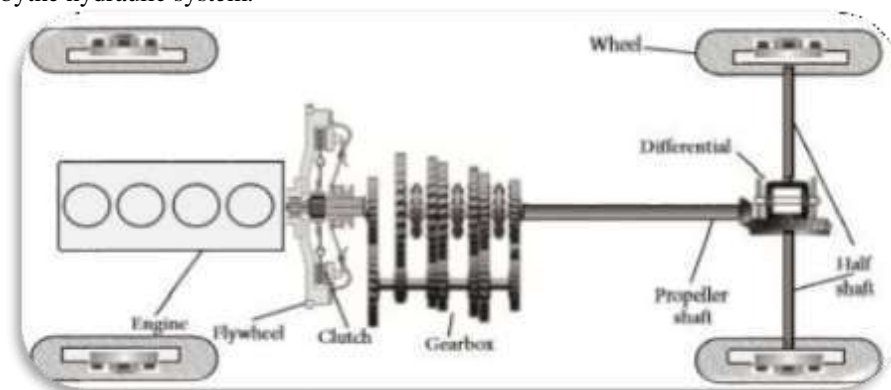


Fig 1.2 Overall structure of automatic transmission

3. Continuously variable transmission(CVT):-

The function of gear transmission is to couple engine shaft with derive wheelers all this while making effective usage of the engine torque and the driving conditions. The transmissions use a range of gear from less to high in traditional automatic transmission or manual transmission. The gear are literally gears-toothed wheel that assist modify & transmit the rotary motion. Unlike the traditional transmission continuously variable gear transmission don't have gearbox with set no of gears. This type of transmission are used pulley, that allows are infinite variable between highest gear & lowest gear shifts. A conventional variable gear transmission system is more suitable for smaller displacements engine this types of system is popular in India example conventional variable transmission system is used gearless scooter such as aviator Hondas moped bike. This system also provides has an alternative transmission on cars or luxury cars such as Mercedes, BMW.



Fig 1.3 Continuously variable transmissions

4. Electronic control transmission:-

A conventional transmission involves manual pressing the clutch shifting of gears and accelerator it depends on the driver to interpret the condition of engine load, choose of gear, speed, and position throttle. These types of power transmission programs are great in recent year with an electronic control automatic transmission. The driver start engine select a gear and operate breaks and accelerator. The usually perform by the clutch and manual gear transmission are accomplish automatically.

5. Hydraulic transmission system:-

The basic arrangement of hydraulic transmission consists of a pump (oil pump) for converting mechanical power into hydraulic pressure and Motor for converting the hydraulic pressure back into mechanical device power for output. A swash plate & Distributor valve for cylindrical piston operation, while the cylinders are integrated into output shaft. A swash plate most event full part in this system. The swash plate of angle is change to provide continuously gear ratios. This transmission gear system also includes lockup mechanism and start clutch for an infinitely variable hydraulic mechanical transmission. When cruising, this lock up mechanism works to decrease transmission efficiency losses, improved fuel economy.

### III. LITERATURE REVIEW

**Vishnu P. R. et.al(2016)**<sup>[1]</sup>This technique takes time for shifting of gear and sometimes the gear don't mesh properly due to which life span of gears were reduced. To avoid this automatic transmission has been done with the help of pneumatic gear transmission. This includes manual five speed gear box, pneumatic double acting cylinders, which is mounted on gear paddle and transmitted power to gear paddle to operated gear forward and reverse. Its required compressor, PLC system, electric motor, push button, limit switch.



Fig 1.4 Pneumatic, PLC Controlled, Automatic Gear Shift, Vishnu P.R., et.al

**Shivaprasad N et.al(2015)**<sup>[2]</sup> In this paper the author using the simplest PIC  $\mu$ -controller and Essential hardware able to change the old gear shift system to more suitable hybrid power transmission of gear shift system. The main purpose of this mechanism system leads to create the drive easy and reduces the tens of destabilizing the car. 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 study that's why name given is hybrid gear shifting.

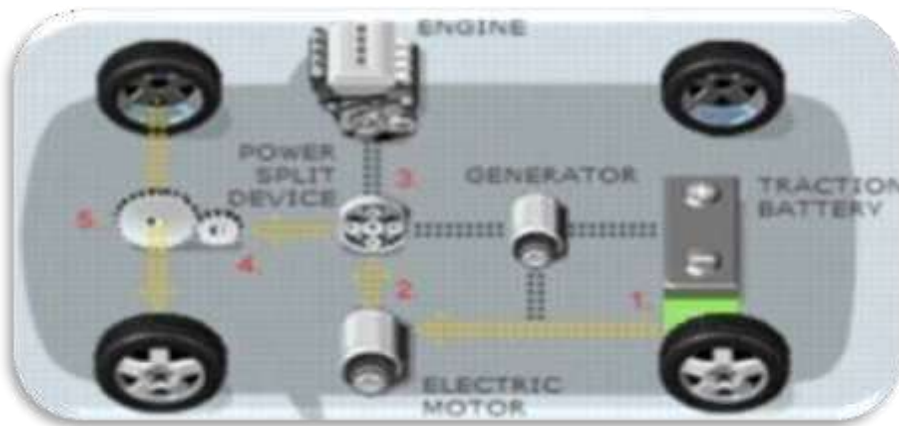


Fig 1.5 Hybrid power transmission of gear shifting, Shivaprasad N., et.al  
**M. S. Kumbhar, et.al (2014)**<sup>[3]</sup> According to authors in this review paper automatic manual operated transmission done by using gear and clutch, these are operating automatic with the help of pneumatic as well as hydraulic system. In this review paper sensor are used to shift gear and increasing speed also these gear are change as per speed of vehicle. This will help in reduction of energy consumption of car or bike. It's provides comfort to person vehicle give better performance of system.

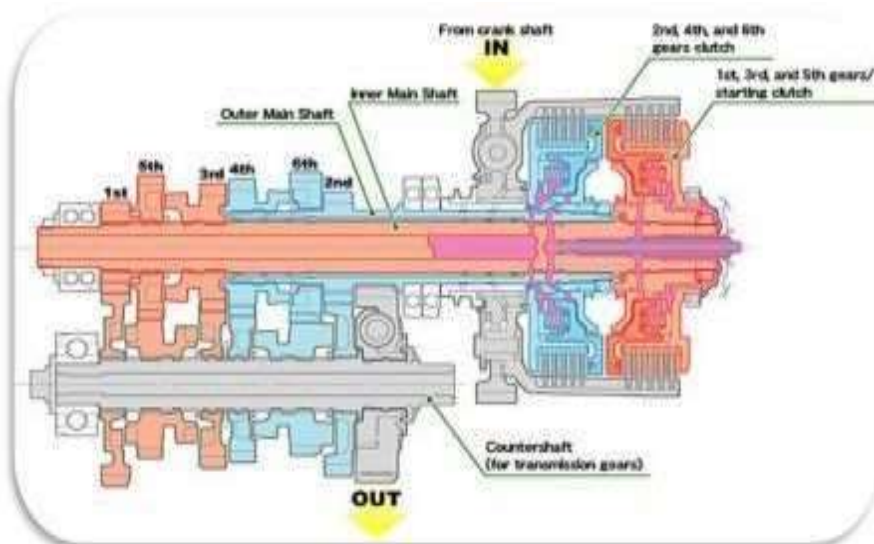


Fig 1.6 Automatic manual transmission, M.S. Kumbhar, et.al

**Ramesh Makwana, et.al (2014)**<sup>[4]</sup> Stepper motors were electromechanical devices which converts electrical energy into mechanical movements. This work relates to application of micro stepper motor and controlling system for two phase stepper motor to improve the accuracy. The current in each pole of this motor is adjusted by sine cosine micro stepping method. Authors explain before this running of motor at different speed changing the number of samples per rotation and position control by number of samples. The experimental review show result that the control system used for controlling the stepper motor is reliable.





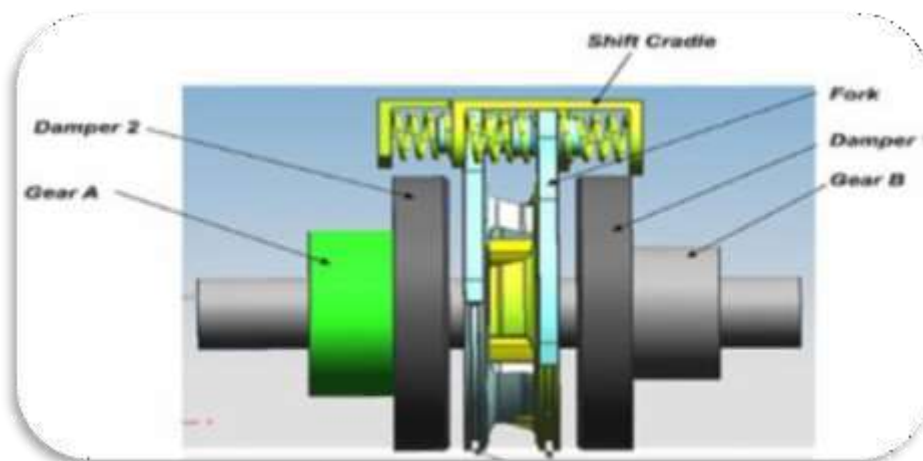
Fig 1.7 automatic manual gear shift transmission, Ramesh Makwana, et.al

**S. Vijay Kumar and P. Nithesh Reddy (2014)**<sup>[5]</sup> In this research gear shifting transmission device was to make the shifting gear process faster and less perishable for the operator. This improvement is possible with devices such as manual four speed gear box, pneumatic cylinders, Programmable Logic Controller (PLC), an electric motor, push switch, LED light, for power supply a external battery. According to suggested method the control is operated with optimum gear shifting ratio for an automatic transmission.

**ZaiminZhong et.al (2012)**<sup>[6]</sup> Introduced a new selector of gear for automatic manual transmissions. The invention which is able to the automation of shift by DC motors and it's also used on manual transmission vehicle. Evidently, the good purpose of this invention that the automation of manual transmission could be easily realized by replacing the shift lever with motors cables.

**B. Mashadi et.al (2007)**<sup>[7]</sup> An Auto transmission of gear strategy for Manual. This Transmissions is based on up to two different steps, namely the condition of working engine and the driver's goal, the parameters required for gear shifting of an automated manual transmission were enlisted. The shifting of gear strategy was designed to improve the affects by using these parameters, with the application of a fuzzy control method.

**R. P. G. Heath and A. J. Child (2007)**<sup>[8]</sup> Automated Manual Transmission (AMT) by shows that Zero shift technology permitted a manual transmission to alter the gear minimum means zero second. This invention was patented for transmission. The Zeroshift 'means shifting gear in zero second Automated Manual Transmission (AMT) it's easy to design and manufacture and allows to the traditional torque converter for using automatic transmission. When driver operating this gear shift in zero second technology offer fuel economy to develop the efficiency and the best result for acceleration of



vehicle.

Fig 1.8 Zero shift automatic manual transmission, R.P.G. Heath and A.J.Child

**E. Galvagno, et.al (2003)**<sup>[9]</sup> The research paper must be latest, first six authors are ok but change the rest of authors. Required power generate during gearshifts were computed for various engine and ACL interventions, thus allowing drawing considerations useful for developing system. According to E. Galvagno improved the gearshift quality and ride comfort of the analyzed transmission. From this study the AMT ACL transmission it was possible to show that the assist clutch is required during gear shifting operation,

**Yoshinori Taguchi et.al (2003)**<sup>[10]</sup> this system is represented by Convention transmission system. The main outcome of this system was to neglect the manual errors in operating the gear shifting system with help of automatic transmission. It's of various type of system such as mechanical systems, hydraulic systems, systems and computer controls all working are together in this research paper. **Magnus Pettersson and Lars Nielsen (2000)**,<sup>[11]</sup> In this study Internal driveline torque control was a fresh idea for handling to increasing shifting and give better result by this system. By calculating the transmitted torque and controlling it to end of position by engine control, the gear are engage and disengage with the help of clutch due to this neglected the disturbance of driver .when the trailfield show neutral gear ,disdain disturbance and dive line to swing to start of the gear shifting . The control scheme was simple against variations among different gears. A model of manual transmission with engine, clutch, gearbox, and drive-shaft and vehicle body is constructed.

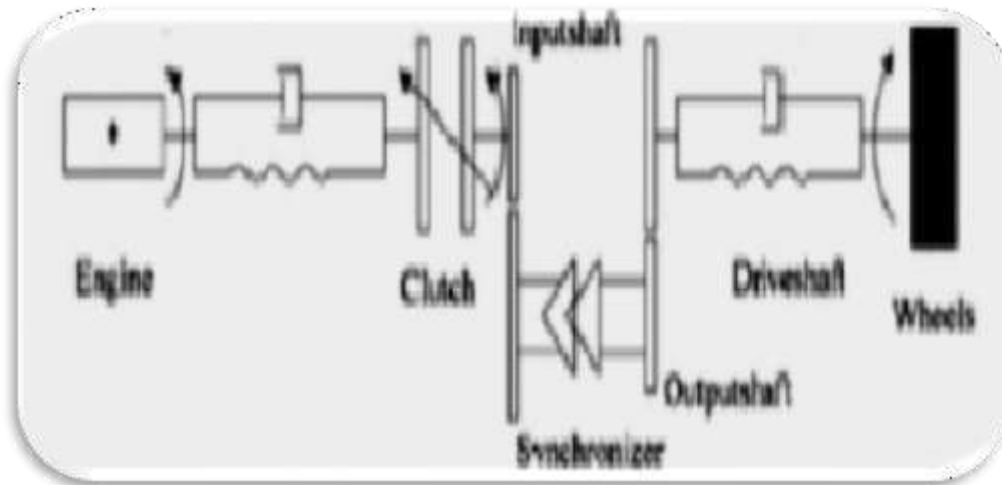


Fig 1.9 Automatic manual transmission block diagram, Magnus Pettersson and Lars Nielsen.

#### IV. CONCLUSION

- 1) This gear transmission system was created with quick gear shifts and minimal human disturbance in mind.
- 3) When all gears are in continuous mesh, some power is lost in overcoming friction across all engaged gear pairs, and oil leakage results in system standstill, the system is impacted by a variety of parameters, such as teeth wear out more during meshing.
- 4) According to a literature review, certain techniques have been used for automatic gear transmission to lessen noise, engine component wear, and fuel consumption.
- 5) Use a conventional variable transmission system, which is better suited for smaller displacement engines, to improve the avoidance of loud and wear-less operation.

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