Automatic Transmission for the Geared Bikes

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Abstract - *The following study is about the automatic Transmission for the geared bikes. In today's technology the automation has become an important part in the Automobile industry. But it is not that much efficient and cost effective. So in this study we have designed, constructed and discussed about the automatic transmission in the geared bikes. The study basically focus on the handicapped and the persons with disability (like small height, no legs, etc.) wants to ride the bikes like Bullets and light motor vehicles. This paper aims and focuses on the improvement of the gear shifting in the bikes and also implements the neutral concept while slowing down the bike i.e. while downshifting.*

Key Words: Automatic transmission, manual transmission, gear shifting mechanism, Proximity inductive sensor, electric throttle, clutch, and accelerator.

1. INTRODUCTION

This research is about the automatic gear transmission for the geared bikes. As all the heavy motor vehicles like cars has automatic transmission but this is not the same case with the bikes. Because in the Case of the bikes it is a lot much harder to embed the system due to low space and also it is expensive. Today the automatic transmission is so advanced that it can offer better fuel efficiency than that of manual transmission. But the cost of such transmission means they are no longer remain cheap, economical bikes. Does due to this reasons the automation in the budget bikes is not so popular. Thus, in order to change this concept with cost efficient and automatic transmission in the bike's motive this research is being done.

In the research we have used:

1. The Proximity Inductive sensor to sense the speed in the form of number of pulses.
2. The Arduino to process the sensors data and to calibrate and control the servo motors action.
3. A high weight capacity servo motor for the up and down gear shifting.
4. Two medium weighted motors to control the acceleration and clutch wires.
5. An electric throttle to give the acceleration input.

The Proximity sensor will sense the speed in terms of the pulses and send those signals to the Arduino. The proximity sensor works on the principle of electromagnetic induction to detect or measure the objects. These sensor will generate a parameter for speed. The sensor will check for the number of pulses for each time after 8 seconds for accurate readings.

The Arduino will take the input data from the sensor and the throttle. The speed sensors data is received to the Arduino and the Arduino will use this parameter to control the gear shifting operation. The Arduino will decide the range for the vehicle to shift the gears. This range will be directly proportional to speed of the vehicle.

Instead of using the actuators for the gear punching here will have used the rack pinion concept. The servo motor will be connected to the pinion which will move the rack in back and forth direction. And the rack will be connected to a rod coming from the gear box.

Two servo motors are connected to the accelerator wire and the clutch wire respectively. The servo motor connected to the accelerator wire will be directly proportional to the electric throttle connected to the Arduino. Which means that when the throttle is moved to a certain position then the servo motor will also move linearly. This means that the servo motor and the throttle motion will be linear. Another servo motor is connected to the clutch wire for smooth shifting of gear without any jerk and damage to the gear box.

An electric throttle is an input device. The input to it will be given through the rider. The electric throttle is nothing but a variable potentiometer. As the position of the knob is changed it will generate a signal. This signal is used to control the acceleration of the vehicle. This electric throttle is directly proportional to the servo motor connected to the accelerators wire.

2. LITERATURE REVIEW

The literature review of journal papers was done:

In the first journal paper Mr. Amar Gupta has discussed a gear shifting mechanism designed and applied to make the shifting process faster and cost effective. In his concept he has used the Hall Effect

sensor to measure the speed of the vehicle. The Hall Effect sensor works on the principle of Hall Effect in which the EMF is induced in a conductor when a magnetic field is applied in a direction perpendicular to that of the flow of current. But for punching the gear he has used the linear actuators. Actuators are the components that is responsible for the moving and controlling a mechanism or system linearly. He has used two linear actuators one for up shifting and second for down shifting. A 6v servo motor was used for the clutch wire to make the gear shifting smooth [1].

In the second research paper the main motive of Mr. Vishnu P R aims to improve the gear shifting process by using two pneumatic double acting cylinders as the punching mechanism. Pneumatic cylinders are mechanical devices which use the power of compressed gas to produce the force in a reciprocating the linear motion. This pneumatic acting cylinders are also known as air cylinders. By using the two pneumatic cylinders one for up shifting and another for down shifting can used as a mechanism. Also the relays were used to provide the positive signal and the negative signal to the pneumatic double acting cylinder. This signals to relay are provided through the control unit of the model. He has used an Atmel IC AT89C52 as a controlling unit. He has used the proximity sensor to sense the speed of the bike. The same sensor is being used in our model. The proximity sensor works on the principle of electromagnetic induction, when the metal comes in the contact of the magnetic field generated by the sensor the metal cuts the magnetic field and induces an EMF in the conductor. An electric motor was used to stretch the clutch wire for the smooth gear shifting [[2]].

So by the review from the various studies we can say that the rack and pinion concept was not used for the gear shifting mechanism and also from both the research we came to know that it was somehow not well cost effective. As the price of the linear actuators are very high it costs around 3,000 INR for one and they are using two. Also the same case with pneumatic double acting cylinders, which costs around 1,500 INR. Instead of using such high value components we can use a simple, rigid and more effective way like Rack and Pinion for the gear shifting. So the aim presents the work of Rack and Pinion gear shifting unit for the two wheelers is performed using the sensors and other parts. As the weight of the

rack and pinion is very much lighter and rigid compared with linear actuator and pneumatic cylinder, the overall weight of the vehicle and the space taken by the mechanism is reduced. By using this concept the gear shifting will be done effectively and optimum force will be exerted by the rack and pinion to move the shifting livers.

3. PROPOSE METHODOLOGY

The concept of the project can be divided into 4 parts.

- The speed sensing unit
- The processing unit
- The gear punching unit

The speed sensor will sense the speed of the vehicle and fed to the Arduino. It is a simple PNP type inductive proximity sensor which works on the principle of the electromagnetic sensor.

The processing unit is an Arduino UNO which will control the three servo motors (one servo motor for accelerator, second for the clutch wire and the third for the Rack and Pinion). The Arduino will process the speed sensors signal and will relate it with the algorithm present in the program. Then the Arduino will send a signal to the servo motor, that to stretch the clutch wire and then will tell the Rack and Pinion to punch the gear according to the range of the speed decided. The clutch wire will not be stretched for the 1st gear as for most of the times rider wants to make him/her comfortable and also it will be easier for gear shifting process. But for the other gears i.e. from 2nd to forward the clutch wire will be stretched by the servo motor.

The Rack and Pinon concept is used to make the gear shifting mechanism for the bike. The Rack and pinion is a very rigid and strong concept. It comprises of two parts: the Rack and the pinion. The pinion is a gear with the threads or teeth's on the outer side which is placed on the Rack. The Rack is the movable object, it has the threads on the surface of it and it provides the linear motion by moving back and forth with the help of the pinion when it spins. This back and forth principle will make the gear box to shift up or to shift down.

4. BLOCK DIAGRAM

The block diagram for the following research is given below:

Instead of actuator we will be using Rack and Pinion concept for gear shifting.

The structure of the block diagram is as follows:
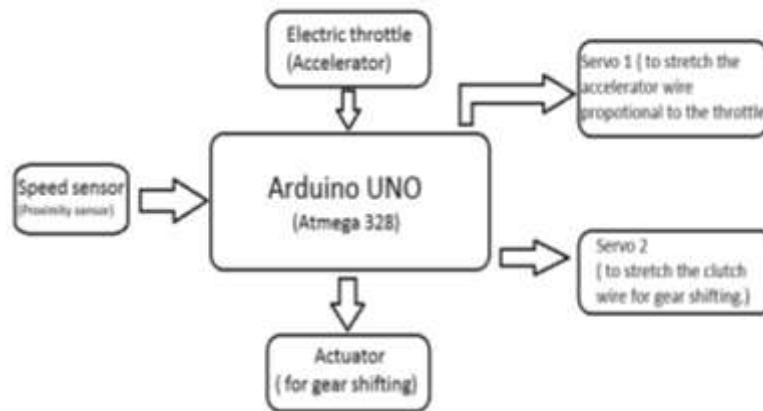
1. The aped sensor gives the speed parameter to the Arduino (control unit) in the form of pulses.
2. The Arduino will process this speed variable and it will signal the actuator or rack and pinion to shift the gears in up or down.
3. The electric throttle will give the acceleration input which will be directly proportional to the servo motor servo 1 connected to the accelerator wire.
4. When the gear is to be shifted the servo motor servo 2 connected to the clutch wire will be stretched and the acceleration will be made zero by disabling the servo1 for smooth transmission for gears.

By using this phenomenon the gear shifting for the bikes or two wheelers will become easier, effective and fuel saving.

5. EXPECTED OUTPUT

The use of automatic provides an ease in the operation and gives a good mileage. Also they are inherently more powerful than any equivalent manual transmission. The automatic transmission has a better fuel efficiency than that of the manual transmission.

The output which we have considered around this thesis is about the mainly fuel efficiency and also the cost efficient. So according to our research due to the use of Rack and pinion concept the force required to exert on the gear box will be less as the small torque on the rack and pinion will produce a greater force for the gear shifting. As a result power consumption will be effective and less. Also the gear shifting will be very smooth as the high speed servo motor is being used for the gear

shifting so the time delay for the operation will be less and also it will be accurate. As the clutch wire will be automatically stretched for the smooth gear shifting and also the acceleration will be made zero while changing the gear so the rider is not required to pull the clutch lever and he will feel it comfortable.

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BIOGRAPHIES

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