Automatic Gear Shifting In Two Wheelerusing Sensor

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ABSTRACT

Motorcycles are widely used around the world particularly in INDIA. The gear shifting system of the motorcycle is conventionally manual. This report covers development of an indigenous gear shifting /changing system for the standard motorcycle. By this system the manual mechanical gear-shifting will remain unchanged because an additional electro-mechanical system is placed on the top of the lever to shift the gear and automatically control the clutch. So, the system has both the option manual as well as automatic. The system uses low-cost microcontrollers to make the accurate decision for shifting the gear up and down by observing the speed, and it controls the clutch transmission where necessary. The complete hardware and software have been tested and the functioning of the automatic gear shifting system is verified. System is flexible and can be used with any motorcycle ranging from 50 to 200 cc. General Terms Automation.

An electronic gear-shifting systemis a method of changinggears on a bike, which enables riders to shift with electronic switches instead of using conventional control levers and mechanical cables. The switches have beenconnected by wires or wirelessly to a battery pack and to a small electric motor that drives the derailleur, switching thechain from cog to cog. Use of an electronic system is to change gears faster, and because the system does not use bowden cables and can calibrate itself, it may require less maintenance.

I. INDRODUCTION

A motorcycle (also called a motor bicycle, motorbike, bike, or cycle) is a single-track, two-wheeledmotor vehicle powered by an engine. Motorcycles vary considerably depending on the task for which they are designed, such as long distance travel, navigating congested urban traffic, cruising, sport and racing, or off-road conditions. In many parts of the world, motorcycles are among the least expensive and most widespread forms of motorized transport.

In the two wheelers the transmission is carried out by manually. This mayresult in fatigue during driving in cities or traffic areas.A system alter gears at diverse speeds in that vehicle without direct control by the person this system is called automatic transmission of gear. Modern automatic shifting can trace their fountainhead to an early "horseless carriage" gearbox that was invented in 1904 by the Sturtevant brothers of Sturtevant from Boston, Massachusetts. When engine speeds increase that time top gear was engaged in engine, the vehicle speed decrease and engine Revolution per minute reduce, the gearbox would shift back to

gear. Unfortunately, the metallurgy of the time was not up to the task and owing to the abruptness of the gear alters. The transmission of gear would be continually failure without warning. The first automatic shifting of gear system usage hydraulic fluid was developed in 1932 by Brazilian engineers, Fernando Lehly Lemos Later and José BrazAraripe, the project were sold to (GM) General Motors& the prototype. The introduced the technology in the 1940 Olds mobile model like a "Hydra Matic" transmission In 1934, both General Motors and REO developed semiautomatic transmissions shifting of gear system that were, less hard to operate than a manual shifting of gear system. These design, continued to usage a clutch to engage gear in engine with the transmission. The General Motors staff, dubbed the " (AST) Automatic Safety Transmission," was notable that in it employed a shifting power to planetary gearbox was hydraulically controlled and sensitive to anticipating future development road speed. Though the automatic transmission gear shifting won't provide the same feeling of vehicle control that manual gear transmission drivers experience, automatic transmission gear method vehicles offer a simple interface that new drivers may feel more comfortable with, In a manual gear transmission vehicle, new drivers does not only need to understand to drive, but how to usage a stick shift. In an automatic transmission of gear vehicle, the learned curve was simplified by the remove of the stick shift. An automatic gear transmission allowed a new driver to pay attention to the road, rather than becoming distracted by the extra components of a stick shift and certain driving conditions, like go and stop traffic or gone up on hills, are not difficult with an automatic gear transmission vehicle. Directness and calmness of mind are major selling points for automatic transmission of gear vehicles, making automatic gear transmissions the preferred vehicles of parents and families. A study has shown lower stress rated in drivers of automatic transmissions of gear. By variance, drivers of a stick shift or manual transmission of gear vehicles display more heart rates as compare to drivers of automatic gear transmissions. The disadvantages are that they are more expensive to buy in the place.

2. AUTOMATIC GEAR SHIFTING IN TWO-WHEELER

In every vehicle, the transmission system transmits the mechanical power from the engine to give kinetic energy to the wheels. The Gear box in the system is responsible to vary the torque according to the driving conditions by shifting the gears manually. Bad shifting is also one of the reasons for the motorcycle accidents. In case of manual gear shifting, the foot lever is used for gear shifting in motorcycle and the clutch operation makes it difficult. The Auto-clutch bikes is used in the project. So, while accelerating the bike, the clutch plates will not wear, performing the smooth operation.

Therefore, we purpose automated system which uses embedded system to shift gears. As this embedded system arrangement installed outside, there is no need for modification inside the engine of the bike.

The working of the automated system is based on the speed of the wheel. As the rpm of the wheel increases, the proximity sensor counts the rpm and sends the signal to microcontroller (MCU). The microcontroller then sends the signal to DC Stepper motor to step up. This process also follows the same with the deceleration of the wheel, as the speed decreases, the Stepper motor will step down the gear. The engine life is also increased as the engine runs smoothly without ‘knocking’. This embedded system can also be used in any auto-clutch motorcycle ranging from 50cc to

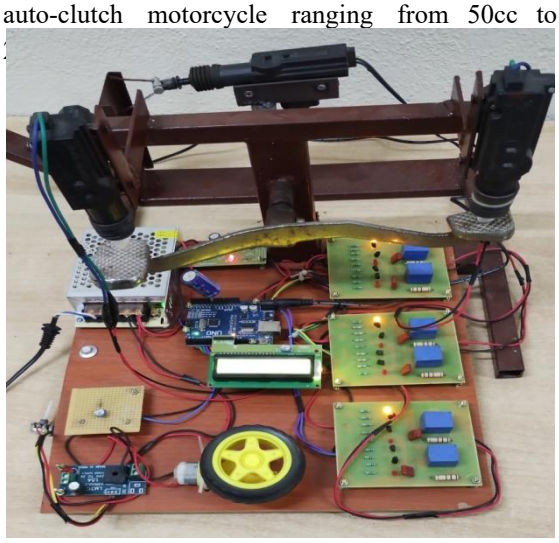

Figure 2.1 Demo Model of Automatic Gear Shifting In Two Wheeler

3. DESIGN AND DRAWING. D.C GUN:

A railgun consists of two parallel metal rails (hence the name) connected to an electrical power supply. When a conductive projectile is inserted between the rails (from the end connected to the power supply), it completes the circuit. Electrons flow from the negative terminal of the power supply up the negative rail, across the projectile, and down the positive rail, back to the power supply.

This current makes the railgun behave similar to an electromagnet, creating a powerful magnetic field in the region of the rails up to the position of the projectile. In accordance with the right-hand rule, the magnetic field circulates around each conductor. Since the current is in opposite direction along each rail, the net magnetic field between the rails (B) is directed vertically. In combination with the current (I) across the projectile, this produces a Lorentz force which accelerates the projectile along the rails. There are also forces acting on the rails attempting to push them apart, but since the rails are firmly mounted, they cannot move. The projectile slides up the rails away from the end with the power supply.

A very large power supply providing, on the order of, one million amperes of current will create a tremendous force on the projectile, accelerating it to a speed of many kilometres per second (km/s). 20 km/s has been achieved with small projectiles explosively injected into the railgun. Although these speeds are theoretically possible, the heat generated from the propulsion of the object is enough to rapidly erode the rails. Such a railgun would require frequent replacement of the rails, or use a heat resistant material that would be conductive enough to produce the same effect.

3.1. ELCTRO MAGNATIC GUN DETAILS:

While playing with my can crusher, I noticed that a can placed off center tended to be pushed out of the solenoid. A little searching of the patent literature convinced me that I had inadvertently created a very poor, single stage, coil gun. Presented below is a summary of what I have found so far.

Figure 3.1 D C Gun

Propellant powered guns are typically limited to muzzle velocities on the order of 2,000 meters per second. This limit is inherent to the use of expanding gas to drive the projectile down a barrel. Barrels simply can't withstand the temperatures and pressures required for higher expansion rates of the propellant combustion products (normally CO2 and NOx). One attempt at a gun for higher velocities used differential pistons (a large one, driven by methane/oxygen combustion, connected to a small one for compression of the drive gas) to provide a high pressure of hydrogen gas (hydrogen is the lightest, and hence fastest expanding, of all gasses). While some success was achieved, the apparatus was cumbersome and the velocities were still limited. For some applications, particularly orbital launching, this is insufficient (earth escape velocity is 11,200 m/s).

Two basic types of electromagnetic gun are described in the patent literature, the rail gun and the coil gun. Both use stored energy sources to produce a large magnetic field and a high electric current through a driving armature. The interaction of the current with the magnetic field generates a force which propels the armature (and any projectile connected to it). Beyond that, they differ substantially, and each has practical difficulties which has prevented them from being more than laboratory curiosities.

3.2. SPRING

The automobile chassis is mounted on the axles not direct but through some form of springs. This is done to isolate the vehicle body from the road shocks which may be in the form of bounce, pitch, roll or sway. These tendencies give rise to an

uncomfortable ride and also cause additional stress in the automobile frame and body. All the parts which perform the function of isolating the automobile from the road shocks are collectively. A Springing device must be a compromise between flexibility and stiffness. If it is more rigid, it will not absorb road shocks efficiently and if it is more flexible it will continue to vibrate even after the bump has passed so we must have sufficient damping of the spring to prevent excessive flexing.

3.3RETURN SPRING

Figure 3.3 Return Spring

A spring is a flexible elastic object used to store mechanical energy. Springs are usually made out of hardened steel. Small springs can be wound from pre-hardened stock, while larger ones. A spring is a mechanical device, which is typically used to store energy and subsequently release it, to absorb shock, or to maintain a force between contacting surfaces. They are made of an elastic material formed into the shape of a helix which returns to its natural length when unloaded this is called return spring. Springs are placed between the road wheels and the vehicle body. When the wheel comes across a bump on the road, it rises and deflects the spring, thereby storing energy therein. On releasing, due to the elasticity of the spring, material, it rebounds thereby expending the stored energy. In this way the spring starts vibrating, with amplitude decreasing gradually on internal friction of the spring material and friction of the suspension joints till vibrations die

3.4 TAPE MOTOR

An audio tape recorder, tape deck, reel-to-reel tape deck, cassette deck or tape machine is an audio storage device that records and plays back sounds, including articulated voices, usually using magnetic tape, either wound on a reel or in a cassette, for storage. It its present day form, it records a fluctuating signal by moving the tape across a tape head that polarizes the magnetic domains in the tape in proportion to the audio signal.

Figure 3.4 Tape Motor

ELECTRICAL

Electric current flowing in the coils of the tape head creates a fluctuating magnetic field. This causes the magnetic material on the tape, which is moving past and in contact with the head, to align in a manner proportional to the original signal. The signal can be reproduced by running the tape back across the tape head, where the reverse process occurs – the magnetic imprint on the tape induces a small current in the read head which approximates the original signal and is then amplified for playback. Many tape recorders are capable of recording and playing back at once by means of separate record and playback heads in line or combined in one unit.

MECHANICAL

Modern professional recorders usually use a three-motor scheme. One motor with a constant rotation speed drives the capstan. This, usually combined with a rubber pinch roller, ensures that the tape speed does not fluctuate. Of the other two motors, one applies a very light torque to the supply reel, and the other a greater torque to the take-up reel, to maintain the tape's tension. During fast winding operation the pinch roller is disengaged and the reel motors provide the necessary power. The cheapest models use a single motor for all required functions; the motor drives the capstan directly and the supply and take-up reelsare loosely coupled to the capstan motor with slipping belts or clutches. There are also variants with two motors, in which one motor is used for rewinding only.

Specifications
1. High quality, low price.
2. Long life, low noise.
3. OEM, new design.
4. Smooth and quiet operation.
Typical applications:
1) Cassette Tape recorder
2) Audio
3) Other industrial equipment Packing:
200pcs/carton
Volume: 0.029cbm
N.W.: 15.5kg
G.W.: 16.0kg

Specifications:
Technical Characteristic(only for reference, we are capable of meeting the sourcingm needs of diverse buyer).

3.5 U-SLOT SENSOR:

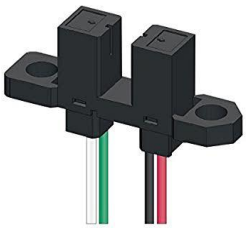

Figure 3.5 U-Slot Sensor

The slot sensors are U-shaped and the active face is located between the two arms. The sensor is actuated when an object passes the slot. Slot sensors detect laterally approaching targets reliably, regardless of their distance to the active face. Slot sensors, sometimes called optical fork sensors because of their "forked" shape, detect objects that pass between the two arms—one with the emitter, the other with the receiver. The fixed slot width provides reliable opposed-mode sensing of objects as small as 0.30 mm.

The ultra-small PM series of u-shaped photoelectric sensors provides a wide range of 29 different models to suit any of your application needs. With the industry's smallest size, the PM series plays a key role in the miniaturization of your equipment. All models are equipped with two outputs, one for *Light-ON* and the other for *Dark-ON* sensing. This increases the versatility of the sensor for use in existing applications. The series is also available in a connector type to maximize ease of installation and allow for wire replacement if the cable is severed. The PM series conforms to the European EMC Directive and carries UL Recognition.

3.6 RELAY

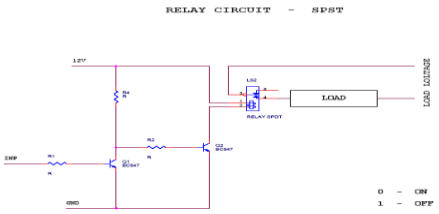

Figure 3.6 Relay Circuit

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Figure 3.7 Relay

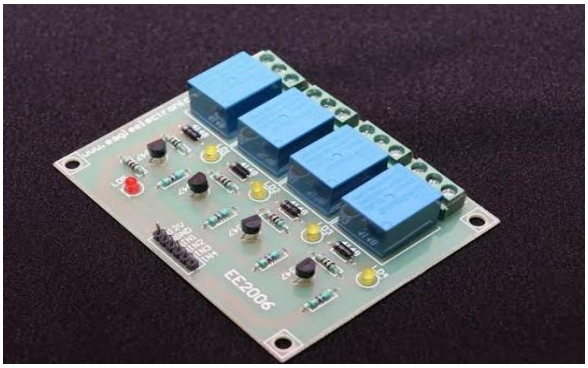

Figure 3.8 Relay

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relayDPDT.

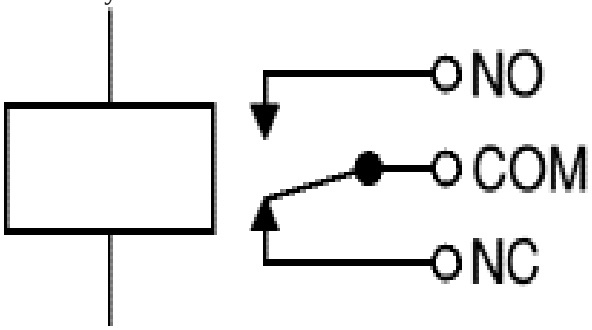

Figure 3.9 Relay

The relay's switch connections are usually labeled COM, NC and NO:

- COM = Common, always connect to this, it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.

4 .CIRCUIT DESCRIPTION:

This circuit is designed to control the load. The load may be motor or any other load. The load is turned ON and OFF through relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547). The relay is connected in the Q2 transistor collector terminal. A Relay is nothing but electromagnetic switching device which consists of three pins. They are Common, Normally close (NC) and Normally open (NO).

The relay common pin is connected to supply voltage. The normally open (NO) pin connected to load. When high pulse signal is given to base of the Q1 transistors, the transistor is conducting and shorts the collector and emitter terminal and zero signals is given to base of the Q2 transistor. So the relay is turned OFF state.

When low pulse is given to base of transistor Q1 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 transistor so the transistor is conducting and relay is turned ON. Hence the common terminal and NO terminal of relay are shorted. Now load gets the supply voltage through relay.

Voltage Signal from Relay Microcontroller or PC	Transistor Q1	Transistor Q2
Off 1	On	Off
On 0	Off	On

Table 4.1

4.1. CONTROL UNIT:

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems. It is finding using diverse area, starting from simple children's toys to highly complex spacecraft. Because of its versatility and many advantages, the application domain has spread in all conceivable directions, making it ubiquitous. As a consequence, it has generate a great deal of interest and enthusiasm among students, teachers and practicing engineers, creating an acute education need for imparting the knowledge of microcontroller based system design and development. It identifies the vital features

responsible for their tremendous impact; the acute educational need created by them and provides a glimpse of the major application area.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analogcomponents needed to control non-digital electronic systems.Some microcontrollers may use four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock

speeds and power consumption.

4.2. MACHINE COMPONENTS

The automatic gear changer in two wheelers- DC gun model is consists of the following components to full fill the requirements of complete operation of the machine.

- Tape motor
- U-Slot sensor
- Control unit
- DC gun
- Spring to Gear Box

DRAWING FOR AUTOMATIC GEAR CHANGER IN TWO WHEELERS BY USING SENSOR

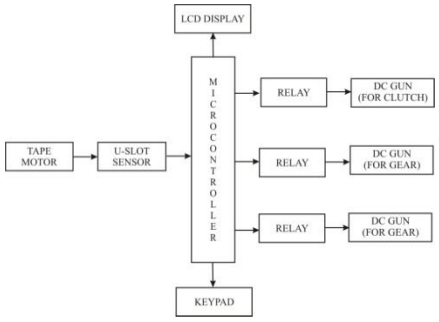

Figure 4.2 Concept Circuit Diagram

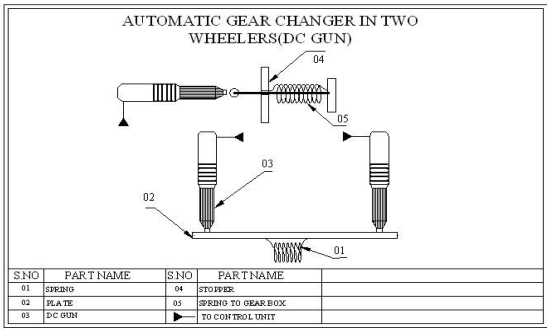

Figure 4.3 Design Concept 2d Model of Gear Shifting

5. WORKING PRINCIPLE

Here we have two dc gun arrangements which are arranged on either side of the vehicle pedal rest for applying the gear. The dc gun is fixed at the end of the flat pedal rest. The plate rest has pivot at the center. The guns are operated with the help of electric power supply and it is controlled by the control unit. One of the guns is used to apply the gear and another one for reducing the gears. The gears are applied on the vehicle depending up on the speed of the vehicle. The speed sensors are placed near the wheel the sensor sense the signal and give the output signal to the control unit. For this purpose, here we are using a tape motor with a U slot sensor such that the speed can be varied through the tape motor. Depending up on the signal the clutch and gears will automatically changed with the help of the control unit. When the vehicle speed increases automatically the clutch and the gear will change in the vehicles. The arrangement is clearly shown in the below diagram.

Field Test Results
i)Up Shifting Conditions
Table 5.1 Up Shifting Conditions

FIELD TEST RESULT					
SR.NO	INITIAL GEAR	PULES	SPEED	GEAR CHANGING	
				FROM	TO
1	First	16	12	First	Second
2	Second	24	24	Second	Third
3	Third	36	36	Third	Fourth
4	Fourth	48	50	No Shifting	

ii)Down Shifting Conditions Table 5.1

FIELD TEST RESULT					
SR.NO	INITIAL GEAR	PULES	SPEED	GEAR CHANGING	
				FROM	TO
1	Fourth	32	40	Fourth	Third
2	Third	18	24	Third	Second
3	Second	9	12	Second	First
4	First	4	1	No Shifting	

in production and mechanical engineering,(2015), Vol.1 , Issue 5.

REFRENCE

[1] Vishnu P R, Vishnu R. RatishR, Vinothkumar G, "Pneumatic Gear Transmission for Two-Wheeler", International Journal of Emerging Technology in Computer Science & Electronics, (2016), Vol. 2, Issue 1.

[2] Shivaprasad N,Dr A N Hari Rao ," Power assisted hybrid gear shifting System in automobile", International journal of advances

[3] M. S. Kumbhar,Prof., D. R Panchagade,"A Literature Review on Automated Manual Transmission (AMT)", International Journal for Scientific Research & Development, (2014),Vol. 2 , Issue 3.

[4] Romesh Makwana, Prof.RajnishKatarne," Analysis of Auto-Gear Shifting Mechanism on different Load Conditions", International journal of engineering sciences & research technology (2014), Vol. 3, Issue 8

[5] S. Vijay Kumar, P. Nithesh Reddy, P., Journal of Mechanical and Civil Engineering, (2014) 11(3), pp. 53-63.

[6] ZaiminZhong, GuolingKong, ZhuopingYu, XinboChen, XueingChen, XiangyanXin, 'Concept civilization a new invention selector of gear for automated manual transmissions', Mechanical Systems and Signal Processing, (2012) volume 31, pp. 316–331

[7] B Mashadi, A Kazemkhani, R BaghaeiLakeh, 'An automatic gear-shifting strategy for manual transmissions', Mechanical, device and Control Engineering, (2007) volume 221, pp.757-758.

[8] R. P. G. Heath and A. J. Child, 'Zero shift means gear shift in zero second his technique used for Automated Manual Transmission (AMT);(2007), SAE Paper No. 200726-061, pp.693-696.

[9] E Galvagno, M. Velardocchia, A. Vigliani, 'Analysis and replica of a torque assist of automated transmission', Mechanical Systems and Signal Processing, (91877–1886), volume 25, (2003), pp.

[10] Yoshinori Taguchi, Yoshitaka Soga, Akira Mineno, 'Development of an Automated manual Transmission mechanism base on sturdy Design',(2003) SAE Paper No. 200301- 0592, SAE World Congress, Detroit, Michigan, March 3.