

A Study on Cruise Control System for Two Wheelers using Pawl and Ratchet Mechanism

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ABSTRACT

Cruise control is a system to control the speed of motor vehicle automatically at certain speed. This is a servo mechanism that takes over the throttle of the vehicle to maintain a steady speed set by the driver, as it is an optional feature for high end variant cars. In this project we are going to implement cruise control concept for two wheelers, In order to avoid continuous acceleration for very long time when we are for long distance rides. We have planned to invoke this concept using electro-mechanical components like IR sensors, Driving mechanism (motor linkages) and pawl ratchet.

Keywords: Cruise control, Electro-mechanical devices, Pawl and ratchet, Arduino, Servo motor.

1. INTRODUCTION

In old method the throttle is manually operated. That is the rider should hold the throttle for a long time to travel in constant speed during long rides, the rider feels restless during long rides. The disadvantage of this old method is the rider doesn't experience the real comfortness while holding the throttle in stable position.

In this our main motive is to reduce the stress which is experienced by the rider, our working principle is automated once the rider releases the hand from the throttle the automated process starts to bring. The main advantage of this the rider can experience the real comfortness of the cruise control.

2. CONTROL COMPONENTS

The following components were used to construct the model of the project and evaluated.

2.1 Ultrasonic Sensor

The ultrasonic sensors are used to sense the presence of object with the distance of the object. It consists of transmitter and receiver the transmitter sends the signal towards the object the object reflects the signal to the receiver, the distance is calculated with respect to the time taken from transmission of the signal and receiving of the signal.

Ultrasonic sensors can detect association of targets and measure the distance to them. Sensors can have an on or off digital output for detecting the group of objects, or an analog output proportional to distance. It can detect the object within the sensing range. The sensing range can be calibrated with the help of a potentiometer. If an object is detected within the set area, the output will change state which is visualized by the integrated LED. Sonic waves are best reflected from hard surfaces.



Fig1. Ultrasonic sensor

2.2 Arduino

Arduino Uno is a type of microcontroller. It has 14 digital input/output pins, 8 analog inputs, a 12 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. This microcontroller is a programmable one. Several basic programs are existing in the help zone. The open source program helps to obtain the specific tasks easily.



Fig 2. Arduino

The Uno differs from all other Arduino boards because this board is produced with an inbuilt USB to serial converter.

“Uno” is an Italian word named to mark the upcoming release of Arduino 1.0. The concept is based on microcontroller board designs, manufactured by several vendors, using various microcontrollers. These systems consist of several digital and analog I/O pins that can be interfaced to various sensors and actuators even to other circuits. The boards feature serial communications interfaces, including USB on some models, for dumping programs from the computers. As like microcontroller C & C++ languages are used to program this device.

2.3 Servo motor

A servomotor is an actuator which is used to control linear motions and angular positions with velocity and acceleration. It can be used as a feedback device by interfacing a sensor. It is also a relatively sophisticated controller. This servo motor can also be used in place to replace the function of a stepper motor where the specific angle of rotation to be maintained for several periods of time. The function of a servo motor is based on the electrical pulses.



Fig 3. Servo motor

This servo motor replaces many motors and circuits to obtain the same application. This type of motors usually functions of DC supply were the control signals are easy to create at required values like ON and OFF duration to control the angle of rotation of the motor. At the same time servo motors doesn't required a separate circuit for control action.

24 Pawl and ratchet

Elastic parts are widely used to make the component. After the pawl is lifted off the end of the tooth and is pushed back by the spring, it will bounce against the wheel and the bouncing continues. Then, when another fluctuation came, the wheel could turn the other way, because the tooth could get underneath during the moment when the pawl was up.

Therefore a most important part of the irreversibility of our wheel is a damping or deadening mechanism which stops the bouncing. When the damping happens, of course, the energy that was in the pawl goes into the wheel and shows up as heat. So, as it turns, the wheel will get hotter and hotter. To make the thing simpler, we can put a gas around the wheel to take up some of the heat. Anyway, let us say the gas keeps rising in temperature, along with the wheel.

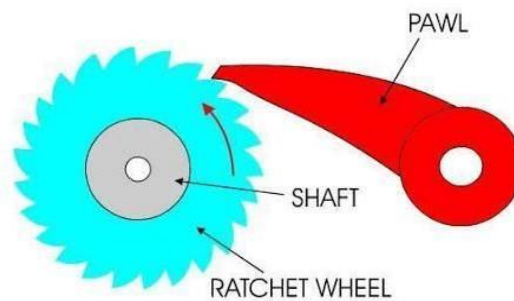


Fig 4. Pawl and Ratchet

25 Communication cable

USB stands for universal serial bus it was designed to standardize the connection of computer peripherals keyboards, pointing devices, digital cameras, printers and network adapters Standard USB 2.0 cable.

Use it to connect Arduino boards. The most general used is Male to Male type connector. There are almost twenty one class of USB cables are available which are differentiated based on their needs. Unlike the other buses USB connections are directed, with both to and fro of data and electric supply. This is used on electric power, with only downstream facing port providing power, this concept is chosen to prevent electrical overloads and damages of the equipment easily.

Thus, USB cables are produced with different type of ends. Therefore in general, each different format requires different types of connectors. USB cables have the plugs, and the corresponding receptacles are on the computers or electronic devices. In common practice, the A end is usually the standard format, and the B side varies over standard, mini, and micro.



Fig 5. USB cable

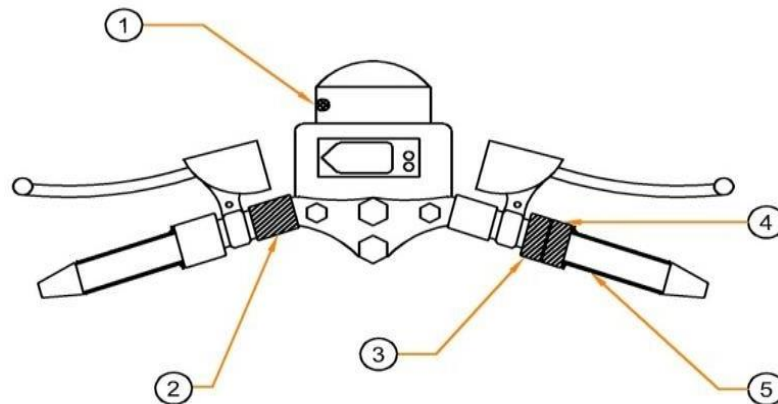
4. WORKING PRINCIPLE

Cruise control concept is advanced feature in order to improve driver comfort. When we are actuated to cruise control the speed of the vehicle gets to a constant speed. When we are on long ride we may feel bored or irritated while holding the Throttle continuously. So we will be actualizing this cruise control for two wheelers to make ease the driving and hassle free. In this project we are implementing a new feature. This concept will be of low cost and of simple working methodology.

We will instigate this cruise control concept with the help electro-mechanical components like IR sensors (infrared), Timer, Control unit, Motor linkage, Pawl and Ratchet.

When we are on a long drive this cruise control can be actuated .it delivers a constant speed and the Throttle gets to a constant position. Suppose in case of any obstacle the driver will be pressing the clutch slightly. The IR sensor present in the mount senses the action of it, and it automatically sends the signal to the control unit present near the throttle mount.

The control unit has a receiver and timer, and then motor rotates the cam connected to the motor. This rotation of cam will lift the pawl from the ratchet. So ratchet rotates and it decelerates and immediately the driver can apply brake and rest the motion of the vehicle.



PART NO.	NAME
1	IR Sensors
2	Receiver & Control Unit
3	Timer & Driving Mechanism
4	Pawl & Ratchet
5	Throttler

Fig 6. Block Diagram

5. CONCLUSION

The prepared mechanism has been successfully designed, developed and is executed for riding the two wheeled vehicle with full comfortless in desired speed during the long rides.

This is done with the help of mechanical components like pawl and ratchet and electrical components like, servo motor, circuit boards and sensor.

In future, we have planned to increase the sensing distance, and also planning to actuate this cruise control with the help off clutch lever and brake also. And will be implementing in tricycles.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.

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