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IDEA AND CREATION OF GYROSCOPE BICYCLE

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***Abstract*— This paper reports on the design and construction of a type of bike that can drive and measure without a passenger. The Automatic Balancing bike will use a control system to keep it from falling off while moving, and be able to driven. The aim of the project was to build a second type of bicycle that has the ability to balance itself using a turning wheel. This robot bike is able to drive and even stop completely without losing balance. In order to maintain balance, the robot reads the sensor input to detect the bending angle and responds precisely to maintain a vertical position. Sensor data is integrated into a control system that emits measuring torque from the motor that rotates the turning wheel. Requirements include that the bike must be able to accelerate, hit a straight line and stop without falling.**

***Index Term*- Gyroscopic Principle, IOT, Self- Balancing**

1. Introduction

Bicycles are a popular form of exercise, recreation, and travel for billions of people. They can also be used to provide physical therapy, as it is a low-level form of exercise that can train balance, strength, stamina and communication. Although one might consider cycling an easy task, this is not the case for most people. This includes young children, adults who have never learned to ride a bicycle, people who are injured, or people with a progressive or mental disability. A program that can provide balanced assistance to a cyclist without otherwise affecting the cycling experience can provide a great deal for these groups of people. Such a program can be used as a teaching tool, and as a physical therapy tool [1] – [2].

This bike balance problem is similar to what is known as an inverted Pendulum problem. A modified pendulum is a pendulum that weighs more than its port Pendulum can be anything that makes a simple weight and rod, in a complete system. While the normal pendulum is stable, the naturally modified pendulum is unstable, and must be well balanced in order to remain upright. In the program in the case of a bicycle, the bicycle is a solid body that can rotate its point of contact with the ground. Although cycling has many degrees of freedom, one type of movement that the project aims to stabilize is the angle of inclination around the point of contact with the ground in relation to the direction of gravity [3] - [4].

2. Methodology

The design of the flywheel uses a flywheel that rotates around an axis similar to the frame of a bicycle. This design mimics a bike like a pendulum with a fixed pivot where the wheels of the bike meet at the bottom. While the bike starts to fall in one direction, the car goes up to the bike applying torque to the flywheel, triggering the torque to turn the bike, which restores the balance of the bike [5].

The design of the flywheel has a few advantages. The design is very stable: the bike can balance even when standing. The mathematical model of this system is a small complexity of the designs considered. Due to the simplicity of the design, the model is likely to be very close to the reality of the three designs. As a result of doing simple and easy math to start and stop, the controller will be easily understood when used. This design would also allow the bike to move in a straight line with just a slight deviation [6] – [7].

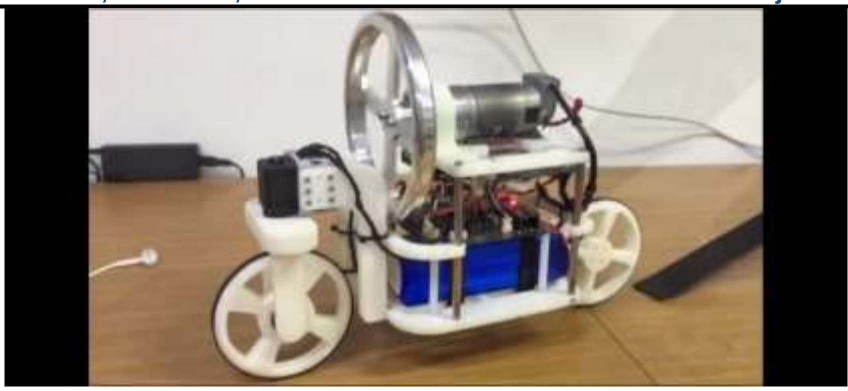

Figure: 1 Prototype model of gyroscopic based control system

2.1 Microcontroller

The microcontroller selected to control the balance of the bike is AT mega 16. The processing unit used is the Atmel ATMega16 microcontroller EEPROM flexible unit. It has four I / O (Input / Output) ports, an ADC (Analog to Digital Converter) board and a PWM (Pulse Width Modulation) that removes traffic control. It can be easily configured with low hardware requirements that make it very popular in robotics applications. Here it performs the following functions [8]:

- ADC modification of Rate Gyro and Accelerometer results.
- Input signal processing
- Occasional gyro reshaping
- Display of angle and other data.
- Operator unit control

Figure: 2 Internal control unit of prototype model

2.2 Actuator

As the bike tilts, we need to use regenerative force to return the robot to a vertical position. The pendulum wheel model is followed for measurement purposes.
The materials used are:-

- High torque 24V DC motor
- Iron turning wheel
- Driver L293D

To provide enough power for the flywheel, a very powerful car with a gear reduction is required. In order to select a car, a built-in frame and structural elements, as well as models for a simple opposed pendulum model, were included in the MATLAB simulation using Simulink. This simulation allows the team to determine the power, torque and velocity the car needs to deliver. To meet these requirements, we use a High torque 24V DC motor.
A capacitor connected to all motor cases and discharges during open or closed sequence, thus behaving as a connector. Motor-generated torque is a function of the normal current value provided in it. It seems obvious that once we have an angle we can swap the flywheel as fast as it can, but that won't do the job. Once that is done it will actually happen that when there is a tendency the bike will fall into a pointless place and reach the other side until it is the same twisting turn. To fix this we need some kind of algorithm that can slow down this movement from time to time and stabilize it in your area over time. This is where the PID (Proportional Integral and Derivative) controller works.

2.3 Gyroscopic Torque

Change in Angular momentum is given by:]

$$= o\,x' - o\,x = x\,x' = o\,x\,.\,\delta\theta \ldots \text{(in the direction of } x\,x'\text{)}$$

$$= I.\omega.\,\delta\theta$$

And rate of change of angular momentum:

$$= I.\omega.\,\delta\theta/\,dt$$

Torque applied to the disc causing the disc precession is given by:

$$T = \lim_{\delta t \to 0} I\omega.\,\delta\theta\,/\delta t = I.\omega.\,\delta\theta/\,dt$$

$$= I.\omega.\,\omega p \ldots(\therefore d\theta/\,dt = \omega p)$$

From above equation, we get to know that torque we can generate on bike to balance is given by product of moment of inertia of rotating mass, angular velocity of rotating mass and angular velocity of tilting motion of the mass.

This concept is based on Newton's first law of motion i.e. every object tends to be in steady state or in the state of motion unless and until it's acted by another force to change its state.

Therefore, rotating mass of the gyroscope resists the tilt of the wheel which results in the formation of gyroscopic couple.

3. Result

From this research paper, we can conclude that, a CMG can be used very effectively on bikes for self balancing purpose inspired from ships and airplane. An enclosed bike is possible because of this technology which can make the ride more and more comfortable because of car like feature (like air conditioning) in it.

4. Conclusion

This paper focuses mainly on the basket using the reaction wheel pendulum. The sloping details of the axis folding obtained by the combination of the sensor of the corresponding filter between the gyroscope and the accelerometer. The simplest PID controller has been used to wrap the alignment direction. Focuses on the use of bicycles, or the provision of pedestrian spaces. However, many college areas also experience traffic congestion, parking difficulties and pollution from mineral-fueled vehicles. It seems that pedal power alone is not enough to replace petrol and diesel vehicles so far, so it is an opportunity to investigate both the reasons why the continued use of unfriendly vehicles continues, and to look at possible solutions. This paper presents the results from a year-long study of the efficiency of electric bicycles on a large tropical compass, identifying obstacles to cycling that can be overcome by the availability of public bicycles.

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