

Mechanical Aspect & Speed Control of Ball Throwing Machine for Tennis Ball for Cricket Practice

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Abstract-Science is basically passive observation of the universe as it exists to generate knowledge and Engineering is making use of that. Engineers always look upon the problems from technical point of view. The human body cannot perform the task with the exact accuracy. Hence, there is a need for a ball throwing machine. For this machine need two rigid wheel coated with rubber. In proposed work, wheels are coated with elastic material. Two high speed AC motors has been used. Two wheels are also brought in use, mounting over the motors. The speed of the two motors for driving the wheels varied by using a PWM with microcontroller. PWM is the process of switching the power to a device on and off at a given frequency. Microcontroller based electronic controls are provides for controlling the speeds of rotation of each wheel.

Keywords-Bowling machine, PWM- Pulse Width Modulation, tennis ball, microcontroller, SCR-Silicon Control Rectifier, MOSFET-Metal Oxide Semiconductor Field Effect Transistor.

I. INTRODUCTION

Today cricket is one of the most popular game in India and abroad. The concept of the cricket ball throwing machine provides accurate and consistent batting practice for cricketers of all standards. This machine provides batting practice for player of school, club and junior level cricketers. It is very much useful to the batsman who can use it as part of their regular practice without necessity of bowler.

The batsman requires the bowler to bowl at a particular line and length as per his needs. Sometimes the bowler is able to bowl at that spot, but more than often the bowler may not to bowl at that perfect spot. Thus, it can be easily seen that the human body do not perform the task with the exact accuracy, as required. So there is a need for a ball throwing machine which can bowl perfect line and length [1]. A human do not bowl at an exact same pace continuously. This problem is also resolved with the help of the bowling machine. The speed required by batsman is set in the machine and it will face the required speed ball continuously [2].

The main mechanism of working in this machine consists of two spinning wheels, each driven by its own

motors. The tennis ball is fed into the gap between two wheels and the gap is slightly less than the diameter of the ball. This complete assembly is mounted on the stand, at such a height as to simulate the delivery of bowler of average height. There are number of ball throwing devices in abroad which is generally fall into following categories: i) pneumatically operated machine, ii) spring operated machine, iii) one or more wheel machine. However, each category of ball throwing machines mentioned their advantages, disadvantages and obviously there are few limitations [1-6].

The pneumatically operated ball throwing devices uses a compressor actuated by motor to produce highly compressed air into throwing pipe. This type of ball throwing devices occupy a lot of space, which is not economical. The spring operated type devices employs a striking and throwing mechanism consisting of either elastic or a spring to throw the ball. In this device, it is difficult to control the mechanism of ball throwing. The third type of ball throwing device is one which is operated by the action of one or more wheels mounted over the motors. The ball is delivered when it is contact with the rotating wheels.

Generally, the rotating wheels of ball throwing machine consist of fiber wheel. The fiber wheel is small in size and hence the contact surface between ball & wheel is less. Also, the large size fiber wheel is available in the market but strength of wheel is not good. Casting the wheel is the way to improve the machine but the cost is much more. Hence, proposed system was used the tire of small cycle which is lower in cost. This wheel was sustain more load than the fiber wheel and capable to throw the ball approximately 150 km per hour.

II. METHODOLOGY FOR THROWING THE BALL

Author said, there are two wheels with rubber or foam type material which are mounted over the respective motors. The spoke of a wheel is remove and place a solid material which can hold the motor vibration. The following figure that, the wheel which is operated at the lathe to fix in motor shaft. After the operation of lathe, its outer surface is coated with rubber material for better contact to ball [3-7] as shown in the fig. 1.



Fig. 1 Lathe Work of Wheel

When the two wheels are rotated with the help of motors, the ball is delivered from between spacing of the two rotating wheels [6-8]. The gap between the two rotating wheels is slightly less than the diameter of the ball. The diameter of the tennis ball is of different types. It varies from diameter as 6.54 cm to 6.86 cm and the masses in the range of 56 g to 59.4 g. The average diameter of a tennis ball for playing cricket is 6.7 cm and the mass is 57.7 g. So, the gap is slightly less than 6.7 cm as shown in the fig. 2.



Fig. 2 Wheel with Rubber Coating

III. DIFFERENT SPEED OF THE BALL

Modern and advance technologies are increasing day by day. Automation results into better quality, increasing the production and reducing the costs and that's why increase the efficiency. The speed of the ball is totally depends upon the speed of the rotating wheels. Also, the speed of the wheels is depend upon the speed of the motors. So, we would say that speed of the ball varies according to the speed of the motors.

The variable speed drives, which was control the speed of the AC as well as DC motors. They are controlling element in the automation system. Depending on the applications, some of them are fixed speed and some of the variable speed drives. In the electrical system, the speed is controlled by using modern power electronics applications. The variable speed drives, till a couple decades back, have various limitations, such as poor efficiencies, large space, lower speed, etc. However, the power electronic devices such as SCR, MOSFETs, etc., with the microcontrollers have variable speed drives system. This systems are small in size and very efficient. The Pulse Width Modulation is a method for binary signals generations, which has two signals periods high and low [9]. Pulse Width Modulation speed controls works by driving the motors with the series of "ON-OFF" pulses and varying the duty cycle. The fraction of time, the output voltage is "ON" compared to when it is "OFF", of the pulses while keeping the frequency constant. As the part of microcontroller concerned ports of the controller are not very sufficient to drive the motors. So, there is a requirement of the 'Driver'. The microcontroller can change the speed of the ball with the help of adjustable voltage regulator. Regulator is the element that control or regulate the speed. According to mood of batsman, batsman can change the speed of the ball by microcontroller with the help of the adjustable voltage regulator. The following figure shows the adjustable voltage regulator.



Fig. 3 Adjustable VoltageRegulator

On the regulator, we can mark the type of speed and according to that he/she change the speed by adjusting the knob of regulator.

IV. ADVANTAGES OF MICROCONTROLLER

- It is flexible to more function can be perform and easy to modify the codes of programming.
- It gives faster speed and low time required for performing the operation and high data transfer rate.
- It memorize the program, once the microcontrollers are programmed then they cannot do not be programmed, etc.

V. CONCLUSION

In the proposed work, the ball throwing machine will deliver the ball through the two wheels. Also, the ball is deliver with different speeds are possible with the help of microcontroller. The machine is compact and efficient.

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