"Sphero"- Entertainment Robot

Prof. Yogesh S. Sharma, Mr. Mayank Jain, Mr. Saurabh Kshatriya, Mr. Yash Sharma, Mr. Yash Sharma, Mr. Yash Ganorkar, Mr. Anshul Dumre, Mr. Aman Palsapure

Asst Professor SBJITMR, Nagpur
Student B.E. Dept of ETC SBJITMR, Nagpur
Student B.E. Dept of ETC SBJITMR, Nagpur
Student B.E. Dept of ETC SBJITMR, Nagpur
Student B.E. Dept of ETC SBJITMR, Nagpur
Student B.E. Dept of ETC SBJITMR, Nagpur
Student B.E. Dept of ETC SBJITMR, Nagpur

Abstract: This paper deals with the design & control of a spherical robot, as robots are being evolved from the last century and still evolving in the different domains. Robotic characteristics like locomotion, controls, sensing etc are still developing. In recent years locomotion of robots is implemented by spherical robots. Rotation of the sphere generates spherical motion. This spherical motion can be achieved by analysis, experimentation and approximate modeling by using one of modeling mechanism like pendulum mechanism.
Keywords: Synchronization, pendulum, Spherical robot.

I.   Introduction

In today's world, many of robots are being inspired by nature that contributes to the field of bio-inspired robot development in robot has helped humans in the hazardous environment and for surveillance also it also deals with the automation of machines. The Sphero is made purely for entertainment purposes and for the purpose of the study of synchronization between the robots for the future perspective so that the self-balancing entertainment robot could be transformed a helping hand to mankind which will be able to not only entertain the user but also to become a user-friendly robot.

This study between two robots will help us to understand not only the communication in between the robot but also the mechanism of the spherical robot and self-balance itself lead it to another level. The predefined & user defined pattern of Sphero will lead it to create and different impact on the user as it will totally different from the robots that are being already available in the market.

II.   Related Work

The research on spherical robot has been started in the late '90s through the work of Halme et al. Thereafter various propulsion mechanisms have been devised. These include internal car-based models, two independent rotating hemispheres, pendulum mechanism, center relocation of gravity, wind power, self-deformation. The first spherical robot was developed by Halme et al. Firstly we were using the car-based mechanism The main disadvantages of the car-based mechanism is that motion is not instantaneous, collision causes loss of contact or even flip over of the car; the precise motion was not possible due to internal slippage and flip flop of the car. But finally, we are using a pendulum mechanism for the prototype of the Sphero. The pendulum machinery has been used by many researchers for its simplicity, easy to design nature. In Sphero we have developed a design that involved a set of two mutually perpendicular rotors attached to the inside of a sphere. The sphere is amassed in two halves, with each half comprising a motor and rotor. There are two main motors driving the counterweight to rotate about the horizontal axis and the vertical axis, as shown in Fig1.

III. Preferred Design

Two motors are referred to as motor:

1(N1) and motor 2 (N2). N1 generates the driving torque about the vertical axis to make the sphere roll along the straight line and N2 generates the leaning torque about the horizontal axis to make the sphere to turn. The main attention during the design phase was how to poise the masses about the axes so as to maintain the neutral equilibrium while the robot is not in motion. When N1 rotates around axis Xb and N2 is static, the rotation of the pendulum and the shaft around axis Xb changes the gravity center of the robot and produces a severity torque that makes the robot transfer forward or backward. When both N1 and N2 rotate, the pendulum and the axle will tilt and produce a gravity torque to make the robot turn. Subsequently, driven by two motors,

the spherical robot can move and turn as estimated. Therefore the motion of the robot can be precise by monitoring these two motors.
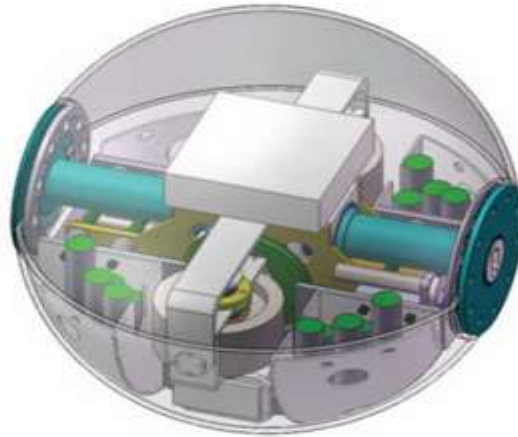
Fig 1: Block Diagram of Sphero

IV. Applications

- Entertainment
- Personal Assistance
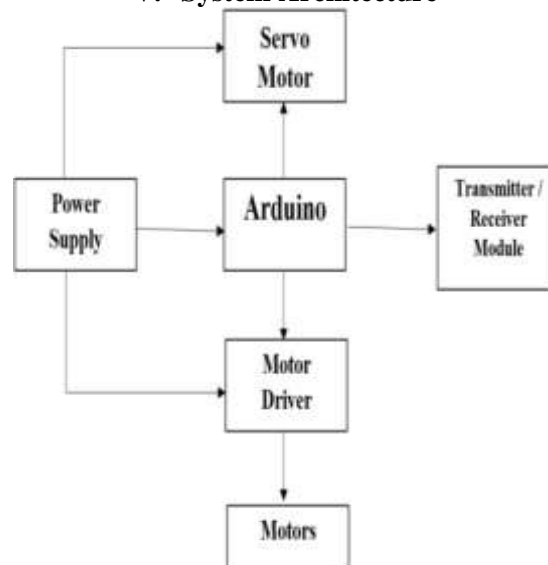- Surveillance

V. System Architecture

Fig 2: Block Diagram of Sphero

After the detailed study of all the purpose and requirements, the Sphero is being brought into project form it will be used as an entertainment purpose robot and a friendly robot to mankind.

The main component used in the project is:

1. Arduino Uno
2. Transceiver module
3. Servo Motor
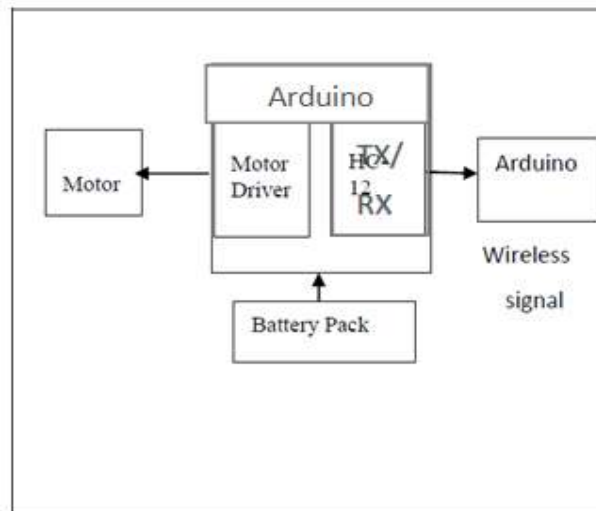4. DC Motors
5. Motor driver
6. Battery Pack

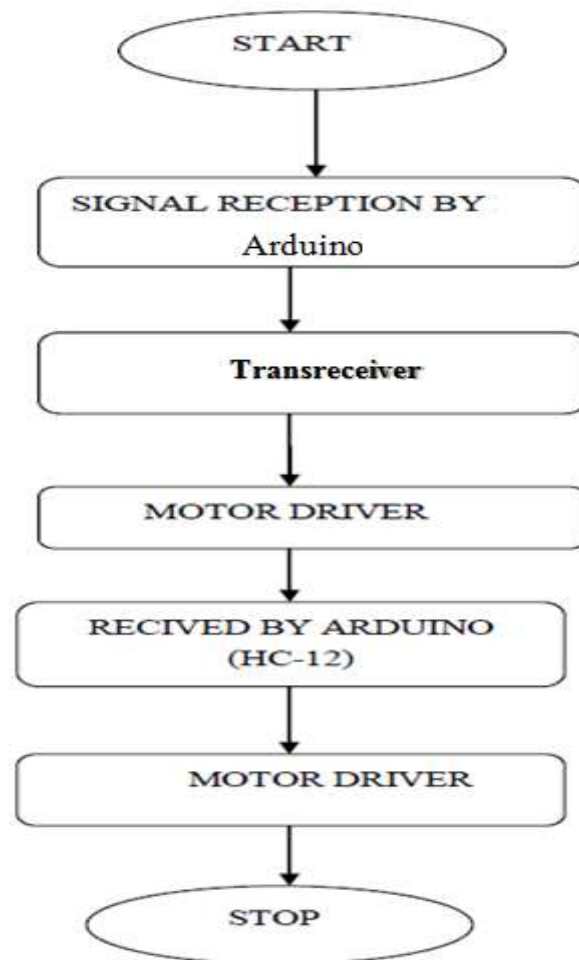**Fig 3:** Block dig of wireless communication between Master and Slave

Fig 4: Flowchart of wireless communication between Master and Slave

VI. Conclusion

The conclusion of work carried on two robots is that they work in synchronization with each other. These two robots are synchronized with the help of transmitter & receiver.

Both the robots are programmed as master and slave, the salve follows the same pattern as the master does. Robots are made for entertainment purposes & with further modifications, it can be used as a personal assistant.

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