

Operating Smart Ping Pong Robot from a Remote Distance Using IR Sensor

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Abstract— The paper deals with the operating a smart ping pong robot from a robot distance using IR sensor. Usually, the player may feel tired to on/off the robot manually where the player has to come from remote distance to operate it. In order to overcome this problem we have designed an IR sensor for the operation of smart ping pong robot, so that the player can on/off the robot from a remote distance. Smart Ping Pong robot throws the ball one by one towards the player or opponent. This robot is specifically used for table tennis game. This robot is controlled from remote distance using a remote control which is operated in the principle of Infrared (IR).

Key words: Ping Pong, IR Sensor, Table Tennis, Remote Controller

I. INTRODUCTION

A robot is a machine that gathers information about its environment (senses) and uses that information (thinks) to follow instructions to do work (acts).

This is the working definition of robots that Robotics exhibit developers used for this exhibit. Today technology is changing at incredible rates making the identification of a robot somewhat difficult. Things that we use every day incorporate features beyond those of early robots.

A robot can be controlled by a human operator, sometimes from a great distance. But most robots are controlled by computer, and fall into either of two categories: autonomous robots and insect robots. An autonomous robot acts as a stand-alone system, complete with its own computer (called the controller). Insect robots work in fleets ranging in number from a few to thousands, with all fleet members under the supervision of a single controller. The term insect arises from the similarity of the system to a colony of insects, where the individuals are simple but the fleet as a whole can be sophisticated.

The term comes from a Czech word, *robota*, meaning "forced labor." The word robot first appeared in a 1920 play by Czech writer Karel Capek, R.U.R.: Rossum's Universal Robots. In the play, the robots eventually overthrow their human creators.

Nowadays, robots do a lot of different tasks in many fields and the number of jobs entrusted to robots is growing steadily. That's why in my opinion one of the best ways how to divide robots into types is a division by their application.

Robots have long captured the human imagination. But despite many advances, robots have yet to reach the potential so often envisioned in science fiction. Today's engineers and computer scientists are still pursuing one missing ingredient: high intelligence. It would be nice for example, if robots possessed the intelligence needed to cope with uncertainty, learn from experience and work as a team.

II. INFRARED SENSOR

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

An Infrared (IR) sensor is used to detect obstacles in front of the robot or to differentiate between colors depending on the configuration of the sensor.

Infrared radiation is the position of electromagnetic spectrum having wavelength longer than visible light wavelength, but smaller than microwaves, i.e, the region roughly from 0.75 μ m to 1000 μ m is the infrared region.

III. WORKING PRINCIPLE OF INFRARED SENSORS

All objects which have a temperature greater than absolute zero (0 kelvin) posses thermal energy and are sources of infrared radiation as a result.

Sources of infrared radiation include blackbody radiators, tungsten lamp and silicon carbide. Infrared sensor typically use infrared lasers and LEDs with specific infrared wavelengths as sources.

A transmission medium is required for infrared transmission, which can be comprised of either a vacuum, the atmosphere or an optical fiber,

Optical components, such as optical lenses made from quartz, CaF₂, Ge and Si etc are used to converge or focus the infrared radiation. In order to limit spectral response, band-pass filters can be used.

Next, infrared detectors are used in order to detect the radiation which has been focused. The output from the detector is usually very small and hence pre-amplifier coupled with circuitry are required to further process the received signals.

IV. SMART PING PONG ROBOT

Basically, any sport needs two player or two team in order to play the game but unfortunately one player may feel interested to play but other may not. In order to overcome this uncertainty we have designed a robot specifically for

table tennis game. It has a single degree of freedom. This robot throws the balls automatically in the interval of 1 second where the player will be playing against this robot. Existing table tennis robot has been designed using a microcontroller and some other programming unit. But in order to reduce the cost and complexity we have designed a Ping-Pong robot using mechanical parts. Crank shaft piston is used as a Manipulator which is excited or driven by a 12volt DC supply (actuator). A wheel is used as an end-effector which throws out the ball very fast. The ball will fall on the table tennis board and pitch toward the player. Major components used in our design are: DC motor, PVC pipe, DC wiper motor, wheel, basket.

Dc motor is used to energize the crank shaft (Manipulator) which moves back and forth and pushes the ball outward to the end effector. Specifications of this motor are: 12volt, 1A, 2000 rpm.

DC wiper motor is used to rotate the metal disc, which is allowed to rotate the disc in an angle of 180 degree. By this mechanism we get one degree of freedom. Specifications of this motor 12volt, 40w, 1-1.5A, 40 rpm.

PVC pipe is used for the piston action, and it is used to feed the balls. It also acts as the passage for the ball to be outwardly delivered. Mild Steel of 3inch thickness and 225 diameter is used as the end effector which is rotated in this mechanism and it rotates the disc at an angle of 180 degree. The Mild steel of 6mm thickness is used as the base that holds the whole body.

V. REMOTE CONTROL USING IR SENSOR

In many home appliances, IR sensor is used to make ON/OFF the TV, VCD, or DVD remote control.

The 38 kHz infrared (IR) rays generated by the remote control are received by IR receiver module TSOP1738 of the circuit. Pin 1 of TSOP1738 is connected to ground, pin 2 is connected to the power supply through resistance R5 and the output is taken from pin3. The output signal is amplified by transistor T1 (BC558).

The amplified signal is fed to clock pin14 of decade counter IC CD4017 (IC1). Pin8 of IC1 is grounded, pin 16 is connected to LED1 (red), which glows to indicate that the appliance is off.

The output of IC1 is taken from its pin2. LED2 (green) connected to pin 2 is used to indicate the 'ON' state of the appliance. Transistor T2 (BC548) connected to pin2 of IC1 driver relay RL1. Diode 1N4007 (D1) acts as freewheeling diode. The appliance to be controlled is connected between the poles of the relay and neutral terminal of mains. It gets connected to live terminal of AC mains via normally opened (N/O) contact when the relay energises.

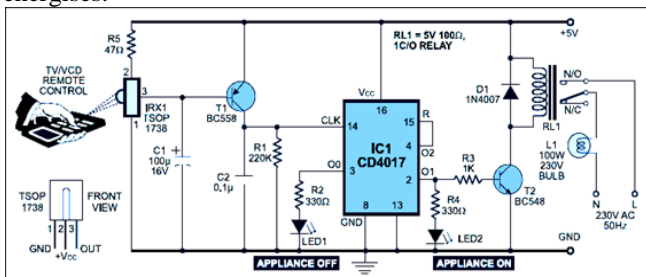


Fig. 1: Circuit Diagram for IR Remote Control

VI. SMART PING PONG ROBOT WITH IR SENSOR

Usually the table tennis table will be of 2.74m long where the robot is placed at one end and at other end player will play against the robot. Player may feel tired to come and on/off the robot. In order to overcome this difficulty faced by the player, we have proposed a method to operate the robot using a remote control from remote distance. The working principle of Remote control is based on the principle of IR sensor.



Fig. 2: Smart Ping Pong Robot

In fig 2, the smart ping pong robot is shown, where the IR circuit is connected to the robot. When it receives a signal from remote it gives supply to motors which are connected to IR circuit and that operate the robot.



Fig. 3: IR Circuit

VII. CONCLUSION

The central result of our research is that to operate the smart ping pong robot from a remote distance. Thus, we have designed remote control circuit for smart ping pong robot which has overcome the problem faced by the other robots that has been designed in electronic platform. Thus by this method, we have achieved a robot with remote controller that's gives high performance at low cost compared to other robots. Thus, our proposed method will be helpful for the table tennis player to operate the robot. By our proposed method, the player may not feel tired to operate the robot.

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