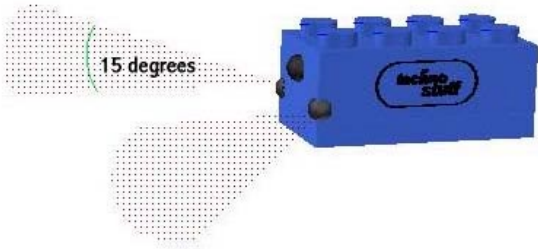


User Guide for the Dual Infrared Proximity Detector.

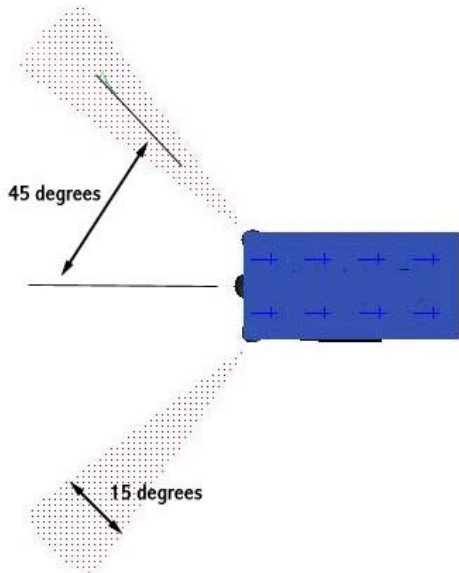
What is a D-IRPD Sensor ?

The Dual Infrared Proximity Detector is a sensor for the Lego® Mindstorms™ Robotic Invention System. The D-IRPD senses when it is close to a large object. Your program can use this information to avoid a collision or to find an object. The sensor uses TV remote control technology. It works by sending out infrared light, and looking for IR light reflected back. Infrared is like normal light, except you cannot see it with you eye. There will be no visible indication when the sensor is operating.

Mounting the Sensor.



The D-IRPD sensor looks in two directions at the same time. The sensor output depends on whether it “sees” an object with it’s left eye, right eye, or both eyes. When mounting the sensor, be sure there are no parts of your robot within the sensor’s field of vision. If you mount the sensor too close to the floor, it will see the floor all the time.



Check your Batteries

The IRPD sensor requires fresh batteries in your RCX. To check your batteries, go to the Lego Main Menu and select “getting started”. Select “Set Up Options”. Place the cursor on the green battery symbol. After a few seconds it will show the battery voltage. The voltage must be at least 8.0 for proper sensor operation..

Testing the Sensor

Remove all sensors from the RCX. Create and download the simple program shown below.



Mount the D-IRPD sensor, and two lamps, as show below. If you do not have two lamps, use motors as indicators.



Run the program. Move your hand in front of the sensor to turn on the lamps. When the sensor sees an object, it will turn on the corresponding lamp. If the lamp flickers on and off, you probably have weak batteries.

Sensor Output Values

The D-IRPD must be programmed as a light sensor. It returns the following approximate values:

- 75 No object detected.
- 48 Object on right.
- 22 Object on left.
- 0 Object straight ahead.

The output value may vary slightly as your battery voltage drops. Make your program respond to a range of values, as show in the test program.

Range

The range of the D-IRPD sensor depends on the amount of infrared light reflected by an object. A white wall is detected at a minimum of five inches away. Color and object size may reduce the detection distance. Use the test program to map the detection distance for different angles and objects. Hint: once an RCX sensor port has been programmed as a light sensor, you can use the "View" button to read the sensor value.

Interference

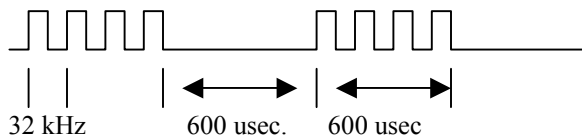
Because the sensor uses TV remote control technology, it will receive signals from other devices that use the same technology. These external signals could produce incorrect distance readings. The sensor also produces infrared light. Light from the sensor can disrupt communication between the RCX and the tower.

Devices that might produce interference are:

- Communication from Mindstorms RCX or Tower.
- Other Infrared distance sensors or beacons.
- Remote control devices for TV, etc.

Technical Description

The dual IR Proximity Detector uses the same technology found in a TV remote control device. It sends out modulated infrared light, and looks for reflected light coming back. When enough light is received back to trigger the detector circuit, the circuit changes binary state. The two LEDs alternate in producing light. When active, a LED puts out a string of modulated square waves. The carrier frequency is 32 kHz. as shown in the following drawing. The pulse string alternates between LEDs. A microprocessor correlates the receiver circuit with LED activity, and sets the Mindstorms return voltage.



Example: Collision avoiding robot.

This robot will avoid walls and beverage cans. If you lower the sensor to the bottom of the RCX, it will avoid balls on a pool table.



Start with the program shown below. The first sensor watcher causes the robot to turn left or right when it sees an object on one side or the other. The second sensor watcher makes the robot back up and turn when it sees an object straight ahead.



This program has some interesting behavior. Try it, and observe the results. Then see if you can "fix" the program.

Other projects

1. Make a car that goes from one room to another.
2. Make an animal that crawls into a corner and sleeps.
3. Make a burglar alarm.

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