ScienceCube

Sending Signals Using Light

Learning Objectives	Understand and explain the principles of a remote control using a light sensor.
Should I think about it?	What are the methods of sending signals using light intensity?

Learning Content

Dad, how does a remote control work?

Light comes in many colors. The ones visible to our eyes are the seven colors of the rainbow, but there are also lights that are invisible to the human eye.

Invisible light?

Yes, it's called ultraviolet (UV) and infrared (IR) light. Ultraviolet light, which comes right after violet in the spectrum, has a very short wavelength. You've heard of using sunscreen to block UV rays, right? That's the light I'm talking about

Oh, I've heard of that. What about infrared light?

Infrared light is what comes out of the remote control. Although it's invisible to the human eye, the infrared light from the remote control reaches the TV and changes the channel or adjusts the volume.

How can infrared light turn on the TV and change the channel?

The TV differentiates channels by the frequency or intensity of the light pulses. Because light travels very fast, the channel changes as soon as you press the remote control button. The TV has a part that receives the infrared light from the remote control. If there's something blocking it, the infrared light won't get through, and the TV won't respond. So, it's good to keep the area in front of the TV clear!

Oh, I see! I shouldn't put anything in front of the TV then!

Light Sensor

The sensor has a light-sensing element in the center, so the sensor should face the light source directly, and the experimental setup should ensure the sensor and light source are at the same height.

Experimental Activities

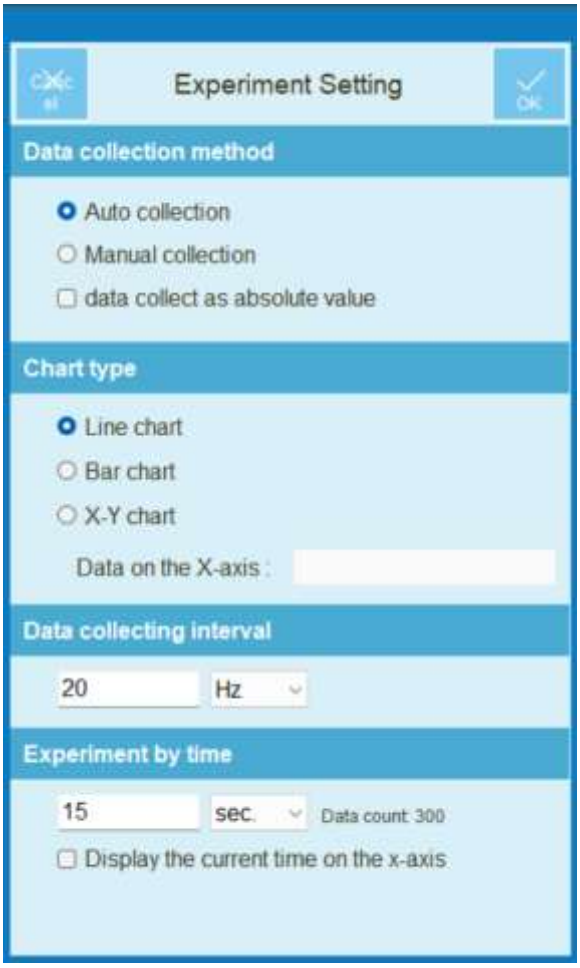
Materials Needed

Interface, Science# program (smart device), Light sensor, Remote control

Experiment Procedure

Setting up the Equipment

1. Run the Science# program on the smart device and connect it to the powered-on interface via Bluetooth or cable.
2. Connect the light sensor to the interface..
3. Press  in Science# to set up the experimental environment as shown below (the setup will be automatic when you press the button).



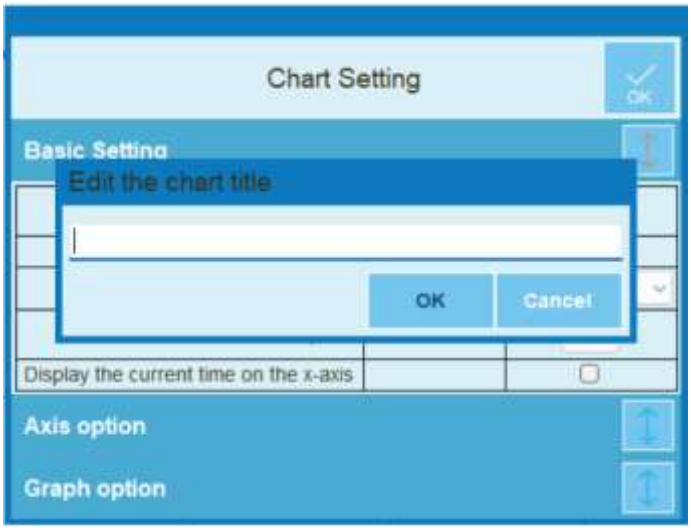
Conducting the Experiment

1. Align the remote control with the center of the light sensor and place them close together.

2. Press the button  while the remote control and sensor are in close contact and wait

until the experiment ends.

3. Press and label the chart title as "Before Operation."



4. Using the same method, press various buttons (1 to 3) on the remote control, measure the light intensity with the light sensor, and record the button numbers in the chart titles.

Experimental contents

1. Measure and compare the light intensity before and after operating the remote control and graph the results.

[Before Operation]

[Button 1]

[Button 2]

[Button 3]

2. Find the light intensity before operating the remote control and the maximum light intensity when each number button is pressed, and record them in the following table.

Category	Before Operation	Button 1	Button 2	Button 3
Light Intensity (lux)				

Experimental results

1. Describe the differences in light intensity before and after operating the remote control, as well as when pressing each number button.

2. Based on the experimental results, explain the principle of how the remote control works.

3. Find devices in our daily lives that use light to send signals.


Report
(For Teachers)
Report
(For Students)