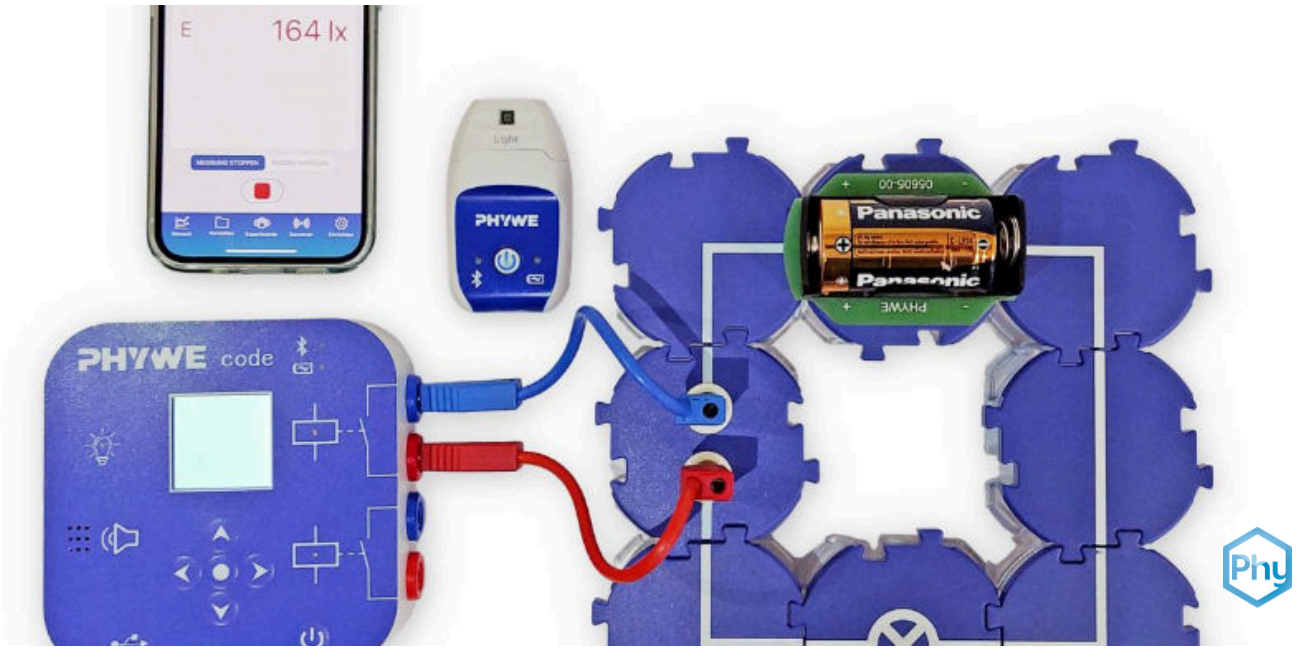
Lighting control with Cobra SMARTsense Code



Physics > Light & Optics > Dispersion of light

Difficulty level	Group size	Preparation time	Execution time
easy	-	10 minutes	10 minutes

This content can also be found online at:

https://www.curriculab.de/c/673cb34bb77f00000281bbbf

PHYWE
Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

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Teacher information

Application

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Experimental setup

Lighting control enables intelligent adjustment of lighting conditions in different environments to improve comfort, energy efficiency and safety.

By using sensors and control technologies, light intensity, colour temperature and switch-on times can be automated or individually adjusted. Such systems are used in smart homes, offices and public spaces.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
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Other information (1/2)

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Prior knowledge

No specific prior knowledge is required. It is advisable to have some experience with the measureAPP.

Principle

This experiment deals with the control of lighting depending on the brightness of the surroundings. In the experiment, the lamp switches off when a freely selectable light intensity is exceeded and vice versa.

Other information (2/2)

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Learning objective

Students are introduced to the basics of programming a lighting control system. The trigger function of the measureAPP is used for this.

Task

Measure the brightness in the room and programme the switching of a light source depending on the room brightness.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
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Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

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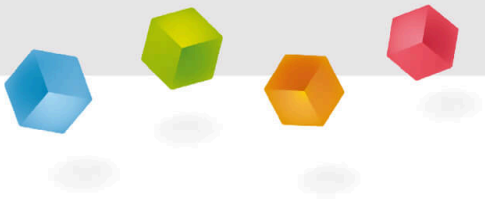

Student information

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Robert-Bosch-Breite 10
37079 Göttingen

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Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Motivation

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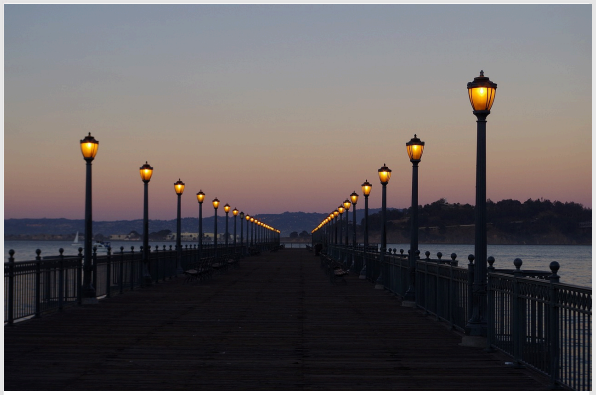

Lanterns as an example of lighting control

Lighting control is an exciting topic that can be found everywhere in everyday life - from smart homes and street lighting to modern offices.

With this experiment, you can experience for yourself how technology makes our lives more comfortable and energy-efficient. You will learn how sensors and controls work together and can develop your own smart lighting!

Tasks

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Experimental setup

Measure the brightness of the room with the Cobra SMARTsense Light Sensor and programme intelligent lighting control using the measureAPP trigger function.

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Robert-Bosch-Breite 10
37079 Göttingen

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Equipment

Position	Equipment	Item no.	Quantity
1	Cobra SMARTsense Code - Output device for switching relays, LEDs, display	12953-00	1
2	Cobra SMARTsense Light - Sensor for measuring illuminance 0 ... 128 kLx (Bluetooth + USB)	12906-01	1
3	Cable module, angled, SB	05601-02	4
4	Line module, interrupted with sockets, SB	05601-04	1
5	Cable module, straight, SB	05601-01	1
6	Lamp socket E10, SB	05604-00	1
7	Battery holder (type C), SB	05605-00	1
8	Bulbs 1.5 V/0.15 A/0.22 W, E10 base Set of 10 bulbs	06150-03	1
9	Battery Baby cell, 1.5 V (type C), R14 (IEC type), pack of 2	07400-00	1
10	Connecting cable, 32 A, 25 cm, red Experiment cable, 4 mm plug	07360-01	1
11	Connecting cable, 32 A, 25 cm, blue Experiment cable, 4 mm plug	07360-04	1
12	measureAPP - the free measurement software for all end devices	14581-61	1

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Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
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Setup (1/3)

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Cobra SMARTsense Light, Cobra SMARTsense Code and the measureAPP are required to measure brightness and control the circuit. The app can be downloaded free of charge from the App Store - see below for QR codes. Check whether Bluetooth is activated on your device (tablet, smartphone).

measureAPP for Android operating systems

measureAPP for iOS operating systems

measureAPP for tablets / PCs with Windows 10

Setup (2/3)

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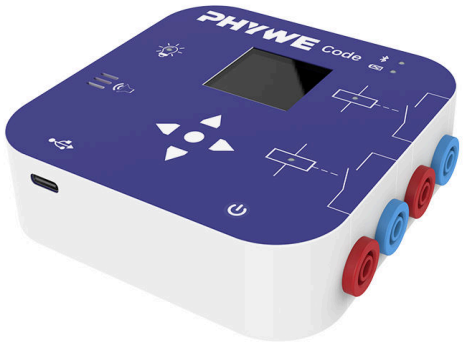

Cobra SMARTsense Code

In this experiment, you will use the Cobra SMARTsense code. This is a control unit that can output specific signals. Possible signal forms are, for example: Illumination of an LED, display indication or sound. In this experiment, we use the relay control of the Cobra SMARTsense Code. In this case, a relay is nothing more than a switch. It can be used to open and close circuits in a targeted manner.

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Setup (3/3)

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Set up the experiment as shown in the diagram. The voltage source here is a $1.5\ V$ Battery. The Cobra SMARTsense code is integrated into the circuit. It acts as a switch. Depending on the programming, the circuit is interrupted or opened.

Procedure (1/2)

Light sensor

1. Switch on your Cobra SMARTsense-Light and the Cobra SMARTsense code by pressing and holding the button on the sensor for 3 seconds.
2. Open the measure app on your tablet or smartphone.
3. Select the sensor "SMARTsense-Light" and "Cobra SMARTsense Code".
4. Display the current brightness value of the sensor in the measureAPP.

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Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
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info@phywe.de
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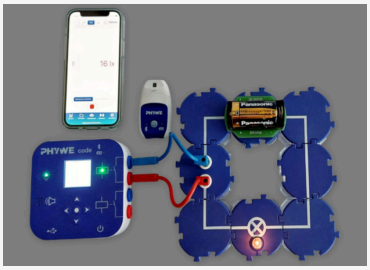
Procedure (2/2)



Now think about how to configure the trigger in the measureAPP. The trigger is there to set "If - Then " to set conditions. The controller has the following goal:

- In a bright environment, the lamp remains off.
- The light comes on in a darkened environment.

Tip: Define a threshold value first X for the light intensity I. Above this value, the lamp remains off. Below this value, the lamp switches on.

Solution:

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Report

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Task 1

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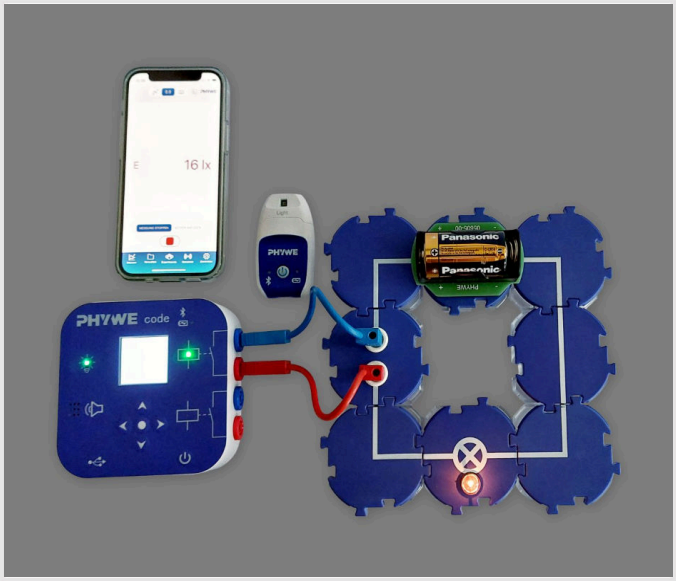
What do we use the Cobra SMARTsense code for in the experiment?

- It is used to measure the ambient brightness.
- It is used to measure the current.
- It serves as a switch. We use it to open or close the circuit.



Task 2 and 3

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What is a relay?

- An intelligent control system
- A switch
- A sensor
- A measurement device

Drag the words into the correct boxes!

If the brightness in the room falls below a certain threshold value X the circuit is _____ and the lamp _____. If the brightness exceeds the threshold value X the circuit is _____ and the lamp _____. The opening and closing of the circuit is controlled by a _____ of the Cobra SMARTsense code.

opened | lights up | relay | closed | does not light up

Check

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Task 4

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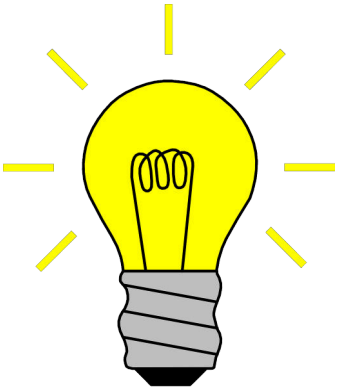

What are the benefits of intelligent lighting control?

- [ ] It increases the service life of the light sources used.
- [ ] It automatically adjusts the lighting conditions to the surroundings.
- [ ] It helps to save energy.
- [ ] It works exclusively with sunlight.

Check

Slide	Score / Total
Slide 16: Intended use Sensors and actuators	0/2
Slide 17: Multiple tasks	0/6
Slide 18: Advantages of lighting control	0/3

Total amount 0 / 11

Solutions Repeat

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