Switching ON an Externally Powered Light When Darkness is Detected

Purpose

This experiment teaches you how to:

- **Use the light sensor** in the Circuit Playground Express (CPX) to detect brightness.

- **Control an external device (relay + light)** based on sensor input.

- Understand how **automation systems** like **street lights** or **smart lamps** work — turning ON automatically at night and OFF in daylight.
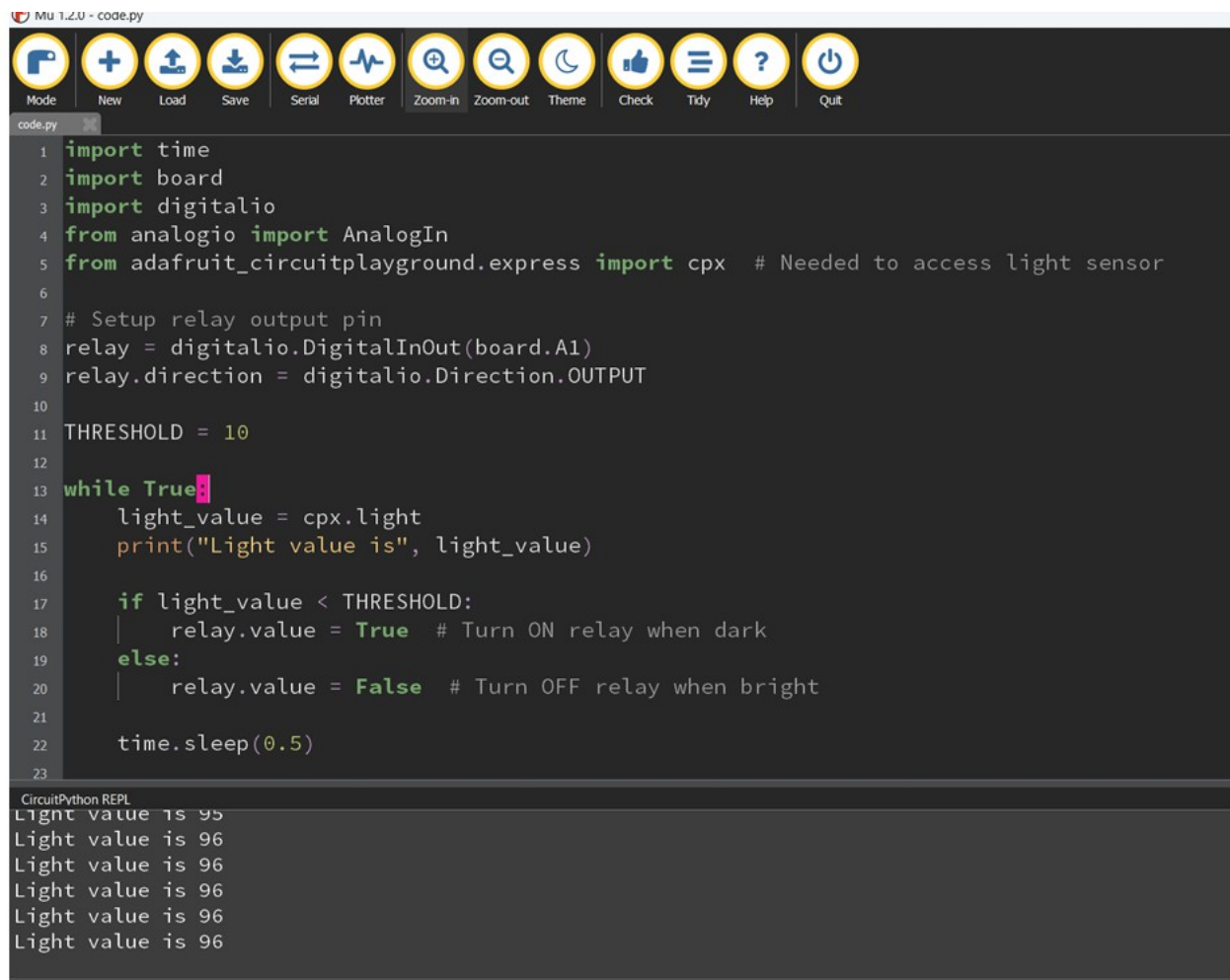
So, you are basically learning **how sensors control electrical devices automatically.**

Concept Explanation:

- The **light sensor** on CPX measures surrounding brightness.

- A **relay module** acts like a switch that can turn ON/OFF an external light.

- When the light level drops below a set **threshold**, CPX sends a signal to the relay to **turn ON** the light.

- When brightness increases, the relay **turns OFF** the light.

This concept is used in **smart streetlights, night lamps, and energy-saving systems.**

Code

```
Mode  New  Load  Save  Serial  Plotter  Zoom-in  Zoom-out  Theme  Check  Tidy  Help  Quit
```

code.py

```python
1  import time
2  import board
3  import digitalio
4  from analogio import AnalogIn
5  from adafruit_circuitplayground.express import cpx  # Needed to access light sensor
6
7  # Setup relay output pin
8  relay = digitalio.DigitalInOut(board.A1)
9  relay.direction = digitalio.Direction.OUTPUT
10
11 THRESHOLD = 10
12
13 while True:
14     light_value = cpx.light
15     print("Light value is", light_value)
16
17     if light_value < THRESHOLD:
18         relay.value = True   # Turn ON relay when dark
19     else:
20         relay.value = False  # Turn OFF relay when bright
21
22     time.sleep(0.5)
23
```

CircuitPython REPL

```
Light value is 95
Light value is 96
Light value is 96
Light value is 96
Light value is 96
Light value is 96
```

Line-by-Line Explanation

- **import time** – Used for creating short pauses (`time.sleep()`).

- **import board** – Accesses the CPX board's input/output pins.

- **import digitalio** – Enables digital pin control (used for relay).

- **from analogio import AnalogIn** – Allows reading analog sensor values.

- **from adafruit_circuitplayground.express import cpx** – Imports CPX library for built-in sensors.

- **Relay setup lines:**

  - **relay = digitalio.DigitalInOut(board.A1)** – Connects the relay to pin A1.

  - **relay.direction = digitalio.Direction.OUTPUT** – Makes that pin an output (can send HIGH/LOW signals).

- **THRESHOLD = 10** – If the light value is below 10, it's considered "dark."

- **while True:** – Infinite loop keeps checking light continuously.

- **light_value = cpx.light** – Reads brightness from CPX light sensor.

- **print("Light value is", light_value)** – Displays the light reading in the serial monitor.

- **if light_value < THRESHOLD:** – Checks if it's dark.

- **relay.value = True** – Turns ON the relay (and hence the connected light).

- **else:** – Runs when brightness is above threshold.

- **relay.value = False** – Turns OFF the relay (light).

- **time.sleep(0.5)** – Adds a short delay before the next check.

Working Principle:

Condition	Light Value	Relay Output	Action
Dark	< 10	HIGH (True)	Light ON
Bright	≥ 10	LOW (False)	Light OFF

Sample Output (in Serial Monitor):

```
Light value is 8
Relay ON (Light ON)
Light value is 96
Relay OFF (Light OFF)
Light value is 5
Relay ON (Light ON)
```