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11. Knocking light

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Experiment 11: Knocking light

Short Description

Create a light alarm that responds to knocking on the door.

Extended Description

How many times has it happened to you that you listen to loud music on your headphones and don't hear someone knocking on your door? Through this small project, we will make an alarm that will attract your attention with light to avoid unpleasant situations.

No previous knowledge is required to make this project, just goodwill, one LED, Raspberry Pi Pico, and SW-420 vibration sensor

The operational principles of the SW-420 vibration sensor

The SW-420 sensor module includes a small metal spring that acts as a mechanical switch. In its default state, the spring is in an open position, and there is no electrical connection between the two terminals of the module.

When the sensor experiences a vibration or impact, the spring inside the module moves or bends due to the external force. This movement causes the metal spring to come into contact with a conductive pad or plate within the module, closing the circuit temporarily.

Once the circuit is closed, the integrated circuit within the module detects this change in the electrical connection and produces an output signal. The output signal can be in the form of a digital signal (e.g., high or low voltage) or an analog signal (e.g., voltage level proportional to the vibration intensity).

Applications of the SW-420 sensor include detecting motion, monitoring impacts or vibrations in systems, security systems, and various other projects where vibration sensing is required.

What is polarity?

Electrical polarity refers to the distinction between positive and negative charges or voltage. It describes the direction or orientation of an electrical potential difference or voltage in a circuit.

In electrical circuits, one terminal or point is designated as positive (+), and the other is designated as negative (-). This polarity convention is a conventional way of representing the flow of electric current. Electrons, which carry the negative charge, flow from the negative terminal to the positive terminal.

Voltage is the measure of the electric potential difference between two points in a circuit. It has a magnitude and a polarity. Polarity indicates the direction of the potential difference, determining the direction of the current flow.

Various electrical components, such as batteries, capacitors, diodes, and polarized capacitors, are marked to indicate their polarity. For example, batteries have plus (+) and minus (-) signs to denote the positive and negative terminals, respectively. Diodes have a stripe or marking on one end to indicate the direction of current flow.

Understanding electrical polarity is essential for correctly connecting components in circuits and ensuring proper current flow. It is crucial to follow the polarity markings provided by the manufacturers and pay attention to polarity when working with electronic devices to avoid damage or incorrect operation.

Objectives:

Through this activity, the user will experiment with Raspberry Pi Pico and various electronic components. such as LED, SW-420 vibration sensor and so on. Through the exercise, the user will gain knowledge about:

- Understand the principle of operation of the SW-420 vibration sensor.
- Connect the circuit as shown in the picture and connect it to the Raspberry Pi Pico.
- Write a program in Python / Blockly.

Materials to be used:

- 1 x Raspberry Pi Pico
- 1 x Pico breadboard kit
- 1 x Full-size breadboard
- 1 x SW-420 vibration sensor
- 1 x 220 Ohm resistor
- 1 x Blue LED
- Jumper wires

Steps to be followed:

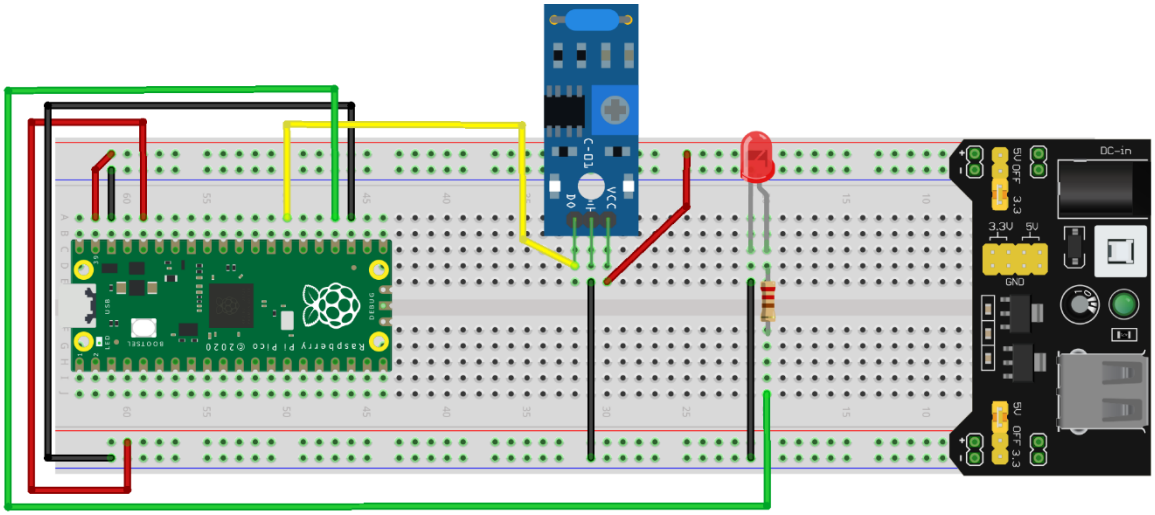
The main steps in the exercise are:

1. Connect the vibration sensor to the Raspberry Pi Pico according to the connection diagram.
   Raspberry Pi Pico Board:
   - GP21: Connect to D0 pin of the sensor
   - GND: Connect to GND rail of the breadboard
   - GP18: Connect to Positive + pin of the LED

   SW-420 vibration sensor:
   - D0: Connect to GP21 of Raspberry Pi Pico board
   - +: Connect to + rail of the breadboard
   - GND: Connect to - rail of the breadboard
2. Connect the LED to the Raspberry Pi Pico
   Blue LED:
   - Positive leg: Connect to GP18 of Raspberry Pi Pico board via a 220-ohm resistor
   - Negative leg: Connect to the - rail of the breadboard

3. Write a program that will turn on the blue LED when the vibration sensor is activated.

Wiring diagram



Code

```
from machine import Pin
from time import sleep

#define pins
knock = Pin(21, Pin.IN)
sleep(2)
led = Pin(18, Pin.OUT)

while True:
    if knock.value() == 0:
        print("Someone is at the door!!!")
        led.high()
        sleep(5)
    if knock.value() == 1:
        print("")
        led.low()
           sleep(0.01)
```

Conclusion

Through this project, we showed how with a little imagination we can use science and create a useful technical creation.

More advanced users can explore the tilt switch and its application in robotics.