AdafruitAPDS9960 Library Documentation

Release 1.0

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The APDS9960 is a specialized chip that detects hand gestures, proximity and ambient light color over I2C. Its available on Adafruit as a breakout.

CHAPTER 1

Installation and Dependencies

This driver depends on:

- Adafruit CircuitPython

Please ensure all dependencies are available on the CircuitPython filesystem. This is easily achieved by downloading the Adafruit library and driver bundle.

1.1 Installing from PyPI

On supported GNU/Linux systems like the Raspberry Pi, you can install the driver locally from PyPI. To install for current user:

```
pip3 install adafruit-circuitpython-apds9960
```

To install system-wide (this may be required in some cases):

```
sudo pip3 install adafruit-circuitpython-apds9960
```

To install in a virtual environment in your current project:

```
mkdir project-name && cd project-name
python3 -m venv .env
source .env/bin/activate
pip3 install adafruit-circuitpython-apds9960
```

CHAPTER 2

Usage Example

```
import board
import digitalio
from adafruit_apds9960.apds9960 import APDS9960

i2c = board.I2C()
int_pin = digitalio.DigitalInOut(board.D5)
apds = APDS9960(i2c, interrupt_pin=int_pin)

apds.enable_proximity = True
apds.proximity_interrupt_threshold = (0, 175)
apds.enable_proximity_interrupt = True

while True:
        print(apds.proximity)
        apds.clear_interrupt()
```

2.1 Hardware Set-up

Connect Vin to 3.3 V or 5 V power source, GND to ground, SCL and SDA to the appropriate pins.

2.2 Basics

Of course, you must import i2c bus device, board pins, and the library:

```
import board
from adafruit_apds9960.apds9960 import APDS9960
import digitalio
```

To set-up the device to gather data, initialize the I2CDevice using SCL and SDA pins. Then initialize the library. Optionally provide an interrupt pin for proximity detection.

```
int_pin = digitalio.DigitalInOut(board.A1)
i2c = board.I2C()
apds = APDS9960(i2c, interrupt_pin=int_pin)
```

2.3 Gestures

To get a gesture, see if a gesture is available first, then get the gesture Code

```
gesture = apds.gesture()
if gesture == 1:
  print("up")
if gesture == 2:
  print("down")
if gesture == 3:
  print("left")
if gesture == 4:
  print("right")
```

2.4 Color Measurement

To get a color measure, enable color measures, wait for color data, then get the color data.

```
apds.enable_color = True

while not apds.color_data_ready:
    time.sleep(0.005)

r, g, b, c = apds.color_data
print("r: {}, g: {}, b: {}, c: {}".format(r, g, b, c))
```

2.5 Proximity Detection

To check for a object in proximity, see if a gesture is available first, then get the gesture Code

```
apds.enable_proximity = True

# set the interrupt threshold to fire when proximity reading goes above 175
apds.proximity_interrupt_threshold = (0, 175)

# enable the proximity interrupt
apds.enable_proximity_interrupt = True

while True:
  if not interrupt_pin.value:
    print(apds.proximity)

    # clear the interrupt
    apds.clear_interrupt()
```

CHAPTER 3

Contributing

Contributions are welcome! Please read our Code of Conduct before contributing to help this project stay welcoming.

CHAPTER 4

Building locally

To build this library locally you'll need to install the circuitpython-travis-build-tools package.

Once installed, make sure you are in the virtual environment:

Then run the build:

4.1 Sphinx documentation

Sphinx is used to build the documentation based on rST files and comments in the code. First, install dependencies (feel free to reuse the virtual environment from above):

```
python3 -m venv .env
source .env/bin/activate
pip install Sphinx sphinx-rtd-theme
```

Now, once you have the virtual environment activated:

```
cd docs
sphinx-build -E -W -b html . _build/html
```

This will output the documentation to `docs/_build/html`. Open the index.html in your browser to view them. It will also (due to -W) error out on any warning like Travis will. This is a good way to locally verify it will pass.

CHAPTER 5

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5.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/apds9960_color_simpletest.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

import time
import board
from adafruit_apds9960.apds9960 import APDS9960
from adafruit_apds9960 import colorutility

i2c = board.I2C()
apds = APDS9960(i2c)
apds.enable_color = True


while True:
    # create some variables to store the color data in

    # wait for color data to be ready
    while not apds.color_data_ready:
        time.sleep(0.005)

    # get the data and print the different channels
    r, g, b, c = apds.color_data
    print("red: ", r)
    print("green: ", g)
    print("blue: ", b)
    print("clear: ", c)

```

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```
    print("color temp {}".format(colorutility.calculate_color_temperature(r, g, b)))
    print("light lux {}".format(colorutility.calculate_lux(r, g, b)))
    time.sleep(0.5)
```

5.2 Gesture Example

Show how to use the device with simple gestures

Listing 2: examples/apds9960_gesture_simpletest.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

import board
from adafruit_apds9960.apds9960 import APDS9960

i2c = board.I2C()

apds = APDS9960(i2c)
apds.enable_proximity = True
apds.enable_gesture = True

# Uncomment and set the rotation if depending on how your sensor is mounted.
# apds.rotation = 270 # 270 for CLUE

while True:
    gesture = apds.gesture()

    if gesture == 0x01:
        print("up")
    elif gesture == 0x02:
        print("down")
    elif gesture == 0x03:
        print("left")
    elif gesture == 0x04:
        print("right")
```

5.3 Proximity Example

Example showing proximity feature

Listing 3: examples/apds9960_proximity_simpletest.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

import board
import digitalio
from adafruit_apds9960.apds9960 import APDS9960

i2c = board.I2C()
```

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```
int_pin = digitalio.DigitalInOut(board.D5)
apds = APDS9960(i2c, interrupt_pin=int_pin)

apds.enable_proximity = True
apds.proximity_interrupt_threshold = (0, 175)
apds.enable_proximity_interrupt = True

while True:
    # print the proximity reading when the interrupt pin goes low
    if not int_pin.value:
        print(apds.proximity)

        # clear the interrupt
        apds.clear_interrupt()
```

5.4 Color Example

Example showing how to get RGB values

Listing 4: examples/apds9960_color_simpletest.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
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import time
import board
from adafruit_apds9960.apds9960 import APDS9960
from adafruit_apds9960 import colorutility

i2c = board.I2C()
apds = APDS9960(i2c)
apds.enable_color = True


while True:
    # create some variables to store the color data in

    # wait for color data to be ready
    while not apds.color_data_ready:
        time.sleep(0.005)

    # get the data and print the different channels
    r, g, b, c = apds.color_data
    print("red: ", r)
    print("green: ", g)
    print("blue: ", b)
    print("clear: ", c)

    print("color temp {}".format(colorutility.calculate_color_temperature(r, g, b)))
    print("light lux {}".format(colorutility.calculate_lux(r, g, b)))
    time.sleep(0.5)
```

5.5 APDS9960

Driver class for the APDS9960 board. Supports gesture, proximity, and color detection.

- Author(s): Michael McWethy

5.5.1 Implementation Notes

Hardware:

- Adafruit APDS9960 Proximity, Light, RGB, and Gesture Sensor (Product ID: 3595)

Software and Dependencies:

- Adafruit CircuitPython firmware for the supported boards: https://circuitpython.org/downloads
- Adafruit's Bus Device library: https://github.com/adafruit/Adafruit_CircuitPython_BusDevice

class adafruit_apds9960.apds9960.**APDS9960**(*i2c*, ***, *interrupt_pin=None*, *address=57*, *integration_time=1*, *gain=1*, *rotation=0*)

APDS9900 provide basic driver services for the ASDS9960 breakout board

Parameters

- **i2c** (*I2C*) – The I2C bus the BME280 is connected to
- **interrupt_pin** (*Pin*) – Interrupt pin. Defaults to None
- **address** (*int*) – The I2C device address. Defaults to 0x39
- **integration_time** (*int*) – integration time. Defaults to 0x01
- **gain** (*int*) – Device gain. Defaults to 0x01
- **rotation** (*int*) – rotation of the device. Defaults to 0

Quickstart: Importing and using the APDS9960

Here is an example of using the *APDS9960* class. First you will need to import the libraries to use the sensor

```
import board
from adafruit_apds9960.apds9960 import APDS9960
```

Once this is done you can define your board.I2C object and define your sensor object

```
i2c = board.I2C()   # uses board.SCL and board.SDA
apds = APDS9960(i2c)
```

Now you have access to the sensor.proximity attribute

```
proximity = apds.proximity
```

clear_interrupt()

Clear all interrupts

color_data

Tuple containing r, g, b, c values

color_data_ready

Color data ready flag. zero if not ready, 1 is ready

color_gain
Color gain value

enable
Board enable. True to enable, False to disable

enable_color
Color detection enable flag. True when color detection is enabled, else False

enable_gesture
Gesture detection enable flag. True to enable, False to disable. Note that when disabled, gesture mode is turned off

enable_proximity
Enable of proximity mode

enable_proximity_interrupt
Proximity interrupt enable flag. True if enabled, False to disable

gesture()
Returns gesture code if detected. =0 if no gesture detected =1 if an UP, =2 if a DOWN, =3 if an LEFT, =4 if a RIGHT

gesture_dimensions
Gesture dimension value: range 0-3

gesture_fifo_threshold
Gesture fifo threshold value: range 0-3

gesture_gain
Gesture gain value: range 0-3

gesture_proximity_threshold
Proximity threshold value: range 0-255

integration_time
Proximity integration time: range 0-255

proximity
Proximity value: range 0-255

proximity_interrupt_threshold
Tuple containing low and high threshold followed by the proximity interrupt persistance. When setting the proximity interrupt threshold values using a tuple of zero to three values: low threshold, high threshold, persistance. persistance defaults to 4 if not provided

rotated_gesture(*original_gesture*)
Applies rotation offset to the given gesture direction and returns the result

rotation
Gesture rotation offset. Acceptable values are 0, 90, 180, 270.

5.6 colorutility

Helper functions for color calculations

- Author(s): Michael McWethy

adafruit_apds9960.colorutility.**calculate_color_temperature**(*r*, *g*, *b*)
Converts the raw R/G/B values to color temperature in degrees Kelvin

adafruit_apds9960.colorutility.**calculate_lux**(*r*, *g*, *b*)
Calculate ambient light values

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