python-elgato-streamdeck

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Dean Camera

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INSTALLATION AND SETUP

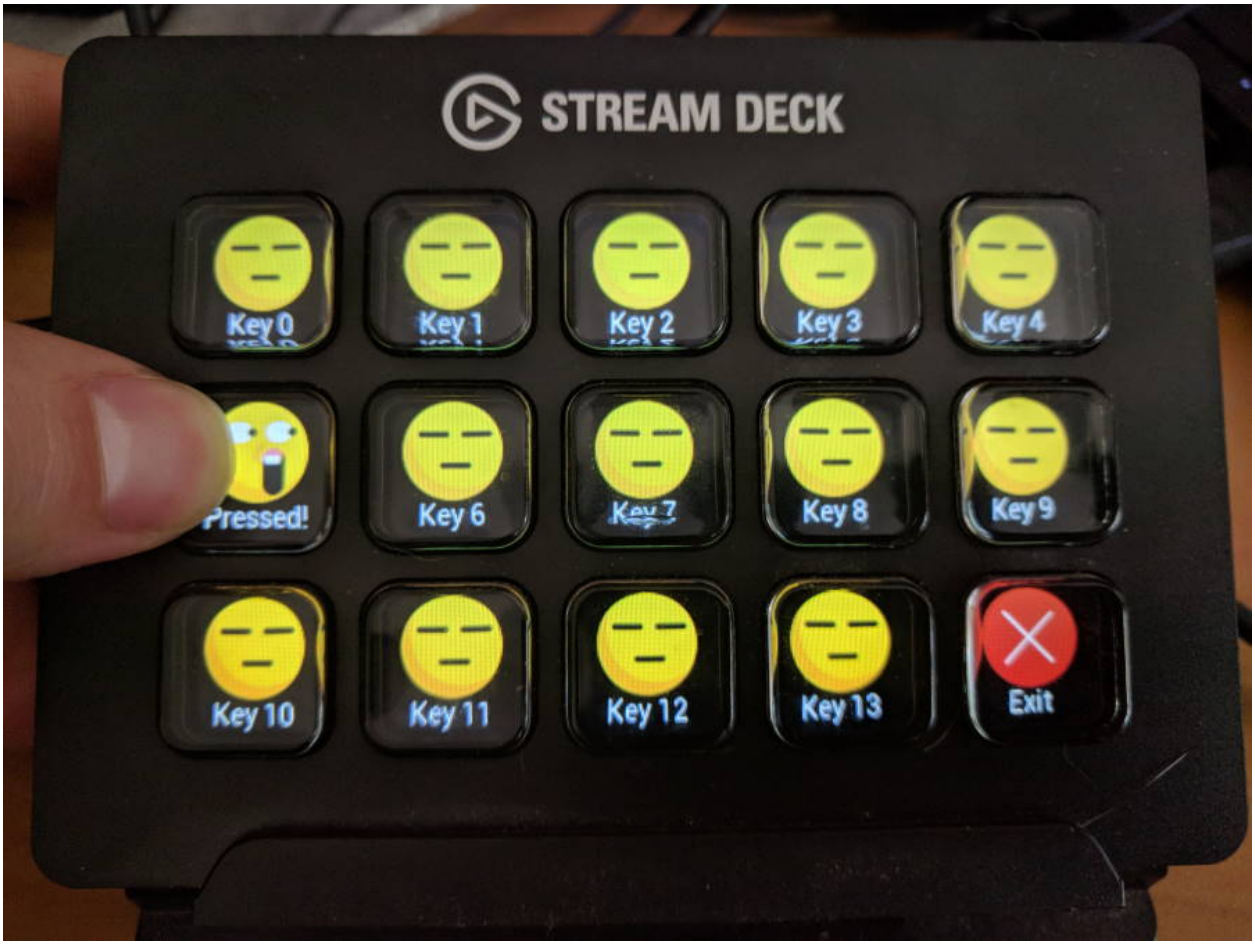
1 Index **3**

1.1 Library Installation . . . 3
1.2 Modules: Device Discovery . . . 4
1.3 Modules: StreamDeck Devices . . . 5
1.4 Modules: Communication Transports . . . 9
1.5 Modules: Image Helpers . . . 13
1.6 Example Script: Device Information . . . 14
1.7 Example Script: Basic Usage . . . 15
1.8 Example Script: Tiled Image . . . 17
1.9 Example Script: Animated Images . . . 20
1.10 Source Code . . . 23
1.11 Changelog . . . 23
1.12 License . . . 25

2 Indices and tables **27**

Python Module Index **29**

Index **31**



This is an open source Python 3 library to control an Elgato Stream Deck directly, without the official software. This can allow you to create your own custom front-ends, such as a custom control front-end for home automation software.

CHAPTER

ONE

INDEX

1.1 Library Installation

To install this library via the *pip* package manager, simply run `pip install streamdeck` from a terminal.

The included examples require the PIL fork *pillow*, although it can be swapped out if desired by the user application for any other image manipulation library. This can also be installed with *pip* via `pip install pillow`.

1.1.1 HID Backend Setup

The library core is structured so that it can use one of (potentially) several alternative HID backend libraries for the actual low level device communications. You will need to install the dependencies appropriate to your chosen backend for the library to work correctly.

Backends:

Default LibUSB HIDAPI Backend

This is the default and recommended backend - a cross platform library for communicating with HID devices. Most systems will have this as a system package available for easy installation.

Windows

Windows systems requires additional manual installation of a DLL in order to function. The latest source for the `hidapi.dll` DLL is the releases page of the libUSB GitHub project.

Place the DLL into a folder that has been added to your system `%PATH%` directory list (typically this includes the `C:\Windows\System32` folder but adding a new path would be recommended instead of modiying your Windows directory).

Ensure you use the correct DLL version for your installed Python version; i.e. if you are using 32-bit Python, install the 32-bit `hidapi.dll`.

MacOS (Darwin)

On MacOS systems, you can choose to either compile the HIDAPI project yourself, or install it via one of the multiple third party package managers (e.g. `brew install hidapi`, when using Homebrew).

Linux (Ubuntu/Debian)

On Linux, the `libhidapi-libusb0` package is required can can be installed via the system's package manager.

The following script has been verified working on a Raspberry Pi (Models 2B and 4B) running a stock Debian Buster image, to install all the required dependencies needed by this project on a fresh system:

```
# Ensure system is up to date, upgrade all out of date packages
sudo apt update && sudo apt dist-upgrade -y

# Install the pip Python package manager
sudo apt install -y python3-pip python3-setuptools

# Install system packages needed for the default LibUSB HIDAPI backend
sudo apt install -y libudev-dev libusb-1.0-0-dev libhidapi-libusb0

# Install system packages needed for the Python Pillow package installation
sudo apt install -y libjpeg-dev zlib1g-dev libopenjp2-7 libtiff5

# Install python library dependencies
pip3 install wheel
pip3 install pillow

# Add udev rule to allow all users non-root access to Elgato StreamDeck devices:
sudo tee /etc/udev/rules.d/10-streamdeck.rules << EOF
    SUBSYSTEMS=="usb", ATTRS{idVendor}=="0fd9", GROUP="users", TAG+="uaccess"
    EOF

# Reload udev rules to ensure the new permissions take effect
    sudo udevadm control --reload-rules

# Install the latest version of the StreamDeck library via pip
pip3 install streamdeck
```

Note that after adding the `udev` rules, you will need to remove and re-attach any existing StreamDeck devices to ensure they adopt the new permissions. This should allow you to access StreamDeck devices *without* needing root permissions.

1.2 Modules: Device Discovery

1.2.1 Device Manager

class StreamDeck.DeviceManager.**DeviceManager**(*transport=None*)

Central device manager, to enumerate any attached StreamDeck devices. An instance of this class must be created in order to detect and use any StreamDeck devices.

Creates a new StreamDeck DeviceManager, used to detect attached StreamDeck devices.

Parameters **transport** (*str*) – name of the the specific HID transport back-end to use, None to auto-probe.

enumerate()
Detect attached StreamDeck devices.

Return type list(*StreamDeck*)

Returns list of `StreamDeck` instances, one for each detected device.

exception `StreamDeck.DeviceManager.`**ProbeError**
Exception thrown when attempting to probe for attached StreamDeck devices, but no suitable valid transport was found.

1.3 Modules: StreamDeck Devices

1.3.1 StreamDeck (Abstract Base)

class `StreamDeck.Devices.StreamDeck.`**StreamDeck**(*device*)
Represents a physically attached StreamDeck device.

close()
Closes the device for input/output.

See also:

See *open()* for the corresponding open method.

connected()
Indicates if the physical StreamDeck device this instance is attached to is still connected to the host.

Return type bool

Returns *True* if the deck is still connected, *False* otherwise.

deck_type()
Retrieves the model of Stream Deck.

Return type str

Returns String containing the model name of the StreamDeck device..

abstract get_firmware_version()
Gets the firmware version of the attached StreamDeck.

Return type str

Returns String containing the firmware version of the attached device.

abstract get_serial_number()
Gets the serial number of the attached StreamDeck.

Return type str

Returns String containing the serial number of the attached device.

id()
Retrieves the physical ID of the attached StreamDeck. This can be used to differentiate one StreamDeck from another.

Return type str

Returns Identifier for the attached device.

key_count()
Retrieves number of physical buttons on the attached StreamDeck device.

Return type int

Returns Number of physical buttons.

key_image_format()
Retrieves the image format accepted by the attached StreamDeck device. Images should be given in this format when setting an image on a button.

See also:

See *set_key_image()* method to update the image displayed on a StreamDeck button.

Return type dict()

Returns Dictionary describing the various image parameters (size, image format, image mirroring and rotation).

key_layout()
Retrieves the physical button layout on the attached StreamDeck device.

Return type (int, int)

Return (rows, columns) Number of button rows and columns.

key_states()
Retrieves the current states of the buttons on the StreamDeck.

Return type list(bool)

Returns List describing the current states of each of the buttons on the device (*True* if the button is being pressed, *False* otherwise).

open()
Opens the device for input/output. This must be called prior to setting or retrieving any device state.

See also:

See *close()* for the corresponding close method.

abstract reset()
Resets the StreamDeck, clearing all button images and showing the standby image.

abstract set_brightness(*percent*)
Sets the global screen brightness of the StreamDeck, across all the physical buttons.

Parameters **percent** (*int/float*) – brightness percent, from [0-100] as an *int*, or normalized to [0.0-1.0] as a *float*.

set_key_callback(*callback*)
Sets the callback function called each time a button on the StreamDeck changes state (either pressed, or released).

Note: This callback will be fired from an internal reader thread. Ensure that the given callback function is thread-safe.

Note: Only one callback can be registered at one time.

See also:

See *set_key_callback_async()* method for a version compatible with Python 3 *asyncio* asynchronous functions.

Parameters **callback** (*function*) – Callback function to fire each time a button state changes.

set_key_callback_async(*async_callback*, *loop=None*)
Sets the asynchronous callback function called each time a button on the StreamDeck changes state (either pressed, or released). The given callback should be compatible with Python 3's *asyncio* routines.

Note: The asynchronous callback will be fired in a thread-safe manner.

Note: This will override the callback (if any) set by *set_key_callback()*.

Parameters

- **async_callback** (*function*) – Asynchronous callback function to fire each time a button state changes.
- **loop** (*asyncio.loop*) – Asyncio loop to dispatch the callback into

abstract set_key_image(*key*, *image*)
Sets the image of a button on the StreamDeck to the given image. The image being set should be in the correct format for the device, as an enumerable collection of bytes.

See also:

See `get_key_image_format()` method for information on the image format accepted by the device.

Parameters

- **key** (*int*) – Index of the button whose image is to be updated.
- **image** (*enumerable*) – Raw data of the image to set on the button. If *None*, the key will be cleared to a black color.

1.3.2 StreamDeck Original

class StreamDeck.Devices.StreamDeckOriginal.**StreamDeckOriginal**(*device*)
Bases: *StreamDeck.Devices.StreamDeck.StreamDeck*

Represents a physically attached StreamDeck Original device.

get_firmware_version()
Gets the firmware version of the attached StreamDeck.

Return type str

Returns String containing the firmware version of the attached device.

get_serial_number()
Gets the serial number of the attached StreamDeck.

Return type str

Returns String containing the serial number of the attached device.

reset()
Resets the StreamDeck, clearing all button images and showing the standby image.

set_brightness(*percent*)
Sets the global screen brightness of the StreamDeck, across all the physical buttons.

Parameters **percent** (*int/float*) – brightness percent, from [0-100] as an *int*, or normalized to [0.0-1.0] as a *float*.

set_key_image(*key*, *image*)
Sets the image of a button on the StreamDeck to the given image. The image being set should be in the correct format for the device, as an enumerable collection of bytes.

See also:

See `get_key_image_format()` method for information on the image format accepted by the device.

Parameters

- **key** (*int*) – Index of the button whose image is to be updated.
- **image** (*enumerable*) – Raw data of the image to set on the button. If *None*, the key will be cleared to a black color.

1.3.3 StreamDeck Mini

class StreamDeck.Devices.StreamDeckMini.**StreamDeckMini**(*device*)
Bases: *StreamDeck.Devices.StreamDeck.StreamDeck*

Represents a physically attached StreamDeck Mini device.

get_firmware_version()
Gets the firmware version of the attached StreamDeck.

Return type str

Returns String containing the firmware version of the attached device.

get_serial_number()
Gets the serial number of the attached StreamDeck.

Return type str

Returns String containing the serial number of the attached device.

reset()
Resets the StreamDeck, clearing all button images and showing the standby image.

set_brightness(*percent*)
Sets the global screen brightness of the StreamDeck, across all the physical buttons.

Parameters **percent** (*int/float*) – brightness percent, from [0-100] as an *int*, or normalized to [0.0-1.0] as a *float*.

set_key_image(*key*, *image*)
Sets the image of a button on the StreamDeck to the given image. The image being set should be in the correct format for the device, as an enumerable collection of bytes.

See also:

See `get_key_image_format()` method for information on the image format accepted by the device.

Parameters

- **key** (*int*) – Index of the button whose image is to be updated.
- **image** (*enumerable*) – Raw data of the image to set on the button. If *None*, the key will be cleared to a black color.

1.3.4 StreamDeck XL

class StreamDeck.Devices.StreamDeckXL.**StreamDeckXL**(*device*)
Bases: *StreamDeck.Devices.StreamDeck.StreamDeck*

Represents a physically attached StreamDeck XL device.

get_firmware_version()
Gets the firmware version of the attached StreamDeck.

Return type str

Returns String containing the firmware version of the attached device.

get_serial_number()
Gets the serial number of the attached StreamDeck.

Return type str

Returns String containing the serial number of the attached device.

reset()
Resets the StreamDeck, clearing all button images and showing the standby image.

set_brightness(*percent*)
Sets the global screen brightness of the StreamDeck, across all the physical buttons.

Parameters **percent** (*int/float*) – brightness percent, from [0-100] as an *int*, or normalized to [0.0-1.0] as a *float*.

set_key_image(*key*, *image*)
Sets the image of a button on the StreamDeck to the given image. The image being set should be in the correct format for the device, as an enumerable collection of bytes.

See also:

See get_key_image_format() method for information on the image format accepted by the device.

Parameters

- **key** (*int*) – Index of the button whose image is to be updated.
- **image** (*enumerable*) – Raw data of the image to set on the button. If *None*, the key will be cleared to a black color.

1.4 Modules: Communication Transports

1.4.1 Transport (Abstract Base)

class StreamDeck.Transport.Transport.**Transport**
Base transport layer, representing an abstract communication back-end which can be used to discovery attached StreamDeck devices.

class Device

Base connection device, representing an abstract connected device which can be communicated with by an upper layer high level protocol.

abstract close()

Closes the device for input/output.

See also:

See *open()* for the corresponding open method.

abstract connected()

Indicates if the physical device object this instance is attached to is still connected to the host.

Return type bool

Returns *True* if the device is still connected, *False* otherwise.

abstract open()

Opens the device for input/output. This must be called prior to sending or receiving any reports.

See also:

See *close()* for the corresponding close method.

abstract path()

Retrieves the logical path of the attached device within the current system. This can be used to uniquely differentiate one device from another.

Return type str

Returns Logical device path for the attached device.

abstract read(*length*)

Performs a blocking read of a HID In report from the open HID device.

Parameters **length** (*int*) – Maximum length of the In report to read.

Return type list(byte)

Returns List of bytes containing the read In report. The first byte of the report will be the Report ID of the report that was read.

abstract read_feature(*report_id*, *length*)

Reads a HID Feature report from the open HID device.

Parameters

- **report_id** (*int*) – Report ID of the report being read.
- **length** (*int*) – Maximum length of the Feature report to read..

Return type list(byte)

Returns List of bytes containing the read Feature report. The first byte of the report will be the Report ID of the report that was read.

abstract write(*payload*)

Sends a HID Out report to the open HID device.

Parameters **payload** (*enumerable()*) – Enumerate list of bytes to send to the device, as an Out report. The first byte of the report should be the Report ID of the report being sent.

Return type int

Returns Number of bytes successfully sent to the device.

abstract write_feature(*payload*)

Sends a HID Feature report to the open HID device.

Parameters **payload** (*enumerable()*) – Enumerate list of bytes to send to the device, as a feature report. The first byte of the report should be the Report ID of the report being sent.

Return type int

Returns Number of bytes successfully sent to the device.

abstract enumerate(*vid*, *pid*)
Enumerates all available devices on the system using the current transport back-end.

Parameters

- **vid** (*int*) – USB Vendor ID to filter all devices by, *None* if the device list should not be filtered by vendor.
- **pid** (*int*) – USB Product ID to filter all devices by, *None* if the device list should not be filtered by product.

Return type list(*Transport.Device*)

Returns List of discovered devices that are available through this transport back-end.

abstract probe()
Attempts to determine if the back-end is installed and usable. It is expected that probe failures throw exceptions detailing their exact cause of failure.

exception StreamDeck.Transport.Transport.**TransportError**
Exception thrown when attempting to access a device using a backend transport that has failed (for example, if the requested device could not be accessed).

1.4.2 'LibUSB HIDAPI' Library Transport

class StreamDeck.Transport.LibUSBHIDAPI.**LibUSBHIDAPI**
Bases: *StreamDeck.Transport.Transport.Transport*

USB HID transport layer, using the LibUSB HIDAPI dynamically linked library directly via ctypes.

class Device(*hidapi*, *device_info*)
Bases: *StreamDeck.Transport.Transport.Transport.Device*

Creates a new HID device instance, used to send and receive HID reports from/to an attached USB HID device.

Parameters **device_info** (*dict()*) – Device information dictionary describing a single unique attached USB HID device.

close()
Closes the HID device for input/output.

See also:

See open() for the corresponding open method.

connected()
Indicates if the physical HID device this instance is attached to is still connected to the host.
Return type bool
Returns *True* if the device is still connected, *False* otherwise.

open()
Opens the HID device for input/output. This must be called prior to sending or receiving any HID reports.

See also:

See close() for the corresponding close method.

path()
Retrieves the logical path of the attached HID device within the current system. This can be used to differentiate one HID device from another.
Return type str

Returns Logical device path for the attached device.

read(*length*)
Performs a blocking read of a HID In report from the open HID device.
Parameters **length** (*int*) – Maximum length of the In report to read.
Return type list(byte)
Returns List of bytes containing the read In report. The first byte of the report will be the Report ID of the report that was read.

read_feature(*report_id*, *length*)
Reads a HID Feature report from the open HID device.
Parameters
- **report_id** (*int*) – Report ID of the report being read.
- **length** (*int*) – Maximum length of the Feature report to read..

Return type list(byte)
Returns List of bytes containing the read Feature report. The first byte of the report will be the Report ID of the report that was read.

write(*payload*)
Sends a HID Out report to the open HID device.
Parameters **payload** (*enumerable()*) – Enumerate list of bytes to send to the device, as an Out report. The first byte of the report should be the Report ID of the report being sent.
Return type int
Returns Number of bytes successfully sent to the device.

write_feature(*payload*)
Sends a HID Feature report to the open HID device.
Parameters **payload** (*enumerable()*) – Enumerate list of bytes to send to the device, as a feature report. The first byte of the report should be the Report ID of the report being sent.
Return type int
Returns Number of bytes successfully sent to the device.

enumerate(*vid*, *pid*)
Enumerates all available USB HID devices on the system.

Parameters

- **vid** (*int*) – USB Vendor ID to filter all devices by, *None* if the device list should not be filtered by vendor.
- **pid** (*int*) – USB Product ID to filter all devices by, *None* if the device list should not be filtered by product.

Return type list(HID.Device)

Returns List of discovered USB HID devices.

static probe()
Attempts to determine if the back-end is installed and usable. It is expected that probe failures throw exceptions detailing their exact cause of failure.

1.5 Modules: Image Helpers

1.5.1 PIL Image Helper

StreamDeck.ImageHelpers.PILHelper.**create_image**(*deck*, *background='black'*)

Creates a new PIL Image with the correct image dimensions for the given StreamDeck device's keys.

See also:

See `to_native_format()` method for converting a PIL image instance to the native image format of a given StreamDeck device.

Parameters

- **deck** (`StreamDeck`) – StreamDeck device to generate a compatible image for.
- **background** (*str*) – Background color to use, compatible with *PIL.Image.new()*.

Return type PIL.Image

Returns Created PIL image

StreamDeck.ImageHelpers.PILHelper.**create_scaled_image**(*deck*, *image*, *margins=[0, 0, 0, 0]*, *background='black'*)

Creates a new key image that contains a scaled version of a given image, resized to best fit the given StreamDeck device's keys with the given margins around each side.

The scaled image is centered within the new key image, offset by the given margins. The aspect ratio of the image is preserved.

See also:

See `to_native_format()` method for converting a PIL image instance to the native image format of a given StreamDeck device.

Parameters

- **deck** (`StreamDeck`) – StreamDeck device to generate a compatible image for.
- **image** (*Image*) – PIL Image object to scale
- **list(int)** – Array of margin pixels in (top, right, bottom, left) order.
- **background** (*str*) – Background color to use, compatible with *PIL.Image.new()*.

Rtrype PIL.Image

Returns Loaded PIL image scaled and centered

StreamDeck.ImageHelpers.PILHelper.**to_native_format**(*deck*, *image*)

Converts a given PIL image to the native image format for a StreamDeck, suitable for passing to `set_key_image()`.

See also:

See `create_image()` method for creating a PIL image instance for a given StreamDeck device.

Parameters

- **deck** (`StreamDeck`) – StreamDeck device to generate a compatible native image for.
- **image** (*PIL.Image*) – PIL Image to convert to the native StreamDeck image format

Return type enumerable()

Returns Image converted to the given StreamDeck's native format

1.6 Example Script: Device Information

The following is a complete example script to enumerate any available StreamDeck devices and print out all information on the device's location and image format.

```
#!/usr/bin/env python3

#         Python Stream Deck Library
#      Released under the MIT license
#
#   dean [at] fourwalledcubicle [dot] com
#         www.fourwalledcubicle.com
#

# Example script that prints out information about any discovered StreamDeck
# devices to the console.

from StreamDeck.DeviceManager import DeviceManager


# Prints diagnostic information about a given StreamDeck.
def print_deck_info(index, deck):
    image_format = deck.key_image_format()

    flip_description = {
        (False, False): "not mirrored",
        (True, False): "mirrored horizontally",
        (False, True): "mirrored vertically",
        (True, True): "mirrored horizontally/vertically",
    }

    print("Deck {} - {}.".format(index, deck.deck_type()))
    print("\t - ID: {}".format(deck.id()))
    print("\t - Serial: '{}'".format(deck.get_serial_number()))
    print("\t - Firmware Version: '{}'".format(deck.get_firmware_version()))
    print("\t - Key Count: {} (in a {}x{} grid)".format(
        deck.key_count(),
        deck.key_layout()[0],
        deck.key_layout()[1]))
    print("\t - Key Images: {}x{} pixels, {} format, rotated {} degrees, {}".format(
        image_format['size'][0],
        image_format['size'][1],
        image_format['format'],
        image_format['rotation'],
        flip_description[image_format['flip']]))


if __name__ == "__main__":
    streamdecks = DeviceManager().enumerate()

    print("Found {} Stream Deck(s).\n".format(len(streamdecks)))
```

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```
    for index, deck in enumerate(streamdecks):
        deck.open()
        deck.reset()

        print_deck_info(index, deck)

        deck.close()
```

1.7 Example Script: Basic Usage

The following is a complete example script to connect to attached StreamDeck devices, display custom image/text graphics on the buttons and respond to press events.

```
#!/usr/bin/env python3

#         Python Stream Deck Library
#      Released under the MIT license
#
#   dean [at] fourwalledcubicle [dot] com
#         www.fourwalledcubicle.com
#

# Example script showing basic library usage - updating key images with new
# tiles generated at runtime, and responding to button state change events.

import os
import threading

from PIL import Image, ImageDraw, ImageFont
from StreamDeck.DeviceManager import DeviceManager
from StreamDeck.ImageHelpers import PILHelper

# Folder location of image assets used by this example.
ASSETS_PATH = os.path.join(os.path.dirname(__file__), "Assets")


# Generates a custom tile with run-time generated text and custom image via the
# PIL module.
def render_key_image(deck, icon_filename, font_filename, label_text):
    # Resize the source image asset to best-fit the dimensions of a single key,
    # leaving a margin at the bottom so that we can draw the key title
    # afterwards.
    icon = Image.open(icon_filename)
    image = PILHelper.create_scaled_image(deck, icon, margins=[0, 0, 20, 0])

    # Load a custom TrueType font and use it to overlay the key index, draw key
    # label onto the image a few pixels from the bottom of the key.
    draw = ImageDraw.Draw(image)
    font = ImageFont.truetype(font_filename, 14)
    draw.text((image.width / 2, image.height - 5), text=label_text, font=font, anchor=
↪"ms", fill="white")

    return PILHelper.to_native_format(deck, image)
```

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```
# Returns styling information for a key based on its position and state.
def get_key_style(deck, key, state):
    # Last button in the example application is the exit button.
    exit_key_index = deck.key_count() - 1

    if key == exit_key_index:
        name = "exit"
        icon = "{}.png".format("Exit")
        font = "Roboto-Regular.ttf"
        label = "Bye" if state else "Exit"
    else:
        name = "emoji"
        icon = "{}.png".format("Pressed" if state else "Released")
        font = "Roboto-Regular.ttf"
        label = "Pressed!" if state else "Key {}".format(key)

    return {
        "name": name,
        "icon": os.path.join(ASSETS_PATH, icon),
        "font": os.path.join(ASSETS_PATH, font),
        "label": label
    }


# Creates a new key image based on the key index, style and current key state
# and updates the image on the StreamDeck.
def update_key_image(deck, key, state):
    # Determine what icon and label to use on the generated key.
    key_style = get_key_style(deck, key, state)

    # Generate the custom key with the requested image and label.
    image = render_key_image(deck, key_style["icon"], key_style["font"], key_style[
↪"label"])

    # Use a scoped-with on the deck to ensure we're the only thread using it
    # right now.
    with deck:
        # Update requested key with the generated image.
        deck.set_key_image(key, image)


# Prints key state change information, updates rhe key image and performs any
# associated actions when a key is pressed.
def key_change_callback(deck, key, state):
    # Print new key state
    print("Deck {} Key {} = {}".format(deck.id(), key, state), flush=True)

    # Update the key image based on the new key state.
    update_key_image(deck, key, state)

    # Check if the key is changing to the pressed state.
    if state:
        key_style = get_key_style(deck, key, state)

        # When an exit button is pressed, close the application.
        if key_style["name"] == "exit":
```

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```
            # Use a scoped-with on the deck to ensure we're the only thread
            # using it right now.
            with deck:
                # Reset deck, clearing all button images.
                deck.reset()

                # Close deck handle, terminating internal worker threads.
                deck.close()


if __name__ == "__main__":
    streamdecks = DeviceManager().enumerate()

    print("Found {} Stream Deck(s).\n".format(len(streamdecks)))

    for index, deck in enumerate(streamdecks):
        deck.open()
        deck.reset()

        print("Opened '{}' device (serial number: '{}')".format(deck.deck_type(),␣
↪deck.get_serial_number()))

        # Set initial screen brightness to 30%.
        deck.set_brightness(30)

        # Set initial key images.
        for key in range(deck.key_count()):
            update_key_image(deck, key, False)

        # Register callback function for when a key state changes.
        deck.set_key_callback(key_change_callback)

        # Wait until all application threads have terminated (for this example,
        # this is when all deck handles are closed).
        for t in threading.enumerate():
            if t is threading.currentThread():
                continue

            if t.is_alive():
                t.join()
```

1.8 Example Script: Tiled Image

The following is a complete example script to display a larger image across a StreamDeck, by sectioning up the image into key-sized tiles, and displaying them individually onto each key.

```
#!/usr/bin/env python3

#         Python Stream Deck Library
#      Released under the MIT license
#
#   dean [at] fourwalledcubicle [dot] com
#         www.fourwalledcubicle.com
#
```

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```
# Example script showing how to tile a larger image across multiple buttons, by
# first generating an image suitable for the entire deck, then cropping out and
# applying key-sized tiles to individual keys of a StreamDeck.

import os
import threading

from PIL import Image, ImageOps
from StreamDeck.DeviceManager import DeviceManager
from StreamDeck.ImageHelpers import PILHelper

# Folder location of image assets used by this example.
ASSETS_PATH = os.path.join(os.path.dirname(__file__), "Assets")


# Generates an image that is correctly sized to fit across all keys of a given
# StreamDeck.
def create_full_deck_sized_image(deck, key_spacing, image_filename):
    key_rows, key_cols = deck.key_layout()
    key_width, key_height = deck.key_image_format()['size']
    spacing_x, spacing_y = key_spacing

    # Compute total size of the full StreamDeck image, based on the number of
    # buttons along each axis. This doesn't take into account the spaces between
    # the buttons that are hidden by the bezel.
    key_width *= key_cols
    key_height *= key_rows

    # Compute the total number of extra non-visible pixels that are obscured by
    # the bezel of the StreamDeck.
    spacing_x *= key_cols - 1
    spacing_y *= key_rows - 1

    # Compute final full deck image size, based on the number of buttons and
    # obscured pixels.
    full_deck_image_size = (key_width + spacing_x, key_height + spacing_y)

    # Resize the image to suit the StreamDeck's full image size. We use the
    # helper function in Pillow's ImageOps module so that the image's aspect
    # ratio is preserved.
    image = Image.open(os.path.join(ASSETS_PATH, image_filename)).convert("RGBA")
    image = ImageOps.fit(image, full_deck_image_size, Image.LANCZOS)
    return image


# Crops out a key-sized image from a larger deck-sized image, at the location
# occupied by the given key index.
def crop_key_image_from_deck_sized_image(deck, image, key_spacing, key):
    key_rows, key_cols = deck.key_layout()
    key_width, key_height = deck.key_image_format()['size']
    spacing_x, spacing_y = key_spacing

    # Determine which row and column the requested key is located on.
    row = key // key_cols
    col = key % key_cols
```

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```
    # Compute the starting X and Y offsets into the full size image that the
    # requested key should display.
    start_x = col * (key_width + spacing_x)
    start_y = row * (key_height + spacing_y)

    # Compute the region of the larger deck image that is occupied by the given
    # key, and crop out that segment of the full image.
    region = (start_x, start_y, start_x + key_width, start_y + key_height)
    segment = image.crop(region)

    # Create a new key-sized image, and paste in the cropped section of the
    # larger image.
    key_image = PILHelper.create_image(deck)
    key_image.paste(segment)

    return PILHelper.to_native_format(deck, key_image)


# Closes the StreamDeck device on key state change.
def key_change_callback(deck, key, state):
    # Use a scoped-with on the deck to ensure we're the only thread using it
    # right now.
    with deck:
        # Reset deck, clearing all button images.
        deck.reset()

        # Close deck handle, terminating internal worker threads.
        deck.close()


if __name__ == "__main__":
    streamdecks = DeviceManager().enumerate()

    print("Found {} Stream Deck(s).\n".format(len(streamdecks)))

    for index, deck in enumerate(streamdecks):
        deck.open()
        deck.reset()

        print("Opened '{}' device (serial number: '{}')".format(deck.deck_type(),␣
↪deck.get_serial_number()))

        # Set initial screen brightness to 30%.
        deck.set_brightness(30)

        # Approximate number of (non-visible) pixels between each key, so we can
        # take those into account when cutting up the image to show on the keys.
        key_spacing = (36, 36)

        # Load and resize a source image so that it will fill the given
        # StreamDeck.
        image = create_full_deck_sized_image(deck, key_spacing, "Harold.jpg")

        print("Created full deck image size of {}x{} pixels.".format(image.width,␣
↪image.height))

        # Extract out the section of the image that is occupied by each key.
```

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```
        key_images = dict()
        for k in range(deck.key_count()):
            key_images[k] = crop_key_image_from_deck_sized_image(deck, image, key_
↪spacing, k)

        # Use a scoped-with on the deck to ensure we're the only thread
        # using it right now.
        with deck:
            # Draw the individual key images to each of the keys.
            for k in range(deck.key_count()):
                key_image = key_images[k]

                # Show the section of the main image onto the key.
                deck.set_key_image(k, key_image)

        # Register callback function for when a key state changes.
        deck.set_key_callback(key_change_callback)

        # Wait until all application threads have terminated (for this example,
        # this is when all deck handles are closed).
        for t in threading.enumerate():
            if t is threading.currentThread():
                continue

            if t.is_alive():
                t.join()
```

1.9 Example Script: Animated Images

The following is a complete example script to connect to attached StreamDeck devices, and display animated graphics on the keys.

```
#!/usr/bin/env python3

#         Python Stream Deck Library
#      Released under the MIT license
#
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#         www.fourwalledcubicle.com
#

# Example script showing one way to display animated images using the
# library, by pre-rendering all the animation frames into the StreamDeck
# device's native image format, and displaying them with a periodic
# timer.

import itertools
import os
import threading
import time

from fractions import Fraction
from PIL import Image, ImageSequence
from StreamDeck.DeviceManager import DeviceManager
```

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```
from StreamDeck.ImageHelpers import PILHelper
from StreamDeck.Transport.Transport import TransportError

# Folder location of image assets used by this example.
ASSETS_PATH = os.path.join(os.path.dirname(__file__), "Assets")

# Animation frames per second to attempt to display on the StreamDeck devices.
FRAMES_PER_SECOND = 30


# Loads in a source image, extracts out the individual animation frames (if
# any) and returns an infinite generator that returns the next animation frame,
# in the StreamDeck device's native image format.
def create_animation_frames(deck, image_filename):
    icon_frames = list()

    # Open the source image asset.
    icon = Image.open(os.path.join(ASSETS_PATH, image_filename))

    # Iterate through each animation frame of the source image
    for frame in ImageSequence.Iterator(icon):
        # Create new key image of the correct dimensions, black background.
        frame_image = PILHelper.create_scaled_image(deck, frame)

        # Pre-convert the generated image to the native format of the StreamDeck
        # so we don't need to keep converting it when showing it on the device.
        native_frame_image = PILHelper.to_native_format(deck, frame_image)

        # Store the rendered animation frame for later user.
        icon_frames.append(native_frame_image)

    # Return an infinite cycle generator that returns the next animation frame
    # each time it is called.
    return itertools.cycle(icon_frames)


# Closes the StreamDeck device on key state change.
def key_change_callback(deck, key, state):
    # Use a scoped-with on the deck to ensure we're the only thread using it
    # right now.
    with deck:
        # Reset deck, clearing all button images.
        deck.reset()

        # Close deck handle, terminating internal worker threads.
        deck.close()


if __name__ == "__main__":
    streamdecks = DeviceManager().enumerate()

    print("Found {} Stream Deck(s).\n".format(len(streamdecks)))

    for index, deck in enumerate(streamdecks):
        deck.open()
        deck.reset()
```

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```
        print("Opened '{}' device (serial number: '{}')".format(deck.deck_type(),␣
↪deck.get_serial_number()))

        # Set initial screen brightness to 30%.
        deck.set_brightness(30)

        # Pre-render a list of animation frames for each source image, in the
        # native display format so that they can be quickly sent to the device.
        print("Loading animations...")
        animations = [
            create_animation_frames(deck, "Elephant_Walking_animated.gif"),
            create_animation_frames(deck, "RGB_color_space_animated_view.gif"),
            create_animation_frames(deck, "Simple_CV_Joint_animated.gif"),
        ]
        print("Ready.")

        # Create a mapping of StreamDeck keys to animation image sets that will
        # be displayed.
        key_images = dict()
        for k in range(deck.key_count()):
            key_images[k] = animations[k % len(animations)]

        # Helper function that will run a periodic loop which updates the
        # images on each key.
        def animate(fps):
            # Convert frames per second to frame time in seconds.
            #
            # Frame time often cannot be fully expressed by a float type,
            # meaning that we have to use fractions.
            frame_time = Fraction(1, fps)

            # Get a starting absolute time reference point.
            #
            # We need to use an absolute time clock, instead of relative sleeps
            # with a constant value, to avoid drifting.
            #
            # Drifting comes from an overhead of scheduling the sleep itself -
            # it takes some small amount of time for `time.sleep()` to execute.
            next_frame = Fraction(time.monotonic())

            # Periodic loop that will render every frame at the set FPS until
            # the StreamDeck device we're using is closed.
            while True:
                try:
                    # Use a scoped-with on the deck to ensure we're the only
                    # thread using it right now.
                    with deck:
                        # Update the key images with the next animation frame.
                        for key, frames in key_images.items():
                            deck.set_key_image(key, next(frames))
                except TransportError as err:
                    print("TransportError: {0}".format(err))
                    # Something went wrong while communicating with the device
                    # (closed?) - don't re-schedule the next animation frame.
                    break

                # Set the next frame absolute time reference point.
```

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```
                #
                # We are running at the fixed `fps`, so this is as simple as
                # adding the frame time we calculated earlier.
                next_frame += frame_time

                # Knowing the start of the next frame we can calculate how long
                # we have to sleep until its start.
                sleep_interval = float(next_frame) - time.monotonic()

                # Schedule the next periodic frame update.
                #
                # `sleep_interval` can be a negative number when current FPS
                # setting is too high for the combination of host and
                # StreamDeck to handle. If this is the case, we skip sleeping
                # immediately render the next frame to try to catch up.
                if sleep_interval >= 0:
                    time.sleep(sleep_interval)

        # Kick off the key image animating thread.
        threading.Thread(target=animate, args=[FRAMES_PER_SECOND]).start()

        # Register callback function for when a key state changes.
        deck.set_key_callback(key_change_callback)

        # Wait until all application threads have terminated (for this example,
        # this is when all deck handles are closed).
        for t in threading.enumerate():
            if t is threading.currentThread():
                continue

            if t.is_alive():
                t.join()
```

1.10 Source Code

Source code is available on Github. Bug reports, patches, suggestions and other contributions welcome.

1.11 Changelog

Version 0.8.4:

- Updated animated example script to attempt to maintain a constant FPS, regardless of rendering time.
- Fixed a race condition in the LibUSB HIDAPI transport backend that could cause crashes when a device was closed.

Version 0.8.3:

- Altered LibUSB transport workaround to only apply on Mac.
- Fixed internal _extract_string() method to discard all data after the first NUL byte, fixing corrupt serial number strings being returned in some cases.
- Set minimum Python version to 3.8, as some of the library uses newer syntax/core library features.

Version 0.8.2:

- Added new `PILHelper.create_scaled_image()` function to easily generate scaled/padded key images for a given deck.
- Updated LibUSB transport backend so that device paths are returned as UTF-8 strings, not raw bytes.
- Updated version/serial number string extraction from StreamDecks so that invalid characters are substituted, rather than raising a `UnicodeDecodeError` error.
- Added LibUSB transport workaround for a bug on Mac platforms when using older versions of the library.

Version 0.8.1:

- Fixed memory leak in LibUSB HIDAPI transport backend.

Version 0.8.0:

- Fix random crashes in LibUSB HIDAPI transport backend on Windows, as the API is not thread safe.
- Added support for atomic updates of StreamDeck instances via the Python `with` scope syntax.

Version 0.7.3:

- Fix crash in new LibUSB HIDAPI transport backend on systems with multiple connected StreamDeck devices.
- Fix crash in new LibUSB HIDAPI transport backend when `connected()` was called on a StreamDeck instance.

Version 0.7.2:

- Documentation restructuring to move installation out of the readme and into the library documentation.

Version 0.7.1:

- Cleaned up new LibUSB HIDAPI transport backend, so that it only searches for OS-specific library files.
- Fixed minor typo in the libUSB HIDAPI transport backend probe failure message.

Version 0.7.0:

- Removed old HID and HIDAPI backends, added new `ctypes` based LibUSB-HIDAPI backend replacement.

Version 0.6.3:

- Added support for the new V2 hardware revision of the StreamDeck Original.

Version 0.6.2:

- Fixed broken StreamDeck XL communications on Linux.
- Added blacklist for the `libhidapi-hidraw` system library which breaks StreamDeck Original communications.

Version 0.6.1:

- Fixed broken HIDAPI backend probing.
- Fixed double-open of HID backend devices causing connection issues on some platforms.

Version 0.6.0:

- Added support for the `HID` Python package. This new HID backend is strongly recommended over the old HIDAPI backend.
- Added auto-probing of installed backends, if no specific transport is supplied when constructing a DeviceManager instance.

Version 0.5.1:

- Fixed StreamDeck XL reporting swapped rows/columns count.
- Fixed StreamDeck XL failing to report correct serial number and firmware version.

Version 0.5.0:

- Fixed StreamDeck devices occasionally showing partial old frames on initial connection.
- Removed support for RAW pixel images, StreamDeck Mini and Original take BMP images.
- Removed `width` and `height` information from Deck key image dict, now returned as `size` tuple entry.

Version 0.4.0:

- Added StreamDeck XL support.

Version 0.3.2:

- Fixed StreamDeck Mini key images not updating under some circumstances.

Version 0.3.1:

- Added animated image example script.

Version 0.3:

- Remapped StreamDeck key indexes so that key 0 is located on the physical top-left of all supported devices.

Version 0.2.4:

- Added new `StreamDeck.get_serial_number()` function.
- Added new `StreamDeck.get_firmware_version()` function.

Version 0.2.3:

- Added new `StreamDeck.ImageHelpers modules` for easier key image generation.

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CHAPTER

TWO

INDICES AND TABLES

- genindex
- modindex

PYTHON MODULE INDEX

S

StreamDeck.DeviceManager, 4
StreamDeck.Devices.StreamDeck, 5
StreamDeck.Devices.StreamDeckMini, 8
StreamDeck.Devices.StreamDeckOriginal, 7
StreamDeck.Devices.StreamDeckXL, 9
StreamDeck.ImageHelpers.PILHelper, 13
StreamDeck.Transport.LibUSBHIDAPI, 11
StreamDeck.Transport.Transport, 9

INDEX

C

close() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5
close() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 11
close() (*StreamDeck.Transport.Transport.Transport.Device method*), 10
connected() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5
connected() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 11
connected() (*StreamDeck.Transport.Transport.Transport.Device method*), 10
create_image() (*in module StreamDeck.ImageHelpers.PILHelper*), 13
create_scaled_image() (*in module StreamDeck.ImageHelpers.PILHelper*), 13

D

deck_type() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5
DeviceManager (*class in StreamDeck.DeviceManager*), 4

E

enumerate() (*StreamDeck.DeviceManager.DeviceManager method*), 5
enumerate() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI method*), 12
enumerate() (*StreamDeck.Transport.Transport.Transport method*), 10

G

get_firmware_version() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5
get_firmware_version() (*StreamDeck.Devices.StreamDeckMini.StreamDeckMini method*), 8
get_firmware_version() (*StreamDeck.Devices.StreamDeckOriginal.StreamDeckOriginal method*), 7
get_firmware_version() (*StreamDeck.Devices.StreamDeckXL.StreamDeckXL method*), 9
get_serial_number() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5
get_serial_number() (*StreamDeck.Devices.StreamDeckMini.StreamDeckMini method*), 8
get_serial_number() (*StreamDeck.Devices.StreamDeckOriginal.StreamDeckOriginal method*), 7
get_serial_number() (*StreamDeck.Devices.StreamDeckXL.StreamDeckXL method*), 9

I

id() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5

K

key_count() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 5
key_image_format() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6
key_layout() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6
key_states() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6

L

LibUSBHIDAPI (*class in StreamDeck.Transport.LibUSBHIDAPI*), 11
LibUSBHIDAPI.Device (*class in StreamDeck.Transport.LibUSBHIDAPI*), 11

M

module
StreamDeck.DeviceManager, 4

StreamDeck.Devices.StreamDeck, 5
StreamDeck.Devices.StreamDeckMini, 8
StreamDeck.Devices.StreamDeckOriginal, 7
StreamDeck.Devices.StreamDeckXL, 9
StreamDeck.ImageHelpers.PILHelper, 13
StreamDeck.Transport.LibUSBHIDAPI, 11
StreamDeck.Transport.Transport, 9

O

open() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6
open() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 11
open() (*StreamDeck.Transport.Transport.Transport.Device method*), 10

P

path() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 11
path() (*StreamDeck.Transport.Transport.Transport.Device method*), 10
probe() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI static method*), 12
probe() (*StreamDeck.Transport.Transport.Transport method*), 11
ProbeError, 5

R

read() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 12
read() (*StreamDeck.Transport.Transport.Transport.Device method*), 10
read_feature() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 12
read_feature() (*StreamDeck.Transport.Transport.Transport.Device method*), 10
reset() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6
reset() (*StreamDeck.Devices.StreamDeckMini.StreamDeckMini method*), 8
reset() (*StreamDeck.Devices.StreamDeckOriginal.StreamDeckOriginal method*), 7
reset() (*StreamDeck.Devices.StreamDeckXL.StreamDeckXL method*), 9

S

set_brightness() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6
set_brightness() (*StreamDeck.Devices.StreamDeckMini.StreamDeckMini method*), 8
set_brightness() (*StreamDeck.Devices.StreamDeckOriginal.StreamDeckOriginal method*), 8
set_brightness() (*StreamDeck.Devices.StreamDeckXL.StreamDeckXL method*), 9
set_key_callback() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 6
set_key_callback_async() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 7
set_key_image() (*StreamDeck.Devices.StreamDeck.StreamDeck method*), 7
set_key_image() (*StreamDeck.Devices.StreamDeckMini.StreamDeckMini method*), 8
set_key_image() (*StreamDeck.Devices.StreamDeckOriginal.StreamDeckOriginal method*), 8
set_key_image() (*StreamDeck.Devices.StreamDeckXL.StreamDeckXL method*), 9
StreamDeck (*class in StreamDeck.Devices.StreamDeck*), 5
StreamDeck.DeviceManager module, 4
StreamDeck.Devices.StreamDeck module, 5
StreamDeck.Devices.StreamDeckMini module, 8
StreamDeck.Devices.StreamDeckOriginal module, 7
StreamDeck.Devices.StreamDeckXL module, 9
StreamDeck.ImageHelpers.PILHelper module, 13
StreamDeck.Transport.LibUSBHIDAPI module, 11
StreamDeck.Transport.Transport module, 9
StreamDeckMini (*class in StreamDeck.Devices.StreamDeckMini*), 8
StreamDeckOriginal (*class in StreamDeck.Devices.StreamDeckOriginal*), 7
StreamDeckXL (*class in StreamDeck.Devices.StreamDeckXL*), 9

T

to_native_format() (*in module StreamDeck.ImageHelpers.PILHelper*), 13
Transport (*class in StreamDeck.Transport.Transport*), 9
Transport.Device (*class in StreamDeck.Transport.Transport*), 9
TransportError, 11

W

write() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 12
write() (*StreamDeck.Transport.Transport.Transport.Device method*), 10
write_feature() (*StreamDeck.Transport.LibUSBHIDAPI.LibUSBHIDAPI.Device method*), 12
write_feature() (*StreamDeck.Transport.Transport.Transport.Device method*), 10