bluedot Documentation

Release 1.2.3

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Feb 22, 2018

Contents

CHAPTER 1

Getting Started

In order to use Blue Dot you will need:

- A Raspberry Pi
  - with built-in Bluetooth (such as the Pi 3 or Pi Zero W)
  - or a USB Bluetooth dongle
- An Android phone or 2nd Raspberry Pi for the remote
- An Internet connection (for the install)

1.1 Installation

These instructions assume your Raspberry Pi is running the latest version of Raspbian[1].

1.1.1 Android App

If you're using an Android phone, the Blue Dot app[2] can be installed from the Google Play Store.

1.1.2 Python Library

Open a terminal (click *Menu* → *Accessories* → *Terminal*), then enter:

```
sudo apt install python3-dbus
sudo pip3 install bluedot
```

If you want to use Blue Dot with Python 2 (there really is no need though!):

```
sudo apt install python-dbus
sudo pip install bluedot
```

To upgrade to the latest version:

[1] https://www.raspberrypi.org/downloads/raspbian/
[2] http://play.google.com/store/apps/details?id=com.stuffaboutcode.bluedot

```
sudo pip3 install bluedot --upgrade
```

1.2 Pairing

In order to use Blue Dot you will need to pair the Raspberry Pi to the remote *Android phone* (page 3) or *2nd Raspberry Pi* (page 5).

1.3 Code

1. Start up Python 3 (select *Menu* → *Programming* → *Python 3*)
2. Select *File* → *New File* to create a new program
3. Enter the following code:

```
from bluedot import BlueDot
bd = BlueDot()
bd.wait_for_press()
print("You pressed the blue dot!")
```

4. Save your program (select *File* → *Save As*) and save as `mydot.py`
5. Run the program, (select *Run* → *Run Module* or press `F5`)

Warning: Do not save your program as `bluedot.py` as Python will try and import your program rather than the bluedot module and you will get the error `ImportError: cannot import name BlueDot`.

1.4 Connecting

Start-up the Blue Dot app[3] on your Android phone or run the *Blue Dot Python App* (page 19) on your 2nd Raspberry Pi:

1. Select your Raspberry Pi from the list
2. Press the Blue Dot

1.5 Where next

Check out the *Recipes* (page 7) and the *Blue Dot API* (page 23) documentation for more ideas on using Blue Dot.

[3] http://play.google.com/store/apps/details?id=com.stuffaboutcode.bluedot

CHAPTER 2

Pair a Raspberry Pi and Android phone

2.1 Using the Desktop

On your Android phone:

1. Open Settings
2. Select Bluetooth
3. This will make your phone "discoverable"

On your Raspberry Pi:

1. Click *Bluetooth* → *Turn On Bluetooth* (if it's off)
2. Click *Bluetooth* → *Make Discoverable*
3. Click *Bluetooth* → *Add Device*
4. Your phone will appear in the list, select it and click guilabel:*Pair*
5. Enter a PIN code

On your Android phone again:

1. Enter the same PIN code when prompted
2. Touch "OK"

Note: You may receive errors relating to services not being able available or being unable to connect: these can be ignored.

2.2 Using the Command Line

On your Raspberry Pi:

1. Type **`bluetoothctl`** and press Enter to open Bluetooth control
2. At the `[bluetooth]#` prompt enter the following commands:

```
discoverable on
pairable on
agent on
default-agent
```

On your Android phone:

1. Open Settings
2. Select Bluetooth
3. Your Raspberry Pi will appear in the list; select it
4. Enter a PIN

On your Raspberry Pi:

1. Re-enter the PIN
2. Type **`quit`** and press Enter to return to the command line

CHAPTER 3

Pair 2 Raspberry Pis

The instructions below describe pairing a couple of Raspberry Pis which either have built-in Bluetooth (the Pi 3B or the Pi Zero W) or a USB Bluetooth dongle.

3.1 Using the Desktop

On the first Raspberry Pi:

1. Click *Bluetooth* → *Turn On Bluetooth* (if it's off)
2. Click *Bluetooth* → *Make Discoverable*

On the second Raspberry Pi:

1. Click *Bluetooth* → *Turn On Bluetooth* (if it's off)
2. Click *Bluetooth* → *Make Discoverable*
3. Click *Bluetooth* → *Add Device*
4. The first Pi will appear in the list: select it and click the *Pair* button

On the first Raspberry Pi again:

1. Accept the pairing request

Note: You may receive errors relating to services not being able available or being unable to connect: these can be ignored.

3.2 Using the Command Line

On the first Raspberry Pi:

1. Enter **`bluetoothctl`** to open Bluetooth control
2. At the `[bluetooth]#` prompt enter the following commands:

```
discoverable on
pairable on
agent on
default-agent
```

On the second Raspberry Pi:

1. Enter **bluetoothctl** to open Bluetooth control
2. At the [bluetooth]# prompt enter the following commands:

```
discoverable on
pairable on
agent on
default-agent
scan on
```

3. Wait for a message to appear showing the first Pi has been found:

```
[NEW] Device 12:23:34:45:56:67 devicename
```

4. Type pair with the mac address of the first Pi:

```
pair 12:23:34:45:56:67
```

5. Enter a PIN

On the first Raspberry Pi again:

1. Enter the same PIN when prompted
2. Type **quit** and press Enter to return to the command line

CHAPTER 4

Recipes

The recipes provide examples of how you can use Blue Dot. Don't be restricted by these ideas and be sure to have a look at the *Blue Dot API* (page 23) as there is more to be discovered.

4.1 Button

The simplest way to use the Blue Dot is as a wireless button.

4.1.1 Hello World

Let's say "Hello World" by creating the *BlueDot* (page 23) object then waiting for the Blue Dot app to connect and be pressed:

```
from bluedot import BlueDot
bd = BlueDot()
bd.wait_for_press()
print("Hello World")
```

Alternatively you can also use *when_pressed* (page 26) to call a function:

```
from bluedot import BlueDot
from signal import pause

def say_hello():
    print("Hello World")

bd = BlueDot()
bd.when_pressed = say_hello

pause()
```

wait_for_release (page 24) and *when_released* (page 26) also allow you to interact when the Blue Dot is released:

```
from bluedot import BlueDot
from signal import pause
```

```
def say_hello():
    print("Hello World")

def say_goodbye():
    print("goodbye")

bd = BlueDot()
bd.when_pressed = say_hello
bd.when_released = say_goodbye

pause()
```

Double presses can also be used with *wait_for_double_press* (page 24) and *when_double_pressed* (page 26):

```
from bluedot import BlueDot
from signal import pause

def shout_hello():
    print("HELLO")

bd = BlueDot()
bd.when_double_pressed = shout_hello

pause()
```

4.1.2 Flash an LED

Using Blue Dot in combination with gpiozero[4] you can interact with electronic components, such as LEDs, connected to your Raspberry Pi.

When the Blue Dot is pressed, the LED connected to GPIO 27 will turn on; when released it will turn off:

```
import os
from bluedot import BlueDot
from gpiozero import LED

bd = BlueDot()
led = LED(27)

bd.wait_for_press()
led.on()

bd.wait_for_release()
led.off()
```

You could also use *when_pressed* (page 26) and *when_released* (page 26):

```
from bluedot import BlueDot
from gpiozero import LED
from signal import pause

bd = BlueDot()
led = LED(27)

bd.when_pressed = led.on
bd.when_released = led.off

pause()
```

[4] https://gpiozero.readthedocs.io/en/latest/recipes.html#module-gpiozero

Alternatively use source[5] and *values* (page 25):

```
from bluedot import BlueDot
from gpiozero import LED
from signal import pause

bd = BlueDot()
led = LED(27)

led.source = bd.values

pause()
```

4.1.3 Remote Camera

Using a Raspberry Pi camera module, picamera.PiCamera[6] and *BlueDot* (page 23), you can really easily create a remote camera:

```
from bluedot import BlueDot
from picamera import PiCamera
from signal import pause

bd = BlueDot()
cam = PiCamera()

def take_picture():
    cam.capture("pic.jpg")

bd.when_pressed = take_picture

pause()
```

4.2 Joystick

The Blue Dot can also be used as a joystick when the middle, top, bottom, left or right areas of the dot are touched.

4.2.1 D-pad

Using the position the Blue Dot was pressed you can work out whether it was pressed to go up, down, left, right like the D-pad[7] on a joystick:

```
from bluedot import BlueDot
from signal import pause

def dpad(pos):
    if pos.top:
        print("up")
    elif pos.bottom:
        print("down")
    elif pos.left:
        print("left")
    elif pos.right:
        print("right")
    elif pos.middle:
```

[5] https://gpiozero.readthedocs.io/en/latest/api_generic.html#gpiozero.SourceMixin.source
[6] https://picamera.readthedocs.io/en/latest/api_camera.html#picamera.PiCamera
[7] https://en.wikipedia.org/wiki/D-pad

```
        print("fire")

bd = BlueDot()
bd.when_pressed = dpad

pause()
```

At the moment the D-pad[8] only registers when it is pressed. To get it work when the position is moved you should add the following line above `pause()`:

```
bd.when_moved = dpad
```

4.2.2 Robot

These recipes assume your robot is constructed with a pair of H-bridges. The forward and backward pins for the H-bridge of the left wheel are 17 and 18 respectively, and the forward and backward pins for H-bridge of the right wheel are 22 and 23 respectively.

Using the Blue Dot and `gpiozero.Robot`[9], you can create a bluetooth controlled robot[10] which moves when the dot is pressed and stops when it is released:

```
from bluedot import BlueDot
from gpiozero import Robot
from signal import pause

bd = BlueDot()
robot = Robot(left=(17, 18), right=(22, 23))

def move(pos):
    if pos.top:
        robot.forward()
    elif pos.bottom:
        robot.backward()
    elif pos.left:
        robot.left()
    elif pos.right:
        robot.right()

def stop():
    robot.stop()

bd.when_pressed = move
bd.when_moved = move
bd.when_released = stop

pause()
```

4.2.3 Variable Speed Robot

You can change the robot to use variable speeds, so the further towards the edge you press the Blue Dot, the faster the robot will go.

The *`distance`* (page 27) attribute returns how far from the centre the Blue Dot was pressed, which can be passed to the robot's functions to change its speed:

[8] https://en.wikipedia.org/wiki/D-pad
[9] https://gpiozero.readthedocs.io/en/latest/api_boards.html#gpiozero.Robot
[10] https://youtu.be/eW9oEPySF58

```
from bluedot import BlueDot
from gpiozero import Robot
from signal import pause

bd = BlueDot()
robot = Robot(left=(lfpin, lbpin), right=(rfpin, rbpin))

def move(pos):
    if pos.top:
        robot.forward(pos.distance)
    elif pos.bottom:
        robot.backward(pos.distance)
    elif pos.left:
        robot.left(pos.distance)
    elif pos.right:
        robot.right(pos.distance)

def stop():
    robot.stop()

bd.when_pressed = move
bd.when_moved = move
bd.when_released = stop

pause()
```

Alternatively you can use a generator and yield (x, y) values to the `gpiozero.Robot.source`[11] property (courtesy of Ben Nuttall[12]):

```
from gpiozero import Robot
from bluedot import BlueDot
from signal import pause

def pos_to_values(x, y):
    left = y if x > 0 else y + x
    right = y if x < 0 else y - x
    return (clamped(left), clamped(right))

def clamped(v):
    return max(-1, min(1, v))

def drive():
    while True:
        if bd.is_pressed:
            x, y = bd.position.x, bd.position.y
            yield pos_to_values(x, y)
        else:
            yield (0, 0)

robot = Robot(left=(lfpin, lbpin), right=(rfpin, rbpin))
bd = BlueDot()

robot.source = drive()

pause()
```

[11] https://gpiozero.readthedocs.io/en/latest/api_boards.html#gpiozero.Robot.source
[12] https://github.com/bennuttall

4.3 Slider

By holding down the Blue Dot and moving the position you can use it as an analogue slider.

4.3.1 Centre Out

Using the *BlueDotPosition.distance* (page 27) property which is returned when the position is moved you can create a slider which goes from the centre out in any direction:

```
from bluedot import BlueDot
from signal import pause

def show_percentage(pos):
    percentage = round(pos.distance * 100, 2)
    print("{}%".format(percentage))

bd = BlueDot()
bd.when_moved = show_percentage

pause()
```

4.3.2 Left to Right

The *BlueDotPosition.x* (page 27) property returns a value from -1 (far left) to 1 (far right). Using this value you can create a slider which goes horizontally through the middle:

```
from bluedot import BlueDot
from signal import pause

def show_percentage(pos):
    horizontal = ((pos.x + 1) / 2)
    percentage = round(horizontal * 100, 2)
    print("{}%".format(percentage))

bd = BlueDot()
bd.when_moved = show_percentage

pause()
```

To make a vertical slider you could change the code above to use *BlueDotPosition.y* (page 27) instead.

4.3.3 Dimmer Switch

Using the gpiozero.PWMLED[13] class and *BlueDot* (page 23) as a vertical slider you can create a wireless dimmer switch:

```
from bluedot import BlueDot
from gpiozero import PWMLED
from signal import pause

def set_brightness(pos):
    brightness = (pos.y + 1) / 2
    led.value = brightness

led = PWMLED(27)
bd = BlueDot()
```

[13] https://gpiozero.readthedocs.io/en/latest/api_output.html#gpiozero.PWMLED

```
bd.when_moved = set_brightness

pause()
```

4.4 Swiping

You can interact with the Blue Dot by swiping across it, like you would to move between pages in a mobile app.

4.4.1 Single

Detecting a single swipe is easy using *wait_for_swipe* (page 24):

```
from bluedot import BlueDot
bd = BlueDot()
bd.wait_for_swipe()
print("Blue Dot swiped")
```

Alternatively you can also use *when_swiped* (page 26) to call a function:

```
from bluedot import BlueDot
from signal import pause

def swiped():
    print("Blue Dot swiped")

bd = BlueDot()
bd.when_swiped = swiped

pause()
```

4.4.2 Direction

You can tell what direction the Blue Dot is swiped by using the *BlueDotSwipe* (page 28) object passed to the function assigned to *when_swiped* (page 26):

```
from bluedot import BlueDot
from signal import pause

def swiped(swipe):
    if swipe.up:
        print("up")
    elif swipe.down:
        print("down")
    elif swipe.left:
        print("left")
    elif swipe.right:
        print("right")

bd = BlueDot()
bd.when_swiped = swiped

pause()
```

4.4.3 Speed, Angle, and Distance

BlueDotSwipe (page 28) returns more than just the direction. It also includes the speed of the swipe (in Blue Dot radius per second), the angle, and the distance between the start and end positions of the swipe:

```
from bluedot import BlueDot
from signal import pause

def swiped(swipe):
    print("Swiped")
    print("speed={}".format(swipe.speed))
    print("angle={}".format(swipe.angle))
    print("distance={}".format(swipe.distance))

bd = BlueDot()
bd.when_swiped = swiped

pause()
```

4.5 Rotating

You can use Blue Dot like a rotary encoder or "iPod classic click wheel" - rotating around the outer edge of the Blue Dot will cause it to "tick". The Blue Dot is split into a number of virtual segments (the default is 8), when the position moves from one segment to another, it ticks.

4.5.1 Counter

Using the *when_rotated* (page 26) callback you can create a counter which increments / decrements when the Blue Dot is rotated either clockwise or anti-clockwise. A *BlueDotRotation* (page 29) object is passed to the callback. Its *value* (page 29) property will be -1 if rotated anti-clockwise and 1 if rotated clockwise:

```
from bluedot import BlueDot
from signal import pause

count = 0

def rotated(rotation):
    global count
    count += rotation.value

    print("{} {} {}".format(count,
                            rotation.clockwise,
                            rotation.anti_clockwise))

bd = BlueDot()
bd.when_rotated = rotated

pause()
```

The rotation speed can be modified using the *BlueDot.rotation_segments* (page 25) property which changes the number of segments the Blue Dot is split into:

```
bd.rotation_segments = 16
```

4.6 Bluetooth

You can interact with the Bluetooth adapter using *BlueDot* (page 23).

4.6.1 Pairing

You can put your Raspberry Pi into pairing mode which will allow pairing from other devices for 60 seconds:

```
from bluedot import BlueDot
from signal import pause

bd = BlueDot()
bd.allow_pairing()

pause()
```

Or connect up a physical button up to start the pairing (the button is assumed to be wired to GPIO 27):

```
from bluedot import BlueDot
from gpiozero import Button
from signal import pause

bd = BlueDot()
button = Button(27)

button.when_pressed = bd.allow_pairing

pause()
```

4.6.2 Paired Devices

You can iterate over the devices that your Raspberry Pi is paired too:

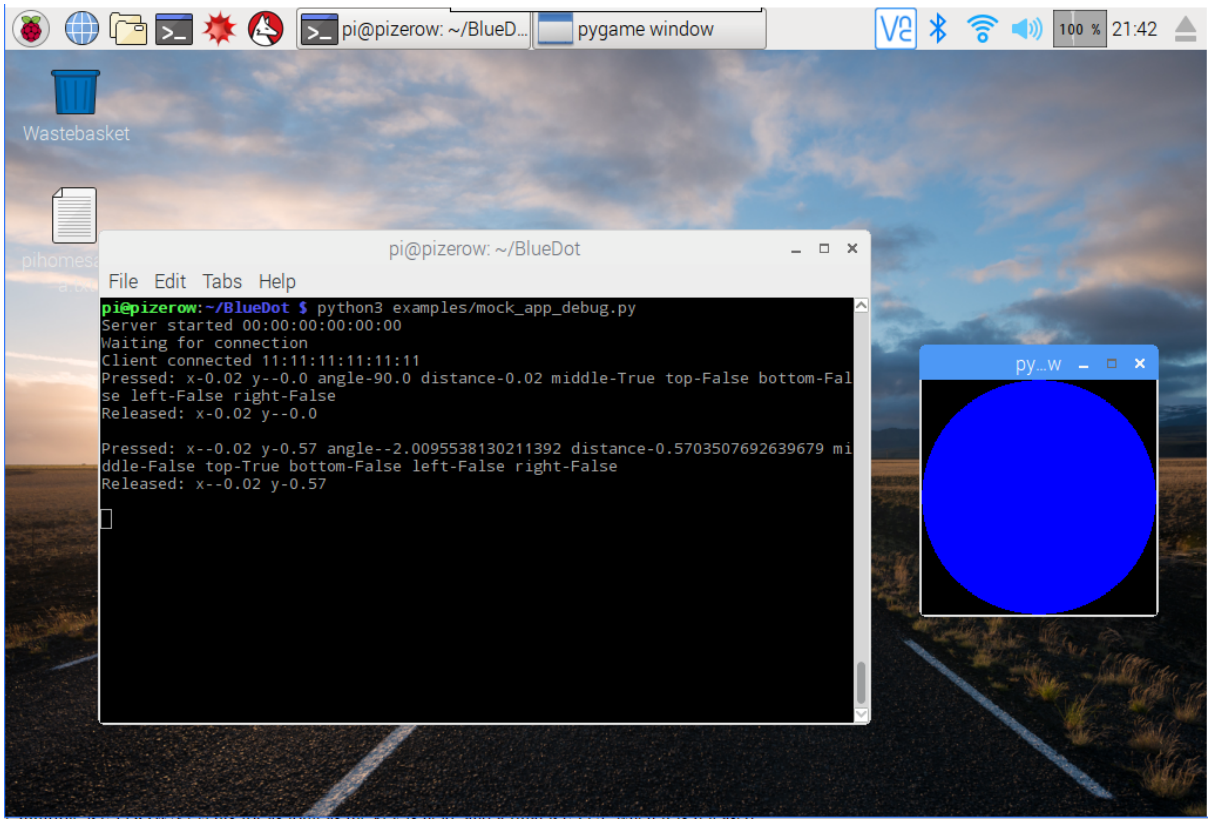
```
from bluedot import BlueDot
bd = BlueDot()

devices = bd.paired_devices
for d in devices:
    device_address = d[0]
    device_name = d[1]
```

4.7 Testing

Blue Dot includes a *MockBlueDot* (page 29) class to allow you to test and debug your program without having to use Bluetooth or a Blue Dot client.

MockBlueDot (page 29) inherits from *BlueDot* (page 23) and is used in the same way, but you have the option of launching a mock app which you can click with a mouse or writing scripts to simulate the Blue Dot being used.



4.7.1 Mock App

Launch the mock Blue Dot app to test by clicking the on-screen dot with the mouse:

```
from bluedot import MockBlueDot
from signal import pause

def say_hello():
    print("Hello World")

bd = MockBlueDot()
bd.when_pressed = say_hello

bd.launch_mock_app()
pause()
```

4.7.2 Scripted Tests

Tests can also be scripted using *MockBlueDot* (page 29):

```
from bluedot import MockBlueDot

def say_hello():
    print("Hello World")

bd = MockBlueDot()
bd.when_pressed = say_hello

bd.mock_client_connected()
bd.mock_blue_dot_pressed(0,0)
```

CHAPTER 5

Blue Dot Android App

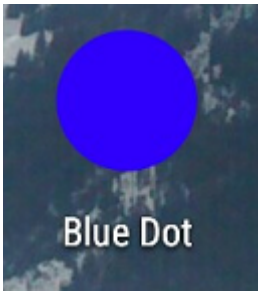
The Blue Dot app[14] is available to download from the Google Play store.

Please leave a rating and review if you find Blue Dot useful :)

5.1 Start

1. Download the Blue Dot app[15] from the Google Play store.
2. If you havent already done so, pair your raspberry pi as described in the *Getting Started* (page 1) guide.
3. Run the Blue Dot app

[14] http://play.google.com/store/apps/details?id=com.stuffaboutcode.bluedot
[15] http://play.google.com/store/apps/details?id=com.stuffaboutcode.bluedot



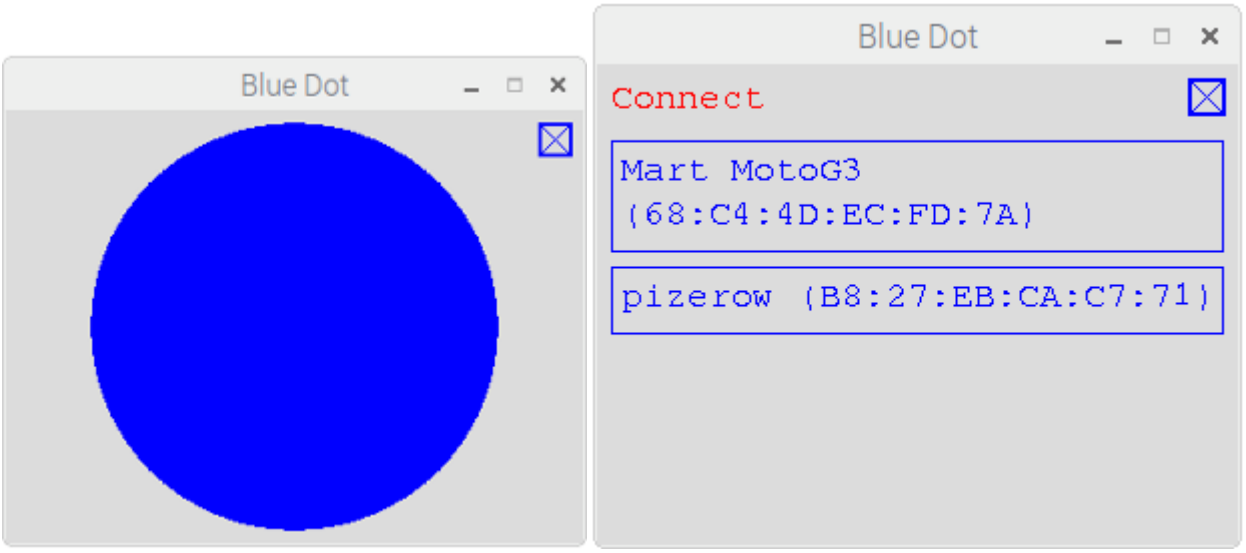
4. Select your Raspberry Pi from the paired devices list

5. Press the Dot

CHAPTER 6

Blue Dot Python App

Blue Dot Python app allows you to use another Raspberry Pi (or linux based computer) as the Blue Dot remote.



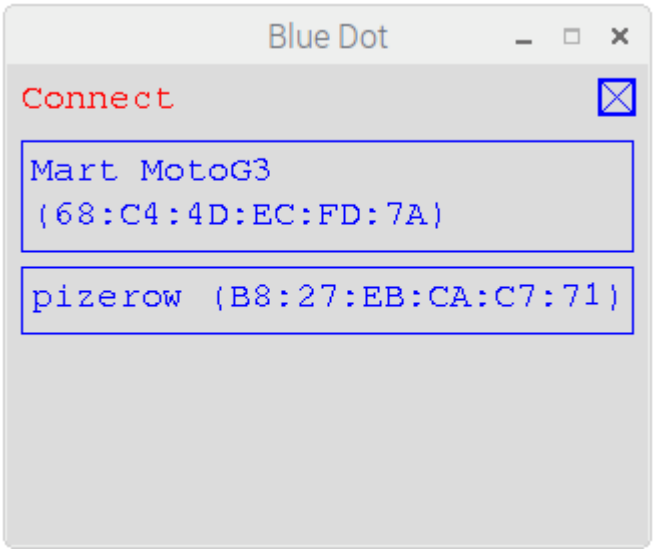
6.1 Start

The app is included in the bluedot Python library:

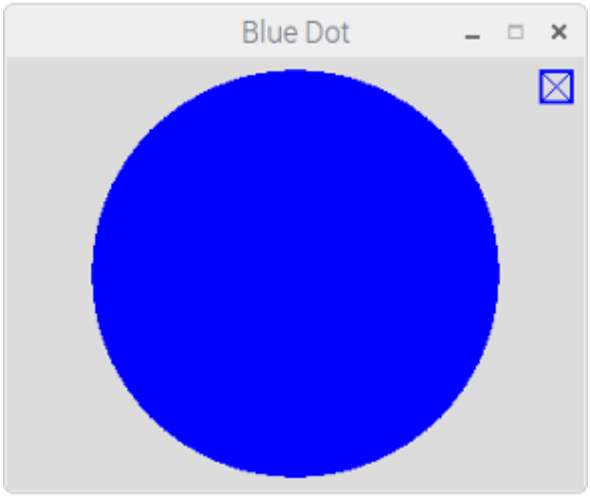
1. If you havent already done so, pair your raspberry pi and install the Python library as described in the *Getting Started* (page 1) guide
2. Run the Blue Dot app:

```
bluedotapp
```

3. Select your Raspberry Pi from the paired devices list



4. Press the Dot



6.2 Options

To get help with the Blue Dot app options:

```
bluedotapp --help
```

If you have more than 1 bluetooth device you can use `--device` to use a particular device:

```
bluedotapp --device hci1
```

You can specify the server to connect to at startup by using the `--server` option:

```
bluedotapp --server myraspberrypi
```

The screen size of the Blue Dot app can be changed using the `width` and `height` options and specifying the number of pixels:

```
bluedotapp --width 500 --height 500
```

The app can also be used full screen, if no `width` or `height` is given the screen will be sized to the current resolution of the screen:

```
bluedotapp --fullscreen
```

CHAPTER 7

Blue Dot API

7.1 BlueDot

class bluedot.**BlueDot**(*device='hci0'*, *port=1*, *auto_start_server=True*, *power_up_device=False*, *print_messages=True*)

Interacts with a Blue Dot client application, communicating when and where it has been pressed, released or held.

This class starts an instance of *btcomm.BluetoothServer* (page 31) which manages the connection with the Blue Dot client.

This class is intended for use with the Blue Dot client application.

The following example will print a message when the Blue Dot is pressed:

```
from bluedot import BlueDot
bd = BlueDot()
bd.wait_for_press()
print("The blue dot was pressed")
```

Parameters

- **device** (*str*[16]) – The Bluetooth device the server should use, the default is "hci0", if your device only has 1 Bluetooth adapter this shouldn't need to be changed.
- **port** (*int*[17]) – The Bluetooth port the server should use, the default is 1, and under normal use this should never need to change.
- **auto_start_server** (*bool*[18]) – If `True` (the default), the Bluetooth server will be automatically started on initialisation; if `False`, the method *start()* (page 24) will need to be called before connections will be accepted.
- **power_up_device** (*bool*[19]) – If `True`, the Bluetooth device will be powered up (if required) when the server starts. The default is `False`.

  Depending on how Bluetooth has been powered down, you may need to use **rfkill** to unblock Bluetooth to give permission to bluez to power on Bluetooth:

[16] https://docs.python.org/3.5/library/stdtypes.html#str
[17] https://docs.python.org/3.5/library/functions.html#int
[18] https://docs.python.org/3.5/library/functions.html#bool
[19] https://docs.python.org/3.5/library/functions.html#bool

```
sudo rfkill unblock bluetooth
```

- **print_messages** (*bool*[20]) – If `True` (the default), server status messages will be printed stating when the server has started and when clients connect / disconect.

allow_pairing(*timeout=60*)
Allow a Bluetooth device to pair with your Raspberry Pi by Putting the adapter into discoverable and pairable mode.

Parameters **timeout** (*int*[21]) – The time in seconds the adapter will remain pairable. If set to `None` the device will be discoverable and pairable indefinetly.

start()
Start the *btcomm.BluetoothServer* (page 31) if it is not already running. By default the server is started at initialisation.

stop()
Stop the Bluetooth server.

wait_for_connection(*timeout=None*)
Waits until a Blue Dot client connects. Returns `True` if a client connects.

Parameters **timeout** (*float*[22]) – Number of seconds to wait for a wait connections, if `None` (the default), it will wait indefinetly for a connection from a Blue Dot client.

wait_for_double_press(*timeout=None*)
Waits until a Blue Dot is double pressed. Returns `True` if the Blue Dot was double pressed.

Parameters **timeout** (*float*[23]) – Number of seconds to wait for a Blue Dot to be double pressed, if `None` (the default), it will wait indefinetly.

wait_for_move(*timeout=None*)
Waits until the position where the Blue Dot is pressed is moved. Returns `True` if the position pressed on the Blue Dot was moved.

Parameters **timeout** (*float*[24]) – Number of seconds to wait for the position that the Blue Dot is pressed to move, if `None` (the default), it will wait indefinetly.

wait_for_press(*timeout=None*)
Waits until a Blue Dot is pressed. Returns `True` if the Blue Dot was pressed.

Parameters **timeout** (*float*[25]) – Number of seconds to wait for a Blue Dot to be pressed, if `None` (the default), it will wait indefinetly.

wait_for_release(*timeout=None*)
Waits until a Blue Dot is released. Returns `True` if the Blue Dot was released.

Parameters **timeout** (*float*[26]) – Number of seconds to wait for a Blue Dot to be released, if `None` (the default), it will wait indefinetly.

wait_for_swipe(*timeout=None*)
Waits until the Blue Dot is swiped. Returns `True` if the Blue Dot was swiped.

Parameters **timeout** (*float*[27]) – Number of seconds to wait for the Blue Dot to be swiped, if `None` (the default), it will wait indefinetly.

adapter
The *btcomm.BluetoothAdapter* (page 34) instance that is being used.

[20] https://docs.python.org/3.5/library/functions.html#bool
[21] https://docs.python.org/3.5/library/functions.html#int
[22] https://docs.python.org/3.5/library/functions.html#float
[23] https://docs.python.org/3.5/library/functions.html#float
[24] https://docs.python.org/3.5/library/functions.html#float
[25] https://docs.python.org/3.5/library/functions.html#float
[26] https://docs.python.org/3.5/library/functions.html#float
[27] https://docs.python.org/3.5/library/functions.html#float

device
The Bluetooth device the server is using. This defaults to "hci0".

double_press_time
Sets or returns the time threshold in seconds for a double press. Defaults to 0.3.

interaction
Returns an instance of *BlueDotInteraction* (page 27) representing the current or last interaction with the Blue Dot.

Note: If the Blue Dot is released (and inactive), *interaction* (page 25) will return the interaction when it was released, until it is pressed again. If the Blue Dot has never been pressed *interaction* (page 25) will return `None`.

---

is_connected
Returns `True` if a Blue Dot client is connected.

is_pressed
Returns `True` if the Blue Dot is pressed (or held).

paired_devices
Returns a sequence of devices paired with this adapter `[(mac_address, name), (mac_address, name), ...]`:

```
bd = BlueDot()
devices = bd.paired_devices
for d in devices:
    device_address = d[0]
    device_name = d[1]
```

port
The port the server is using. This defaults to 1.

position
Returns an instance of *BlueDotPosition* (page 27) representing the current or last position the Blue Dot was pressed, held or released.

Note: If the Blue Dot is released (and inactive), *position* (page 25) will return the position where it was released, until it is pressed again. If the Blue Dot has never been pressed *position* (page 25) will return `None`.

---

print_messages
When set to `True` results in messages relating to the status of the Bluetooth server to be printed.

rotation_segments
Sets or returns the number of virtual segments the Blue Dot is split into for rotating. Defaults to 8.

running
Returns a `True` if the server is running.

server
The *btcomm.BluetoothServer* (page 31) instance that is being used to communicate with clients.

value
Returns a 1 if the Blue Dot is pressed, 0 if released.

values
Returns an infinite generator constantly yielding the current value.

when_client_connects
Sets or returns the function which is called when a Blue Dot connects.

when_client_disconnects
Sets or returns the function which is called when a Blue Dot disconnects.

when_double_pressed
Sets or returns the function which is called when the Blue Dot is double pressed.

The function should accept 0 or 1 parameters, if the function accepts 1 parameter an instance of *BlueDotPosition* (page 27) will be returned representing where the Blue Dot was pressed the second time.

Note - the double press event is fired before the 2nd press event e.g. events would be appear in the order, pressed, released, double pressed, pressed.

when_moved
Sets or returns the function which is called when the position the Blue Dot is pressed is moved.

The function should accept 0 or 1 parameters, if the function accepts 1 parameter an instance of *BlueDotPosition* (page 27) will be returned representing the new position of where the Blue Dot is held.

when_pressed
Sets or returns the function which is called when the Blue Dot is pressed.

The function should accept 0 or 1 parameters, if the function accepts 1 parameter an instance of *BlueDotPosition* (page 27) will be returned representing where the Blue Dot was pressed.

The following example will print a message to the screen when the button is pressed:

```
from bluedot import BlueDot

def dot_was_pressed():
    print("The Blue Dot was pressed")

bd = BlueDot()
bd.when_pressed = dot_was_pressed
```

This example shows how the position of where the dot was pressed can be obtained:

```
from bluedot import BlueDot

def dot_was_pressed(pos):
    print("The Blue Dot was pressed at pos x={} y={}".format(pos.x, pos.y))

bd = BlueDot()
bd.when_pressed = dot_was_pressed
```

when_released
Sets or returns the function which is called when the Blue Dot is released.

The function should accept 0 or 1 parameters, if the function accepts 1 parameter an instance of *BlueDotPosition* (page 27) will be returned representing where the Blue Dot was held when it was released.

when_rotated
Sets or returns the function which is called when the Blue Dot is rotated (like an iPod clock wheel).

The function should accept 0 or 1 parameters, if the function accepts 1 parameter an instance of *BlueDotRotation* (page 29) will be returned representing how the Blue Dot was rotated.

when_swiped
Sets or returns the function which is called when the Blue Dot is swiped.

The function should accept 0 or 1 parameters, if the function accepts 1 parameter an instance of *BlueDotSwipe* (page 28) will be returned representing the how the Blue Dot was swiped.

7.2 BlueDotPosition

class bluedot.**BlueDotPosition**(*x*, *y*)

Represents a position of where the blue dot is pressed, released or held.

Parameters

- **x** (*float*[28]) – The x position of the Blue Dot, 0 being centre, -1 being far left and 1 being far right.
- **y** (*float*[29]) – The y position of the Blue Dot, 0 being centre, -1 being at the bottom and 1 being at the top.

angle

The angle from centre of where the Blue Dot is pressed, held or released. 0 degress is up, 0..180 degrees clockwise, -180..0 degrees anti-clockwise.

bottom

Returns `True` if the Blue Dot is pressed, held or released at the bottom.

distance

The distance from centre of where the Blue Dot is pressed, held or released. The radius of the Blue Dot is 1.

left

Returns `True` if the Blue Dot is pressed, held or released on the left.

middle

Returns `True` if the Blue Dot is pressed, held or released in the middle.

right

Returns `True` if the Blue Dot is pressed, held or released on the right.

time

The time the blue dot was at this position.

Note: This is the time the message was received from the Blue Dot app, not the time it was sent.

---

top

Returns `True` if the Blue Dot is pressed, held or released at the top.

x

The x position of the Blue Dot, 0 being centre, -1 being far left and 1 being far right.

y

The y position of the Blue Dot, 0 being centre, -1 being at the bottom and 1 being at the top.

7.3 BlueDotInteraction

class bluedot.**BlueDotInteraction**(*pressed_position*)

Represents an interaction with the Blue Dot, from when it was pressed to when it was released.

A *BlueDotInteraction* (page 27) can be active or inactive, i.e. it is active because the Blue Dot has not been released, or inactive because the Blue Dot was released and the interaction finished.

Parameters **pressed_position** (BlueDotPosition (page 27)) – The BlueDotPosition when the Blue Dot was pressed.

moved(*moved_position*)

Adds an additional position to the interaction, called when the position the Blue Dot is pressed moves.

[28] https://docs.python.org/3.5/library/functions.html#float
[29] https://docs.python.org/3.5/library/functions.html#float

released(*released_position*)
Called when the Blue Dot is released and completes a Blue Dot interaction

Parameters **released_position** (BlueDotPosition (page 27)) – The BlueDotPosition when the Blue Dot was released.

active
Returns True if the interaction is still active, i.e. the Blue Dot hasnt been released.

current_position
Returns the current position for the interaction.

If the interaction is inactive, it will return the position when the Blue Dot was released.

distance
Returns the total distance of the Blue Dot interaction

duration
Returns the duration in seconds of the interaction, i.e. the amount time between when the Blue Dot was pressed and now or when it was released.

positions
A sequence of *BlueDotPosition* (page 27) instances for all the positions which make up this interaction.

The first position is where the Blue Dot was pressed, the last is where the Blue Dot was released, all position in between are where the position Blue Dot changed (i.e. moved) when it was held down.

pressed_position
Returns the position when the Blue Dot was pressed i.e. where the interaction started.

previous_position
Returns the previous position for the interaction.

If the interaction contains only 1 position, None will be returned.

released_position
Returns the position when the Blue Dot was released i.e. where the interaction ended.

If the interaction is still active it returns None.

7.4 BlueDotSwipe

class bluedot.**BlueDotSwipe**(*interaction*)
Represents a Blue Dot swipe interaction.

A *BlueDotSwipe* (page 28) can be valid or invalid based on whether the Blue Dot interaction was a swipe or not.

Parameters **interaction** (BlueDotInteraction (page 27)) – The BlueDotInteraction object to be used to determine whether the interaction was a swipe.

angle
Returns the angle of the swipe (i.e. the angle between the pressed and released positions)

distance
Returns the distance of the swipe (i.e. the distance between the pressed and released positions)

down
Returns True if the Blue Dot was swiped down.

interaction
The *BlueDotInteraction* (page 27) object relating to this swipe.

left
Returns True if the Blue Dot was swiped left.

right
Returns `True` if the Blue Dot was swiped right.

speed
Returns the speed of the swipe in Blue Dot radius / second.

up
Returns `True` if the Blue Dot was swiped up.

valid
Returns `True` if the Blue Dot interaction is a swipe.

7.5 BlueDotRotation

class bluedot.**BlueDotRotation**(*interaction*, *no_of_segments*)

anti_clockwise
Returns `True` if the Blue Dot was rotated anti-clockwise.

clockwise
Returns `True` if the Blue Dot was rotated clockwise.

valid
Returns `True` if the Blue Dot was rotated.

value
Returns 0 if the Blue Dot wasn't rotated, -1 if rotated anti-clockwise and 1 if rotated clockwise.

7.6 MockBlueDot

class bluedot.**MockBlueDot**(*device='hci0'*, *port=1*, *auto_start_server=True*, *power_up_device=False*, *print_messages=True*)
MockBlueDot (page 29) inherits from *BlueDot* (page 23) but overrides `_create_server()`, to create a *MockBluetoothServer* (page 35) which can be used for testing and debugging.

launch_mock_app()
Launches a mock Blue Dot app.

The mock app reacts to mouse clicks and movement and calls the mock blue dot methods to simulates presses.

This is useful for testing, allowing you to interact with Blue Dot without having to script mock functions.

The mock app uses pygame which will need to be installed.

mock_blue_dot_moved(*x*, *y*)
Simulates the Blue Dot being moved.

Parameters

- **x** (*int*[30]) – The x position where the mock Blue Dot was moved too
- **y** (*int*[31]) – The y position where the mock Blue Dot was moved too

mock_blue_dot_pressed(*x*, *y*)
Simulates the Blue Dot being pressed.

Parameters

[30] https://docs.python.org/3.5/library/functions.html#int
[31] https://docs.python.org/3.5/library/functions.html#int

- **x** (*int*[32]) – The x position where the mock Blue Dot was pressed
- **y** (*int*[33]) – The y position where the mock Blue Dot was pressed

mock_blue_dot_released(*x*, *y*)
Simulates the Blue Dot being released.

Parameters

- **x** (*int*[34]) – The x position where the mock Blue Dot was released
- **y** (*int*[35]) – The y position where the mock Blue Dot was released

mock_client_connected(*client_address='11:11:11:11:11:11'*)
Simulates a client connecting to the Blue Dot.

Parameters **client_address** (*string*[36]) – The mock client mac address, defaults to '11:11:11:11:11:11'

mock_client_disconnected()
Simulates a client disconnecting from the Blue Dot.

[32] https://docs.python.org/3.5/library/functions.html#int
[33] https://docs.python.org/3.5/library/functions.html#int
[34] https://docs.python.org/3.5/library/functions.html#int
[35] https://docs.python.org/3.5/library/functions.html#int
[36] https://docs.python.org/3.5/library/string.html#module-string

CHAPTER 8

Bluetooth Comm API

Blue Dot also contains a useful `btcomm` API for sending and receiving data over Bluetooth.

For normal use of Blue Dot, this API doesn't need to be used, but its included in the documentation for info and for those who might need a simple Bluetooth communication library.

8.1 BluetoothServer

class bluedot.btcomm.**BluetoothServer**(*data_received_callback*, *auto_start=True*, *device='hci0'*, *port=1*, *encoding='utf-8'*, *power_up_device=False*, *when_client_connects=None*, *when_client_disconnects=None*)

Creates a Bluetooth server which will allow connections and accept incoming RFCOMM serial data.

When data is received by the server it is passed to a callback function which must be specified at initiation.

The following example will create a Bluetooth server which will wait for a connection and print any data it receives and send it back to the client:

```
from bluedot.btcomm import BluetoothServer
from signal import pause

def data_received(data):
    print(data)
    s.send(data)

s = BluetoothServer(data_received)
pause()
```

Parameters

- **data_received_callback** – A function reference should be passed, this function will be called when data is received by the server. The function should accept a single parameter which when called will hold the data received. Set to `None` if received data is not required.
- **auto_start** (*bool*[37]) – If `True` (the default), the Bluetooth server will be auto-

[37] https://docs.python.org/3.5/library/functions.html#bool

matically started on initialisation, if `False`, the method `start` will need to be called before connections will be accepted.

- **device** (*str*[38]) – The Bluetooth device the server should use, the default is "hci0", if your device only has 1 Bluetooth adapter this shouldn't need to be changed.
- **port** (*int*[39]) – The Bluetooth port the server should use, the default is 1.
- **encoding** (*str*[40]) – The encoding standard to be used when sending and receiving byte data. The default is "utf-8". If set to `None` no encoding is done and byte data types should be used.
- **power_up_device** (*bool*[41]) – If `True`, the Bluetooth device will be powered up (if required) when the server starts. The default is `False`.

  Depending on how Bluetooth has been powered down, you may need to use **rfkill** to unblock Bluetooth to give permission to bluez to power on Bluetooth:

```
sudo rfkill unblock bluetooth
```

- **when_client_connects** – A function reference which will be called when a client connects. If `None` (the default), no notification will be given when a client connects
- **when_client_disconnects** – A function reference which will be called when a client disconnects. If `None` (the default), no notification will be given when a client disconnects

send(*data*)
Send data to a connected Bluetooth client

Parameters **data** (*str*[42]) – The data to be sent.

start()
Starts the Bluetooth server if its not already running. The server needs to be started before connections can be made.

stop()
Stops the Bluetooth server if its running.

adapter
A *BluetoothAdapter* (page 34) object which represents the Bluetooth device the server is using.

client_address
The MAC address[43] of the client connected to the server. Returns `None` if no client is connected.

client_connected
Returns `True` if a client is connected.

data_received_callback
Sets or returns the function which is called when data is received by the server.

The function should accept a single parameter which when called will hold the data received. Set to `None` if received data is not required.

device
The Bluetooth device the server is using. This defaults to "hci0".

encoding
The encoding standard the server is using. This defaults to "utf-8".

[38] https://docs.python.org/3.5/library/stdtypes.html#str
[39] https://docs.python.org/3.5/library/functions.html#int
[40] https://docs.python.org/3.5/library/stdtypes.html#str
[41] https://docs.python.org/3.5/library/functions.html#bool
[42] https://docs.python.org/3.5/library/stdtypes.html#str
[43] https://en.wikipedia.org/wiki/MAC_address

port
The port the server is using. This defaults to 1.

running
Returns a `True` if the server is running.

server_address
The MAC address[44] of the device the server is using.

when_client_connects
Sets or returns the function which is called when a client connects.

when_client_disconnects
Sets or returns the function which is called when a client disconnects.

8.2 BluetoothClient

class bluedot.btcomm.**BluetoothClient**(*server*, *data_received_callback*, *port=1*, *device='hci0'*, *encoding='utf-8'*, *power_up_device=False*, *auto_connect=True*)

Creates a Bluetooth client which can send data to a server using RFCOMM Serial Data.

The following example will create a Bluetooth client which will connect to a paired device called "raspberrypi", send "helloworld" and print any data is receives:

```
from bluedot.btcomm import BluetoothClient
from signal import pause

def data_received(data):
    print(data)

c = BluetoothClient("raspberrypi", data_received)
c.send("helloworld")

pause()
```

Parameters

- **server** (*str*[45]) – The server name ("raspberrypi") or server MAC address ("11:11:11:11:11:11") to connect to. The server must be a paired device.
- **data_received_callback** – A function reference should be passed, this function will be called when data is received by the client. The function should accept a single parameter which when called will hold the data received. Set to `None` if data received is not required.
- **port** (*int*[46]) – The Bluetooth port the client should use, the default is 1.
- **device** (*str*[47]) – The Bluetooth device to be used, the default is "hci0", if your device only has 1 Bluetooth adapter this shouldn't need to be changed.
- **encoding** (*str*[48]) – The encoding standard to be used when sending and receiving byte data. The default is "utf-8". If set to `None` no encoding is done and byte data types should be used.
- **power_up_device** (*bool*[49]) – If `True`, the Bluetooth device will be powered up (if required) when the server starts. The default is `False`.

[44] https://en.wikipedia.org/wiki/MAC_address
[45] https://docs.python.org/3.5/library/stdtypes.html#str
[46] https://docs.python.org/3.5/library/functions.html#int
[47] https://docs.python.org/3.5/library/stdtypes.html#str
[48] https://docs.python.org/3.5/library/stdtypes.html#str
[49] https://docs.python.org/3.5/library/functions.html#bool

Depending on how Bluetooth has been powered down, you may need to use **rfkill** to unblock Bluetooth to give permission to Bluez to power on Bluetooth:

```
sudo rfkill unblock bluetooth
```

- **auto_connect** (*bool*[50]) – If `True` (the default), the Bluetooth client will automatically try to connect to the server at initialisation, if `False`, the *connect()* (page 34) method will need to be called.

connect()
Connect to a Bluetooth server.

disconnect()
Disconnect from a Bluetooth server.

send(*data*)
Send data to a Bluetooth server.

Parameters **data** (*str*[51]) – The data to be sent.

adapter
A *BluetoothAdapter* (page 34) object which represents the Bluetooth device the client is using.

client_address
The MAC address of the device being used.

connected
Returns `True` when connected.

data_received_callback
Sets or returns the function which is called when data is received by the client.

The function should accept a single parameter which when called will hold the data received. Set to `None` if data received is not required.

device
The Bluetooth device the client is using. This defaults to "hci0".

encoding
The encoding standard the client is using. The default is "utf-8".

port
The port the client is using. This defaults to 1.

server
The server name ("raspberrypi") or server MAC address[52] ("11:11:11:11:11:11") to connect to.

8.3 BluetoothAdapter

class bluedot.btcomm.**BluetoothAdapter**(*device='hci0'*)
Represents and allows interaction with a Bluetooth Adapter.

The following example will get the Bluetooth adapter, print its powered status and any paired devices:

```
a = BluetoothAdapter()
print("Powered = {}".format(a.powered))
print(a.paired_devices)
```

[50] https://docs.python.org/3.5/library/functions.html#bool
[51] https://docs.python.org/3.5/library/stdtypes.html#str
[52] https://en.wikipedia.org/wiki/MAC_address

Parameters **device** (*str*[53]) – The Bluetooth device to be used, the default is "hci0", if your device only has 1 Bluetooth adapter this shouldn't need to be changed.

allow_pairing(*timeout=60*)
Put the adapter into discoverable and pairable mode.

Parameters **timeout** (*int*[54]) – The time in seconds the adapter will remain pairable. If set to `None` the device will be discoverable and pairable indefinetly.

address
The MAC address[55] of the Bluetooth adapter.

device
The Bluetooth device name. This defaults to "hci0".

discoverable
Set to `True` to make the Bluetooth adapter discoverable.

pairable
Set to `True` to make the Bluetooth adapter pairable.

paired_devices
Returns a sequence of devices paired with this adapater `[(mac_address, name), (mac_address, name), ...]`:

```
a = BluetoothAdapter()
devices = a.paired_devices
for d in devices:
    device_address = d[0]
    device_name = d[1]
```

powered
Set to `True` to power on the Bluetooth adapter.

Depending on how Bluetooth has been powered down, you may need to use **rfkill** to unblock Bluetooth to give permission to bluez to power on Bluetooth:

```
sudo rfkill unblock bluetooth
```

8.4 MockBluetoothServer

class bluedot.mock.**MockBluetoothServer**(*data_received_callback*, *auto_start=True*, *device='mock0'*, *port=1*, *encoding='utf-8'*, *power_up_device=False*, *when_client_connects=None*, *when_client_disconnects=None*)
MockBluetoothServer (page 35) inherits from *BluetoothServer* (page 31) but overrides `__init__`, `start()` and `stop()` to create a *MockBluetoothServer* (page 35) which can be used for testing and debugging.

mock_client_connected(*client_address='11:11:11:11:11:11'*)
Simulates a client connected to the *BluetoothServer* (page 31).

Parameters **client_address** (*string*[56]) – The mock client mac address, defaults to '11:11:11:11:11:11'

mock_client_disconnected()
Simulates a client disconnecting from the *BluetoothServer* (page 31).

[53] https://docs.python.org/3.5/library/stdtypes.html#str
[54] https://docs.python.org/3.5/library/functions.html#int
[55] https://en.wikipedia.org/wiki/MAC_address
[56] https://docs.python.org/3.5/library/string.html#module-string

mock_client_sending_data(*data*)
Simulates a client sending data to the *BluetoothServer* (page 31).

CHAPTER 9

Protocol

Blue Dot uses a client/server model. The `BlueDot` class starts a Bluetooth server, the Blue Dot application connects as a client.

The detail below can be used to create new applications (clients); if you do please send a pull request :)

9.1 Bluetooth

Communication over Bluetooth is made using a RFCOMM serial port profile, on port 1, using UUID "00001101-0000-1000-8000-00805f9b34fb".

9.2 Specification

The transmission is a 1-way stream from client to server; the server sends no acknowledgements or data back to the client.

All messages between client and server conform to the same format:

```
[operation],[x],[y]\n
```

Where:

- *operation* is either 0, 1 or 2:
  - Blue Dot released.
  - Blue Dot pressed.
  - Blue Dot pressed position moved.
- *x* & *y* specify the position on the Blue Dot that was pressed, released, and/or moved.
  - Positions are values between -1 and +1, with 0 being the centre and 1 being the radius of the Blue Dot.
  - *x* is the horizontal position where +1 is far right.
  - *y* is the vertical position where +1 is the top.
- \n represents the ASCII new-line character (ASCII character 10).

9.3 Example

If the blue dot is pressed at the top, the following message will be sent:

```
1,0.0,1.0\n
```

While the blue dot is pressed (held down), the user moves their finger to the far right causing the following message to be sent:

```
2,1.0,0.0\n
```

The button is then released, resulting in the following message:

```
0,1.0,0.0\n
```

If positions cannot be sent, *x* and *y* will still be sent but will default to 0.

CHAPTER 10

Build

These are instructions for how to develop, build and deploy Blue Dot.

10.1 Develop

Install / upgrade tools:

```
sudo python3 -m pip install --upgrade pip setuptools wheel twine
```

Clone repo and install for dev:

```
git clone https://github.com/martinohanlon/BlueDot
cd BlueDot
git checkout dev
sudo python3 setup.py develop
```

10.2 Test

Install pytest[57]:

```
sudo pip3 install -U pytest
```

Run tests:

```
cd BlueDot/tests
pytest -v
```

10.3 Deploy

Create `.pypirc` credentials file:

[57] https://doc.pytest.org/

```
nano ~/.pypirc

[distutils]
index-servers =
    pypi

[pypi]
username:
password:
```

Build for deployment:

```
python3 setup.py sdist
python3 setup.py bdist_wheel
python setup.py bdist_wheel
```

Deploy to PyPI[58]:

```
twine upload dist/* --skip-existing
```

[58] https://pypi.python.org/pypi

CHAPTER 11

Change log

11.1 Bluedot Python library

11.1.1 1.2.3 - 2018-02-22

- fix to *wait_for_press* and *wait_for_release*
- when_client_connects and when_client_disconnects callbacks are now threaded
- The python blue dot app can now be started with the command *bluedotapp*
- new tests for *wait_for_(events)*

11.1.2 1.2.2 - 2017-12-30

- bluetooth comms tests and minor bug fix in `BluetoothClient` (page 33)

11.1.3 1.2.1 - 2017-12-18

- massive code and docs tidy up by Dave Jones[59]

11.1.4 1.2.0 - 2017-12-10

- added when_rotated
- threaded swipe callbacks
- exposed new `BlueDot` (page 23) properties (`adapter` (page 24), `running` (page 25), `paired_devices` (page 25))
- fixed active bug in interaction
- automated tests

[59] https://github.com/waveform80

11.1.5 1.1.0 - 2017-11-05

- threaded callbacks
- python app rounded x,y performance improvements

11.1.6 1.0.4 - 2017-09-10

- serial port profile port fix
- launching multiple blue dots fix

11.1.7 1.0.3 - 2017-07-28

- python 2 bug fix

11.1.8 1.0.2 - 2017-07-23

- bug fix

11.1.9 1.0.1 - 2017-06-19

- bug fixes

11.1.10 1.0.0 - 2017-06-04

- production release!
- added double click
- doc updates
- minor changes

11.1.11 0.4.0 - 2017-05-05

- added swipes and interactions
- doc updates
- bug fix in *BlueDot.when_moved* (page 26)

11.1.12 0.3.0 - 2017-05-01

- Python Blue Dot app
- minor bug fix in *BluetoothClient* (page 33)

11.1.13 0.2.1 - 2017-04-23

- bug fix in *MockBlueDot* (page 29)
- doc fixes

11.1.14 0.2.0 - 2017-04-23

- added *when_client_connects* (page 25), *when_client_disconnects* (page 25)
- added *allow_pairing()* (page 24) functions
- refactored Bluetooth comms
- added *BluetoothAdapter* (page 34)

11.1.15 0.1.2 - 2017-04-14

- mock blue dot improvements
- doc fixes

11.1.16 0.1.1 - 2017-04-08

- clamped distance in *BlueDotPosition* (page 27)

11.1.17 0.1.0 - 2017-04-07

- Check Bluetooth adapter is powered
- Handle client connection timeouts
- Docs & image updates

11.1.18 0.0.6 - 2017-04-05

- Added *MockBlueDot* (page 29) for testing and debugging
- more docs

11.1.19 0.0.4 - 2017-03-31

Updates after alpha feedback

- Python 2 compatibility
- `.dot_position` to `.position`
- `.values` added
- clamped `x`, `y` to 1
- loads of doc updates

11.1.20 0.0.2 - 2017-03-29

Alpha - initial testing

11.2 Android app

11.2.1 2 (1.1) - 2017-11-05

- better responsive layout
- fixed issues with small screen devices
- rounded x,y values increasing performance
- new help icon
- link to https://bluedot.readthedocs.io not http

11.2.2 1 (0.0.2) - 2017-04-05

- icon transparency
- connection monitor
- added info icon to https://bluedot.readthedocs.io

11.2.3 0 (0.0.1) - 2017-03-29

- alpha - initial testing

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