

Scratch + Raspberry Pi Workshop: Control LED Lights by Programming

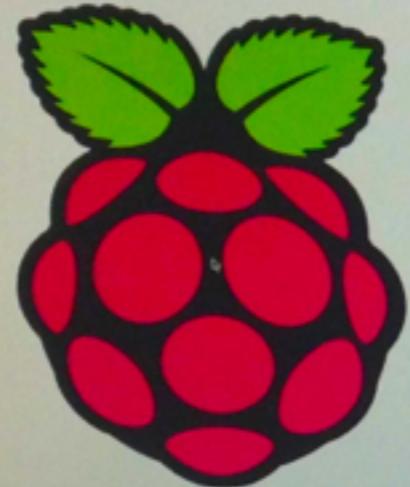


2014/04/17 (Sun)
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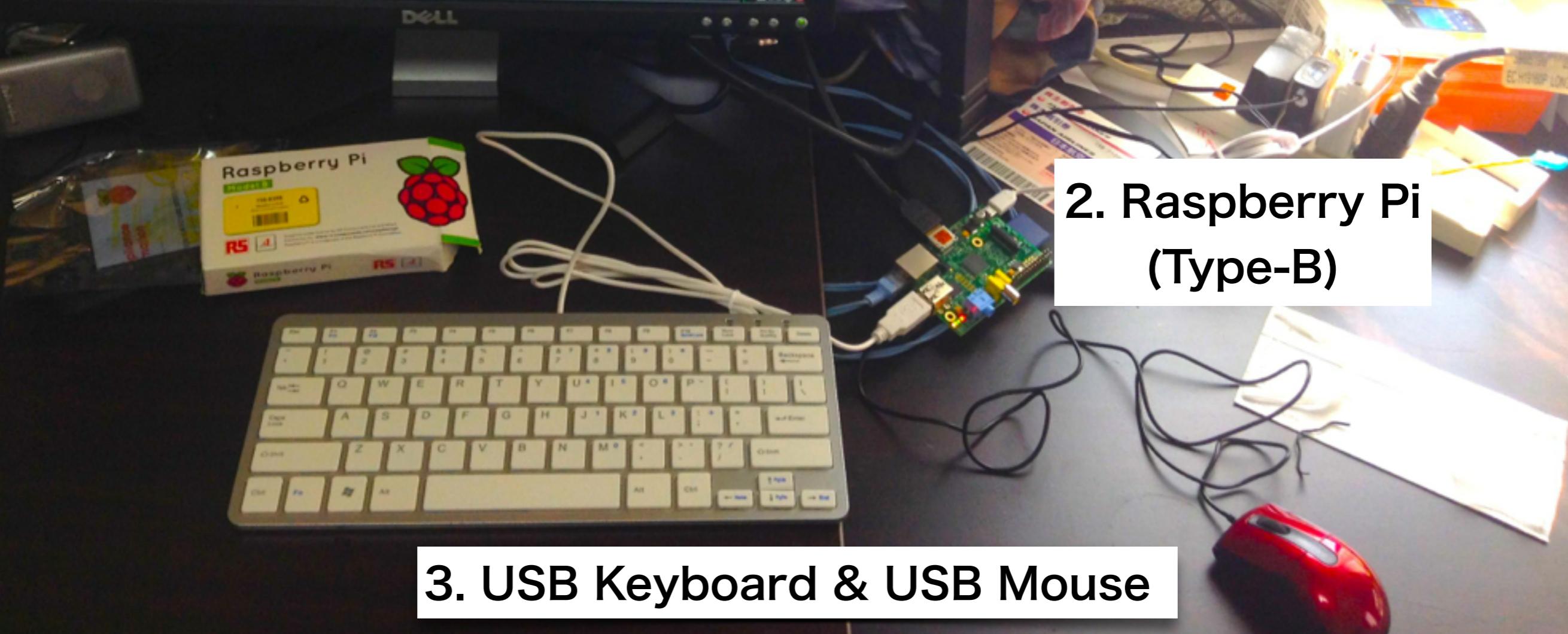
Note for Instructors

- These slides were used in the 1.5 hour workshop, held at Yokohama International School.
 - If you'd like to have this workshop, you will need to prepare the following things/software:
 1. Get a Raspberry Pi and stuffs to boot it: Display, keyboard, mouse, cables, etc.
 2. Download and install Scratch GPIO4.
 3. Buy a breadboard and circuit elements.
- * For details, see **References** on the last slide.

Hands-on: Let's set up Raspberry Pi!



1. HDMI Display



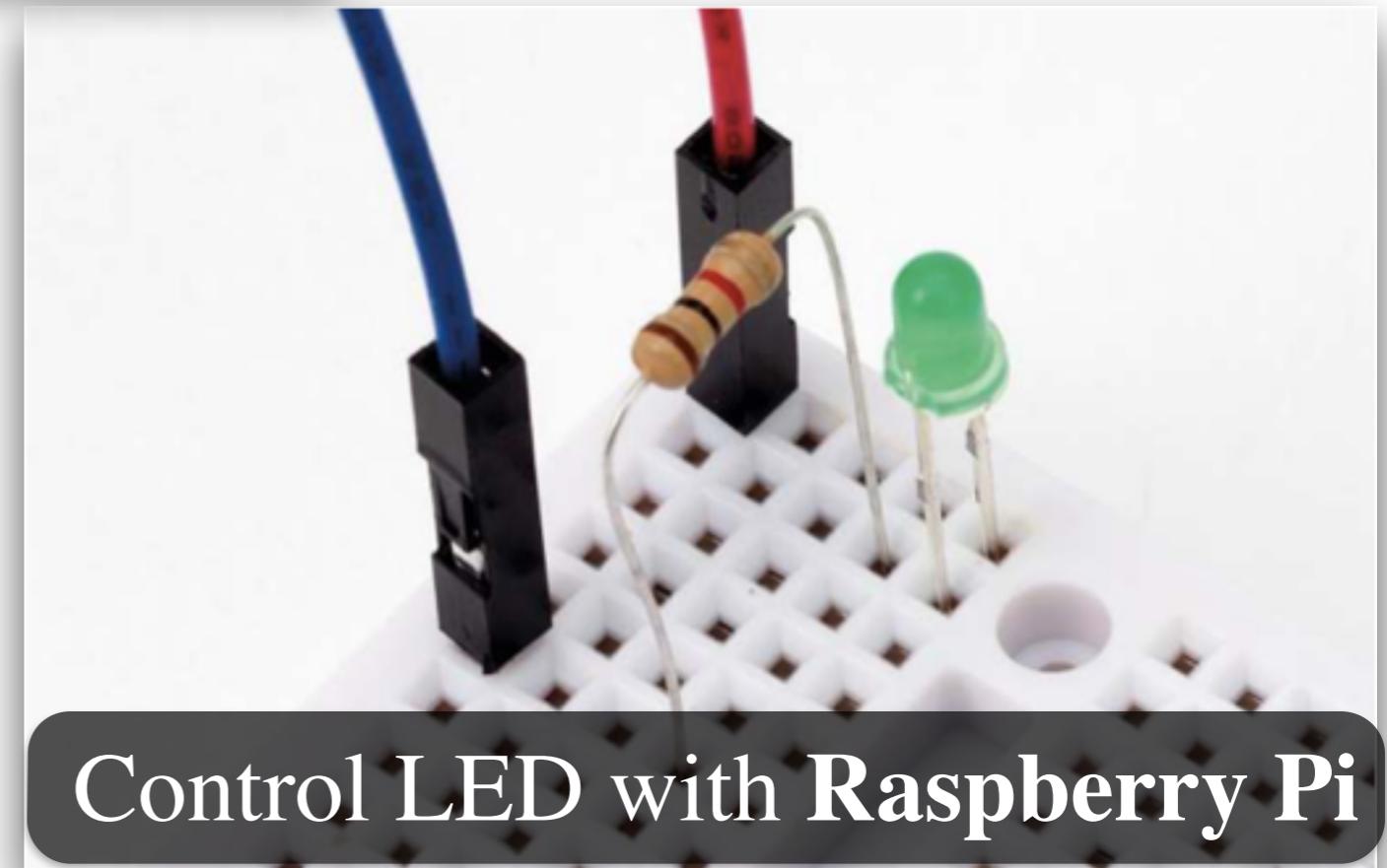
2. Raspberry Pi
(Type-B)

3. USB Keyboard & USB Mouse



Ports we'll use in this workshop

Summary



SCRATCH

File Edit Share Help

Motion Control
Looks Sensing
Sound Operators
Pen Variables

Stage

Scripts Backgrounds Sounds

when green flag clicked

set score to 0
forever
change score by 1

score 32

Make a variable
Delete a variable
 score
set score to 0
change score by 1
show variable score
hide variable score
Make a list

New sprite:

Sprite1 Sprite2 Sprite3

Stage

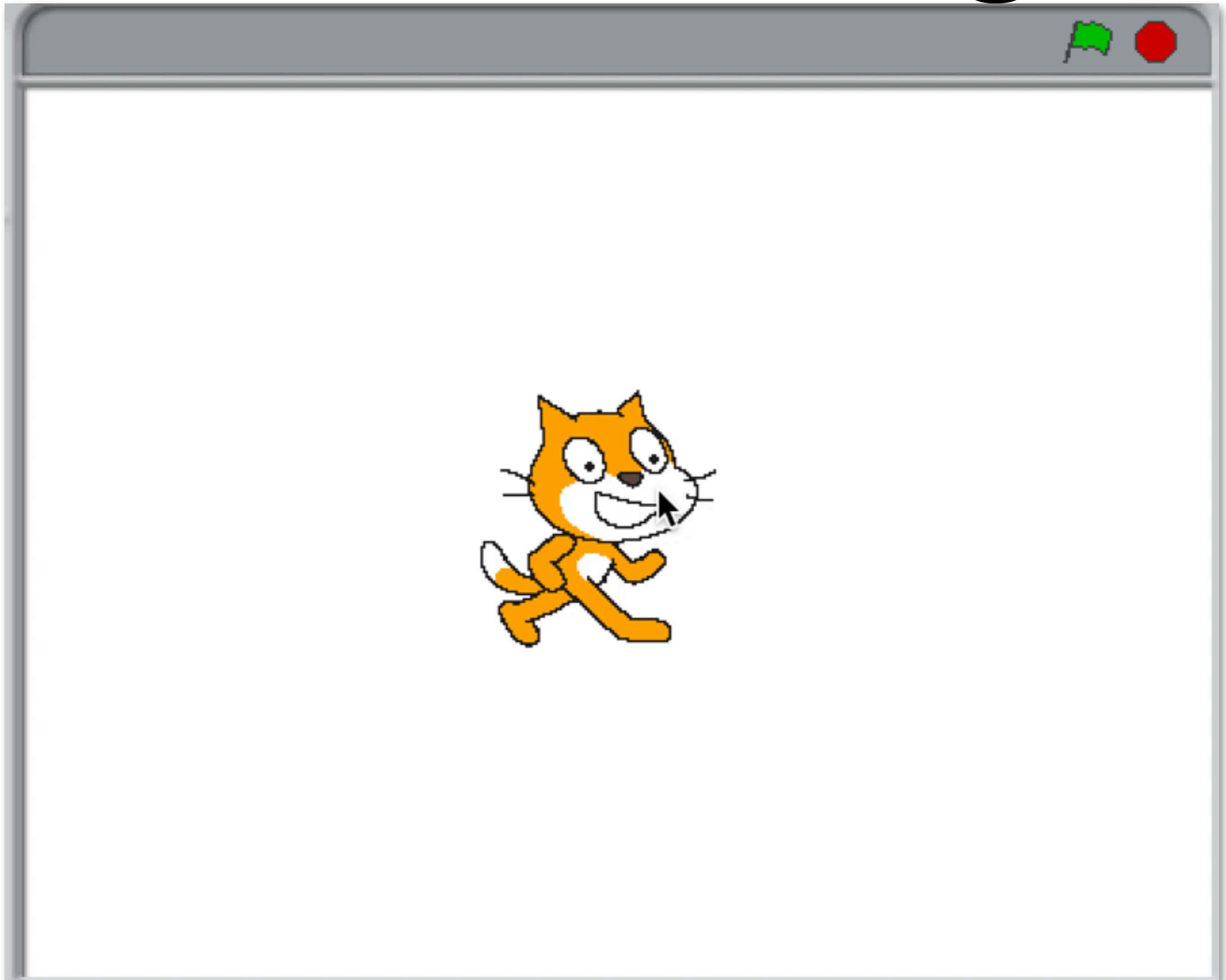
x: -453 y: -118

Making a program with Scratch is really easy.

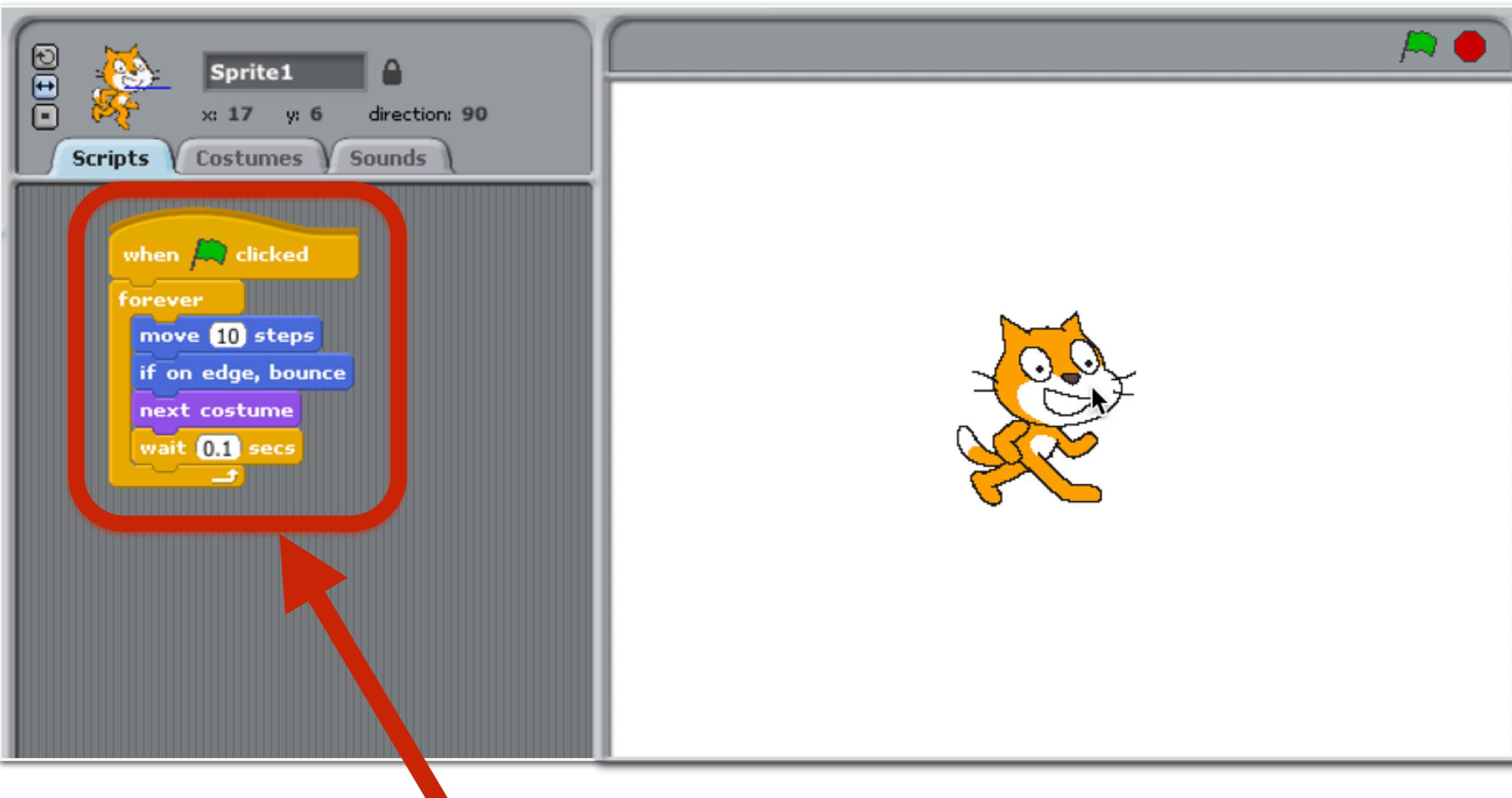
You can run Scratch by double-clicking this icon on Desktop:



Hands-on: Walking Cat



Hands-on: Walking Cat



This is one of answers that makes a cat walk.

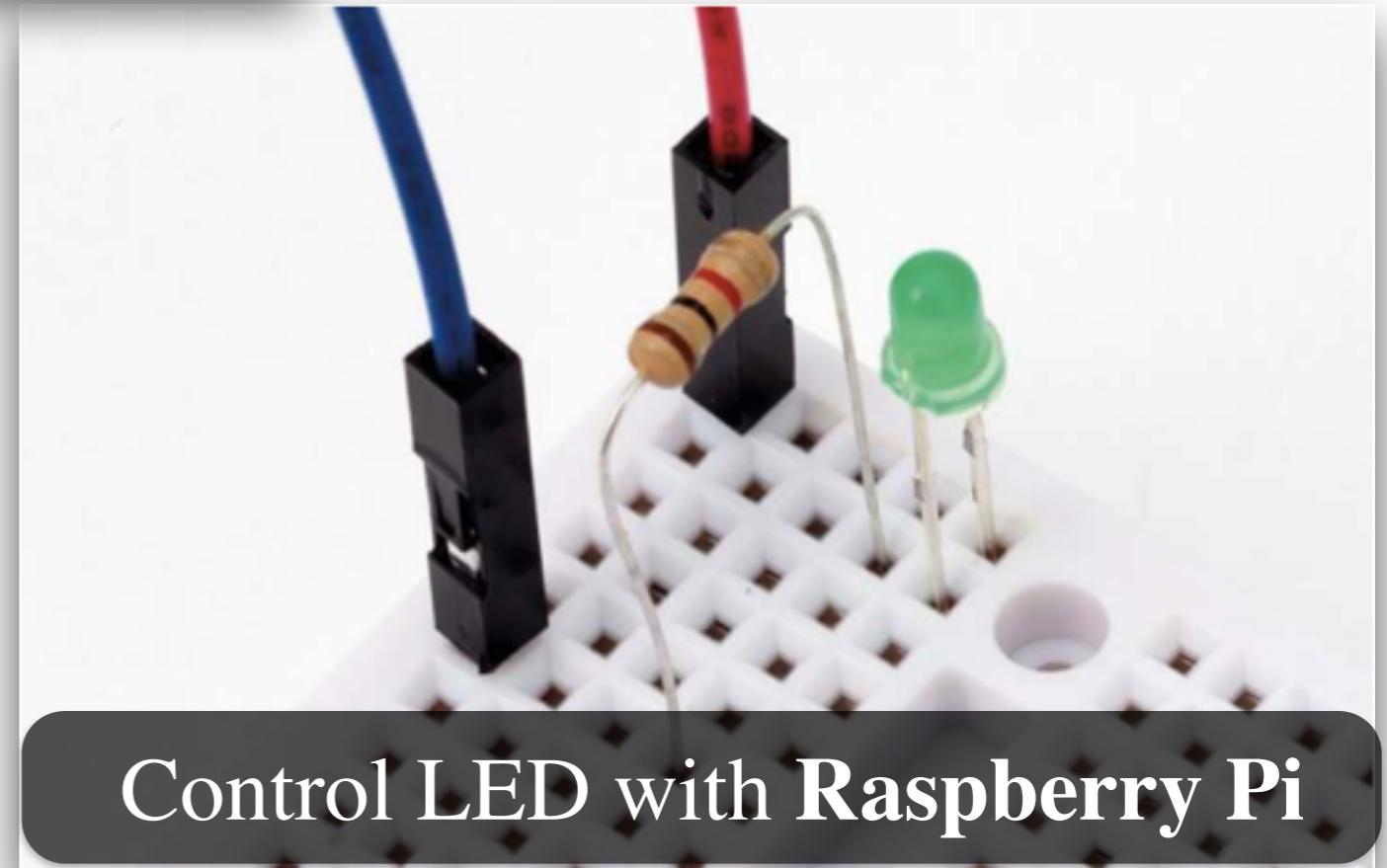
Other Sample: Whack a Cat



Other Sample: Escape from Cat



Summary



LED:

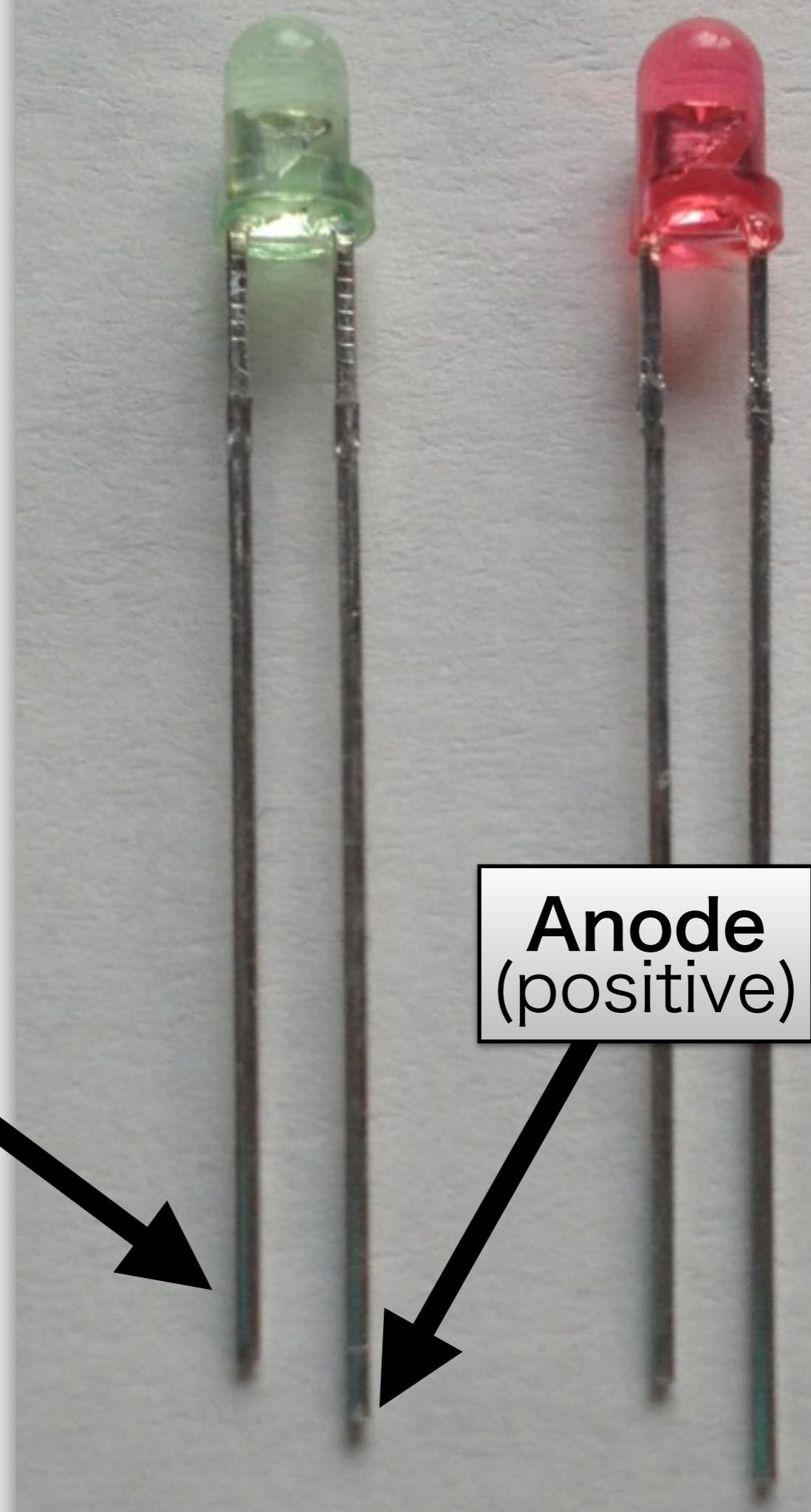
Light Emitting Diode

The length is different.

- Shorter is negative.
- Longer is positive.

Cathode
(negative)

Anode
(positive)

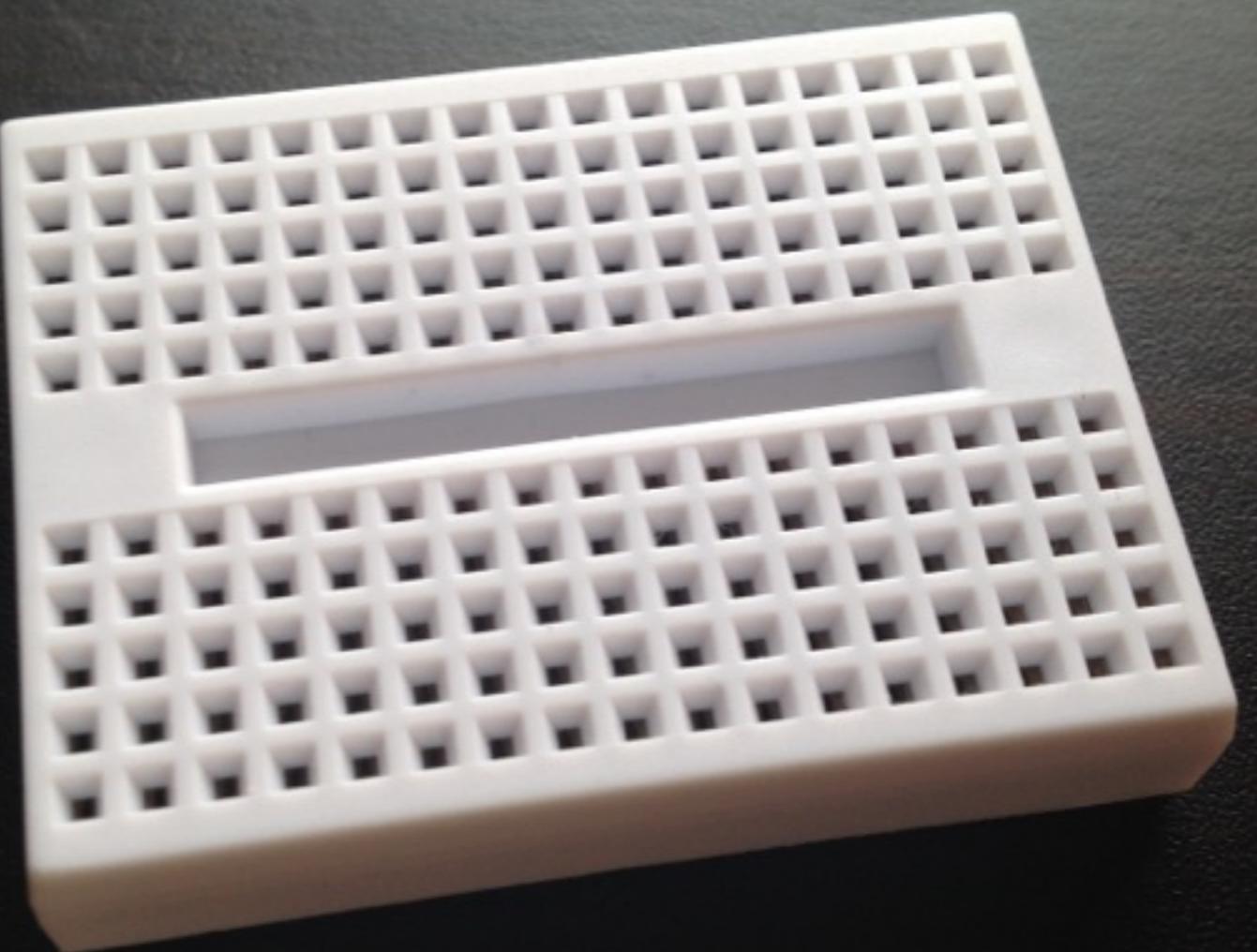


Breadboard

is usually a construction base for prototyping of electronics.

The term "breadboard" is commonly used to refer to a solderless breadboard.

cf. [http://en.wikipedia.org/
wiki/Breadboard](http://en.wikipedia.org/wiki/Breadboard)



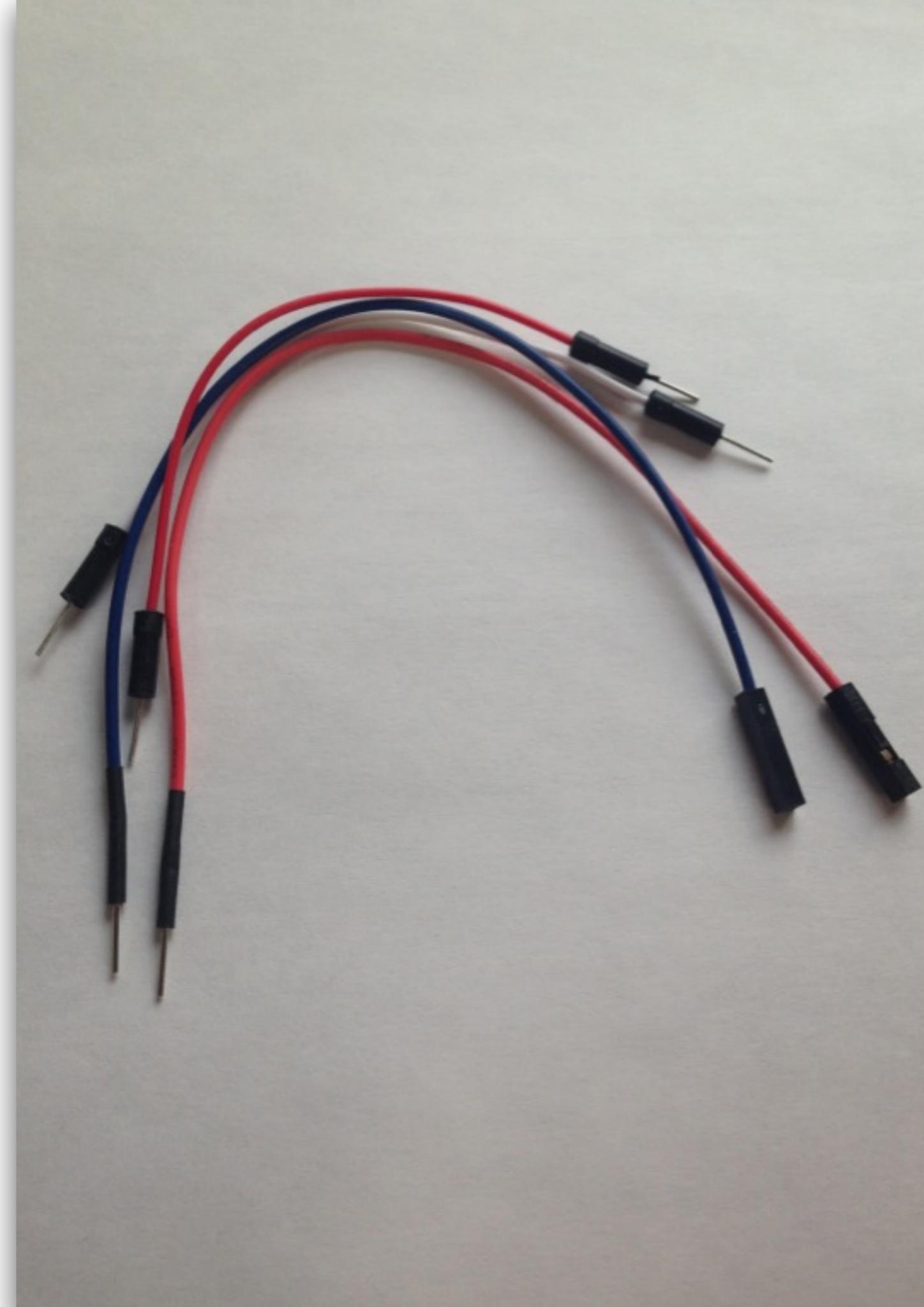
Jumper Wire

There are two types for connecting between:

1. Raspberry Pi and Breadboard

2. Breadboard and Breadboard

* You don't have to care about it's color.



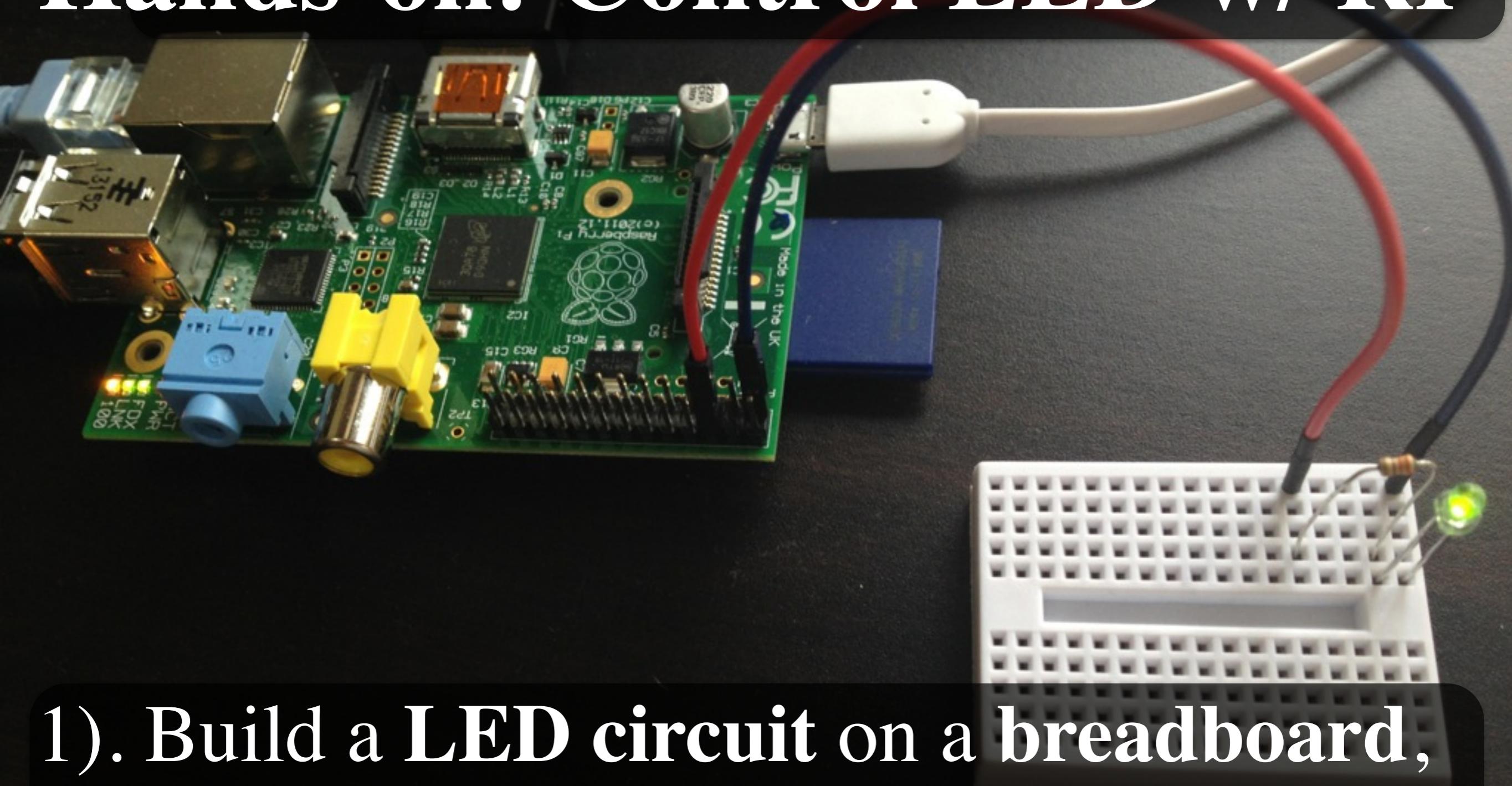
Resistor

is an electronic element to control current to LED

Bend a resistor ‘C’ shape to wire it into your breadboard.

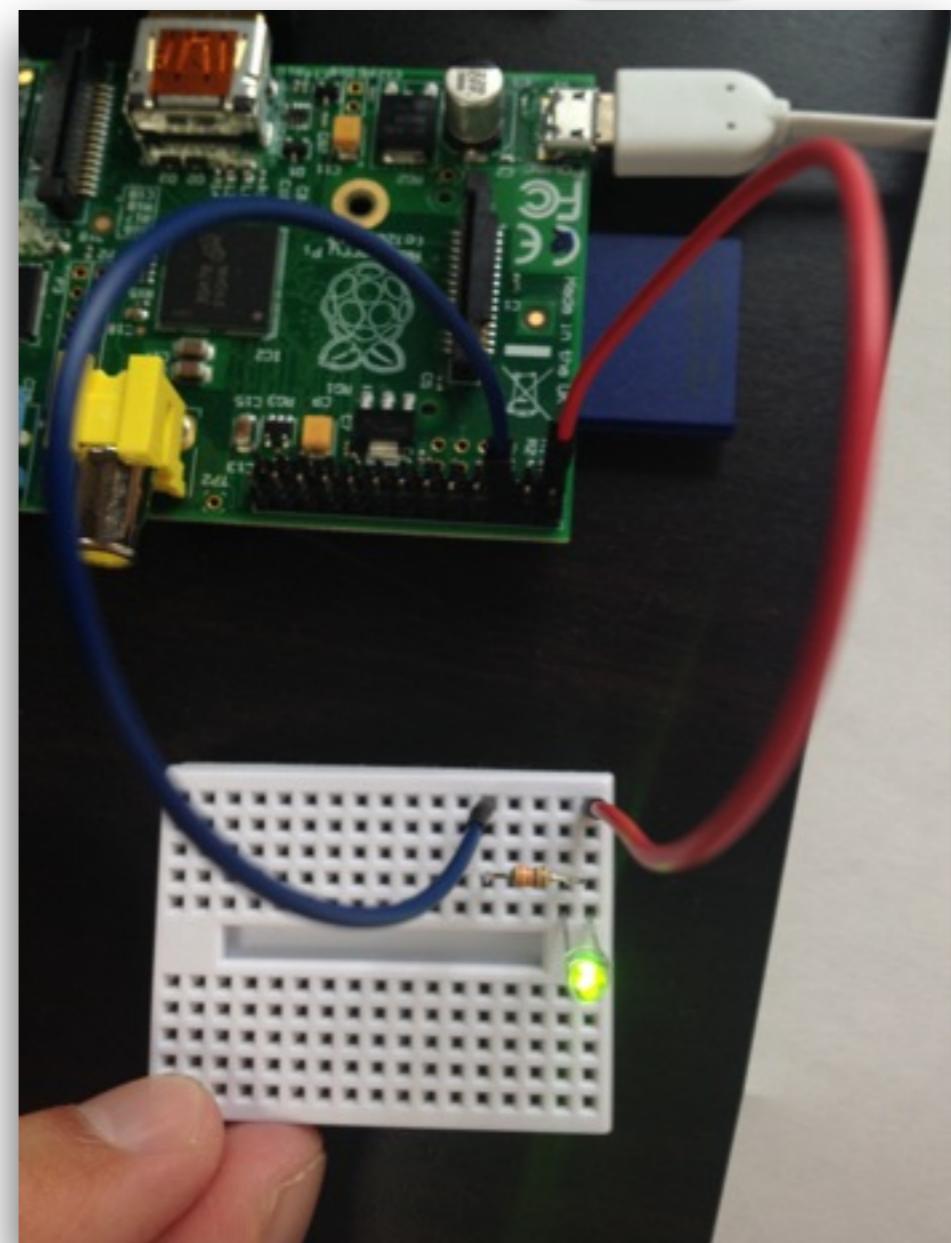
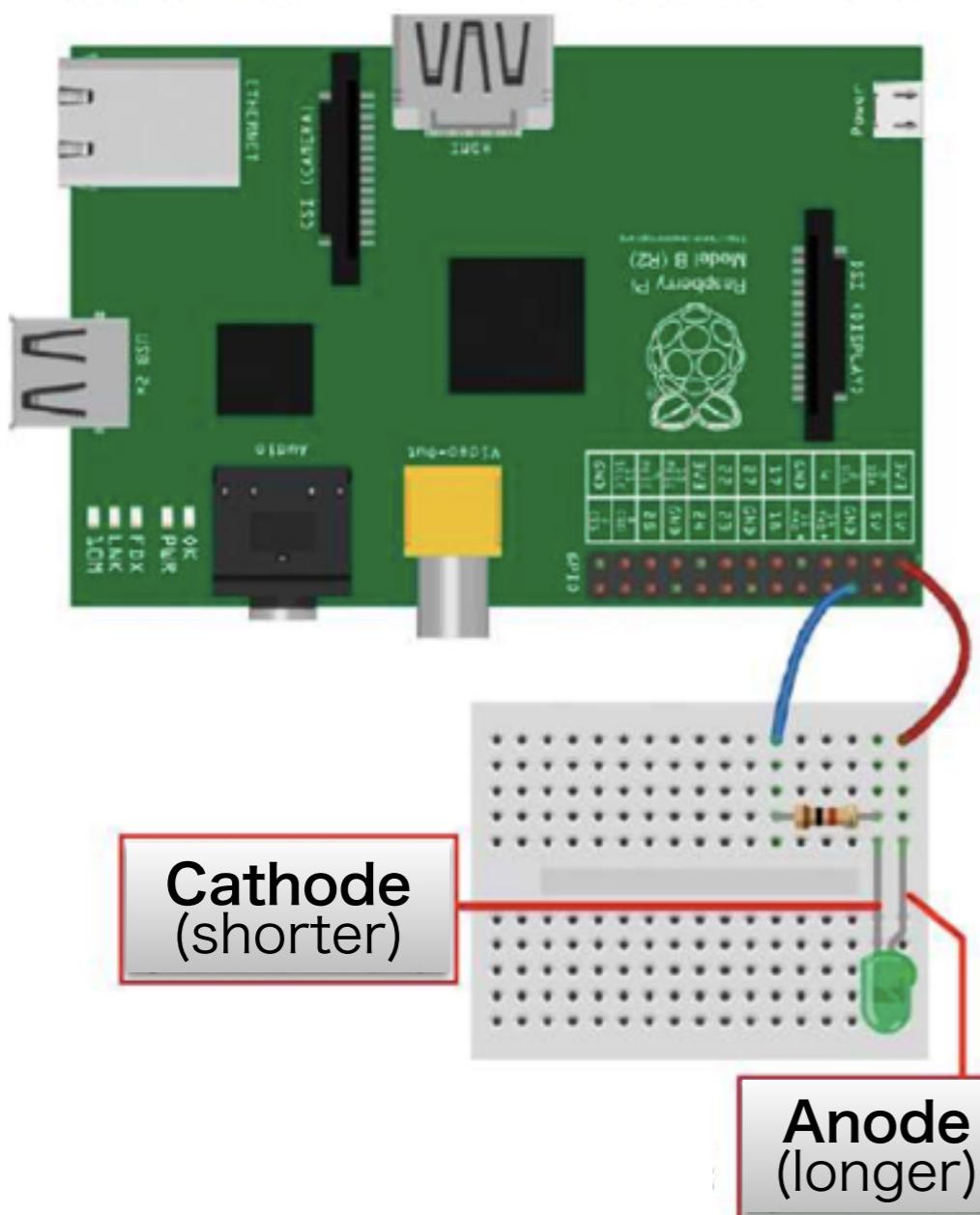
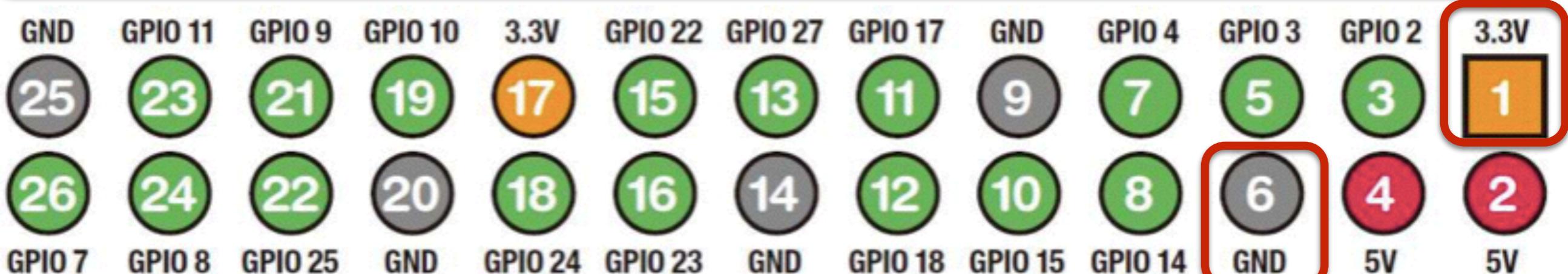


Hands-on: Control LED w/ RP

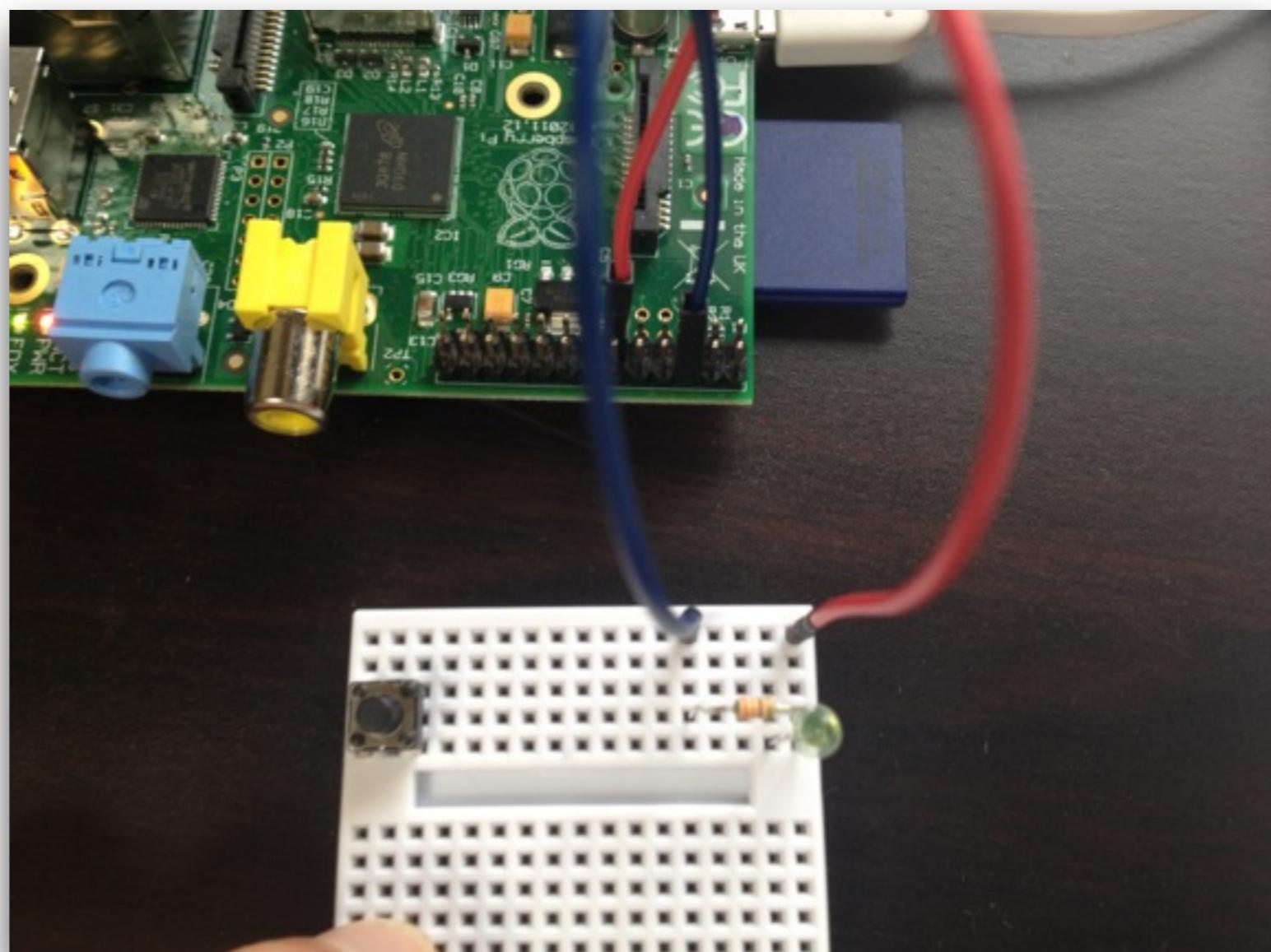
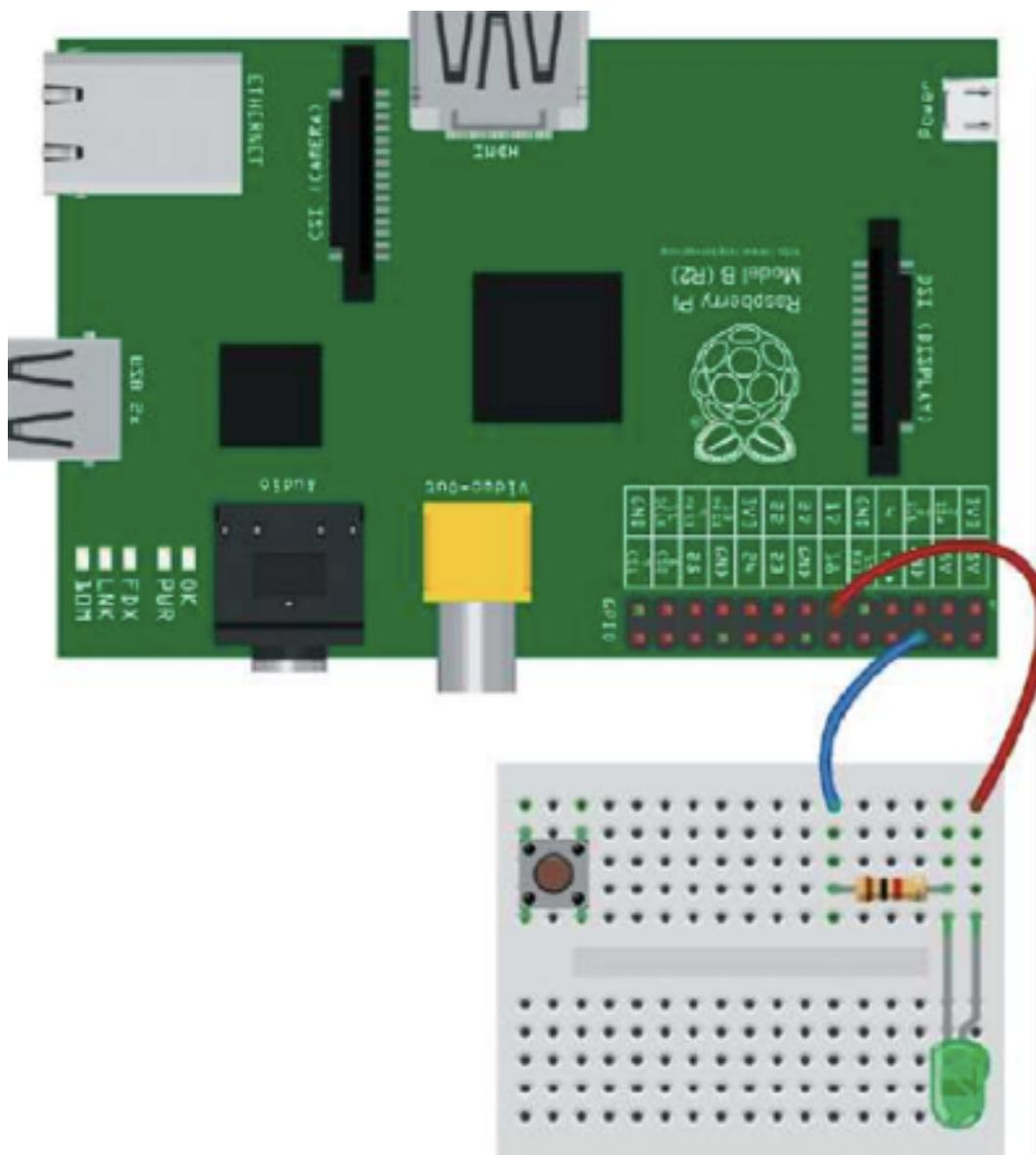
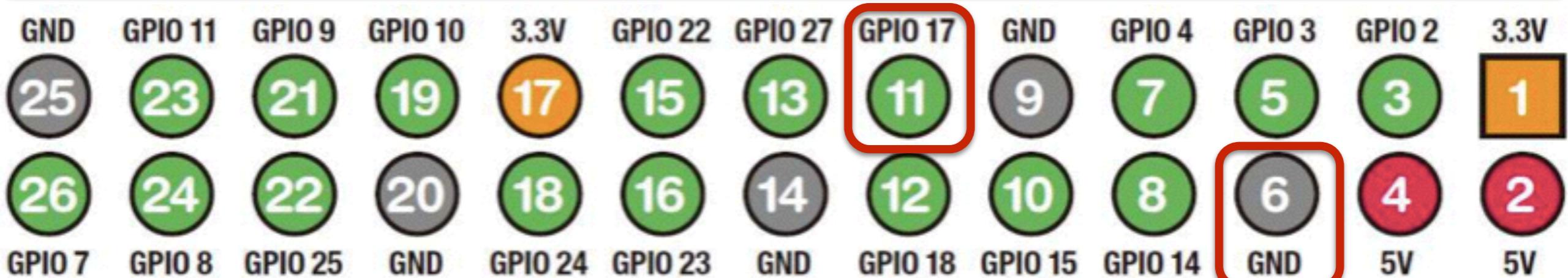


- 1). Build a LED circuit on a breadboard,
- 2). connect it to Raspberry Pi's GPIO, and
- 3). control LED light from Scratch.

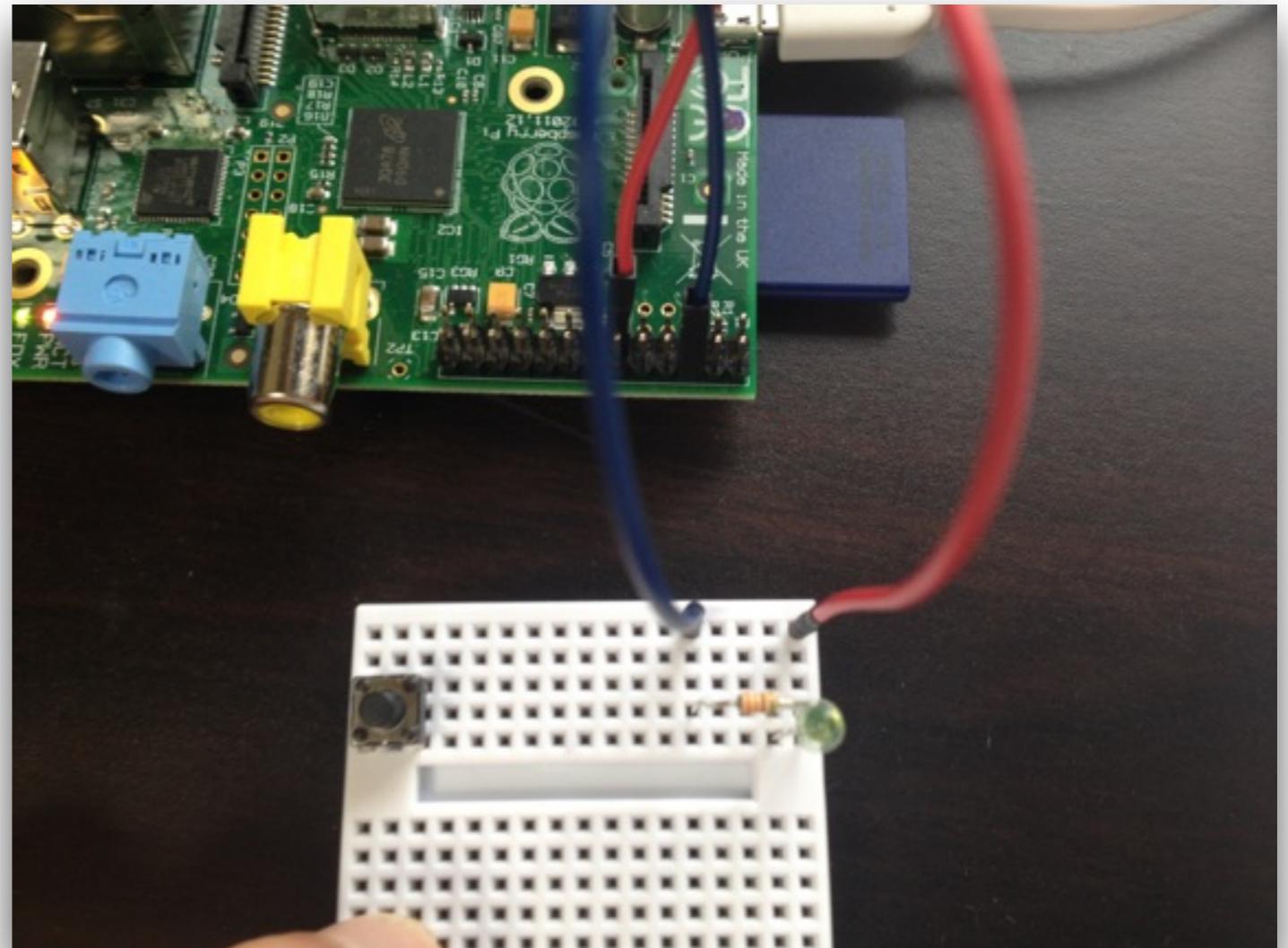
1). Build a LED circuit on a breadboard



2). Connect it to Raspberry Pi's GPIO



3). Control LED light from Scratch



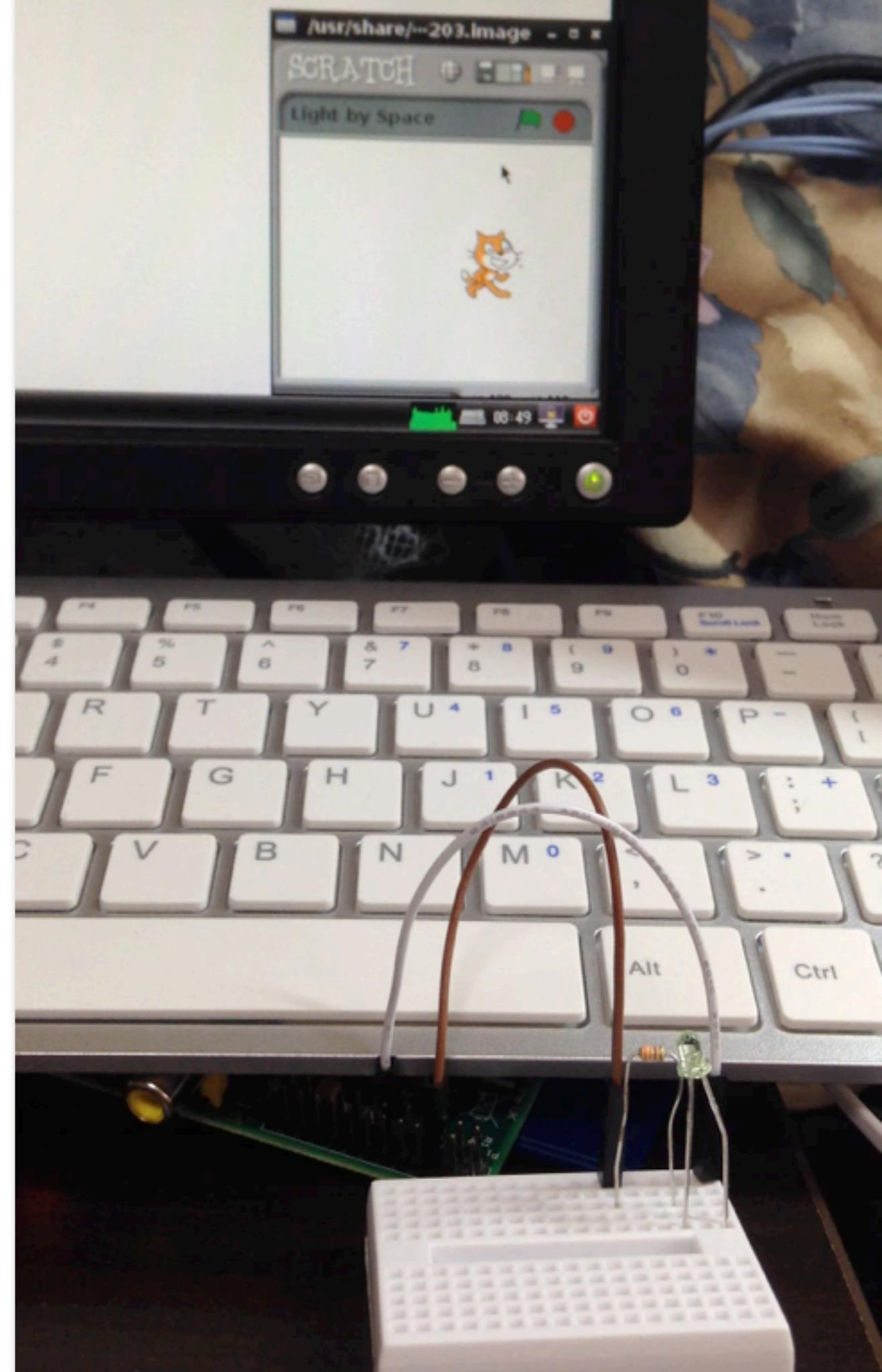
1. Close Scratch window.
2. Open Scratch GPIO4.
3. File -> Open **blink11**.
4. Click the green flag.



Scratch GPIO4

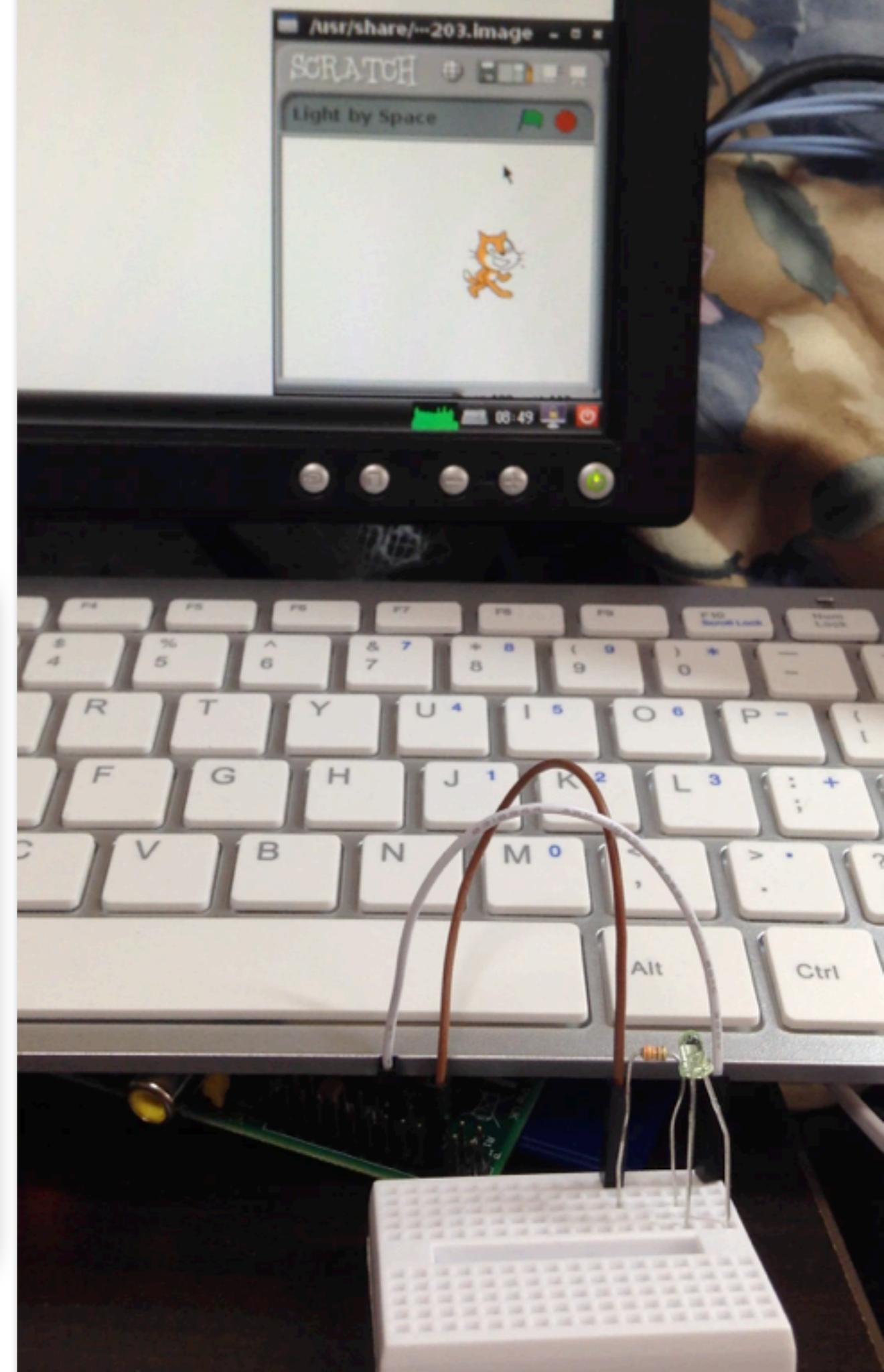
Hands-on: Light by Space

- Create a script that turns on LED light while pressing **Space** on your keyboard.
- If not pressing **Space**, LED light should be off.
- Hint: Some block in **Sensing** may be helpful.



Hands-on: Light by Space

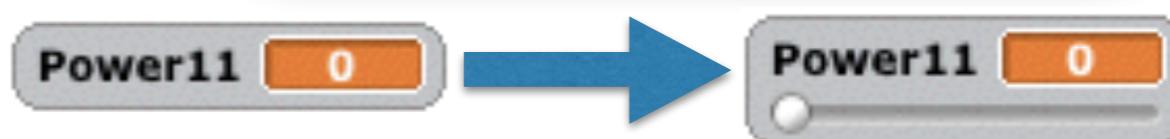
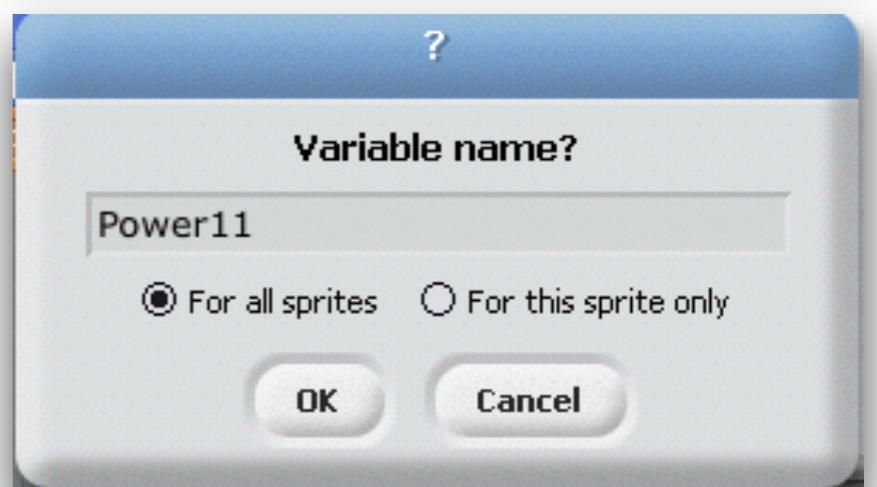
Sample Answer:



Control from 0/1 to 0~1

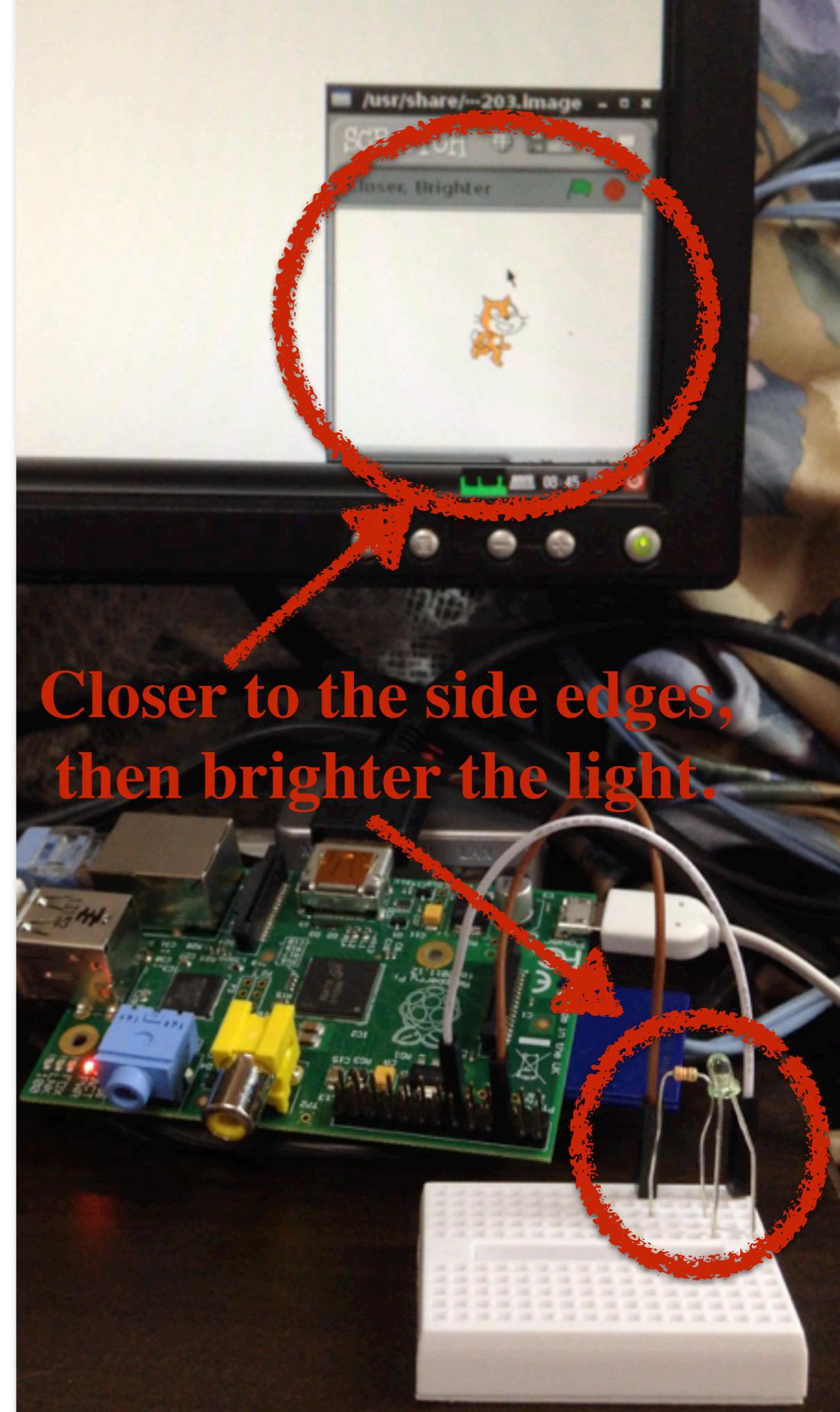
Let's control brightness of LED light by using **Variables** (orange block).

1. Go to **Variables**, and click **Make a variable**.
2. Name it **Power11**, and click **OK**.
3. Double click **Power11** appeared at the top left in the stage.
4. Change the number by dragging the slider next of **Power11**.



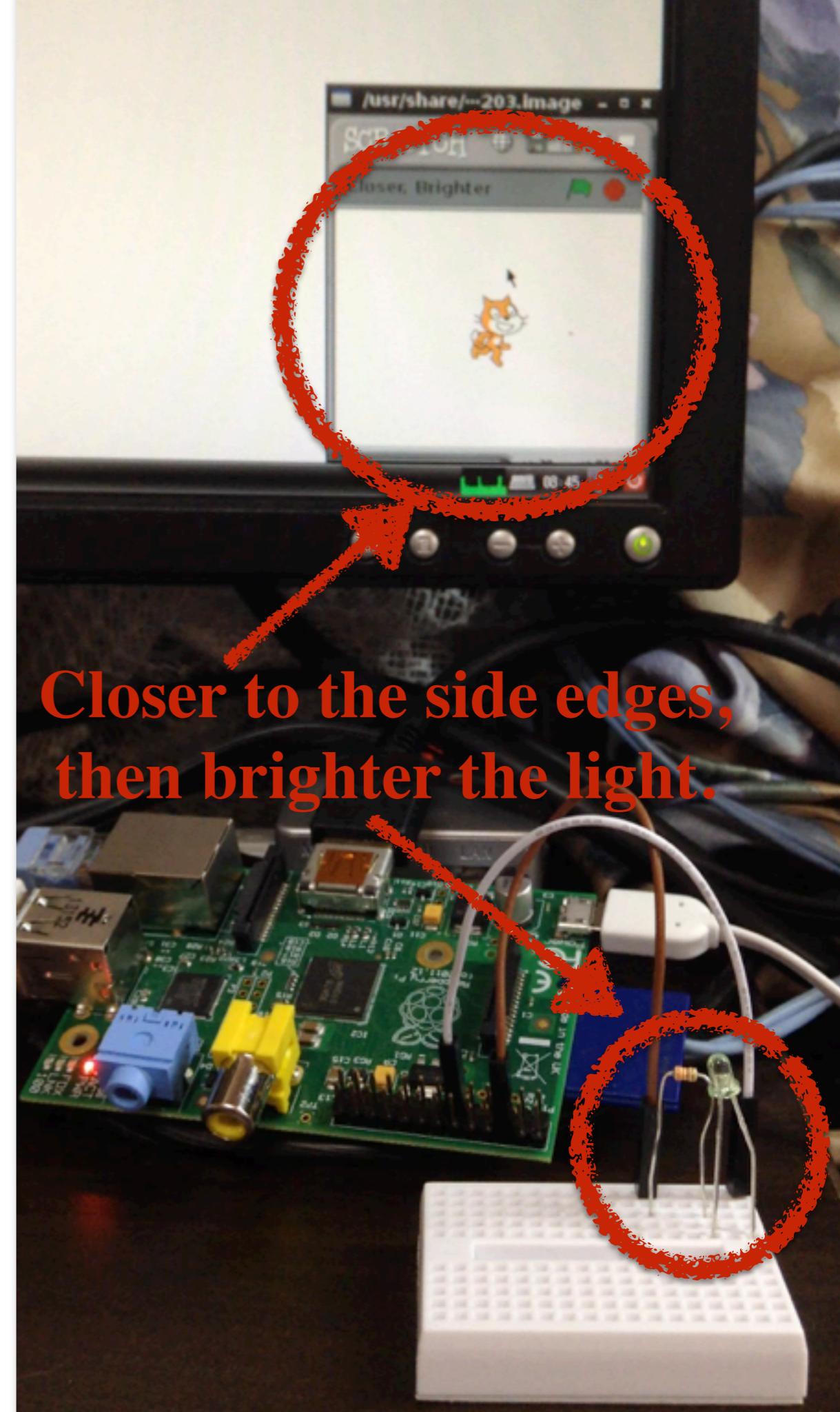
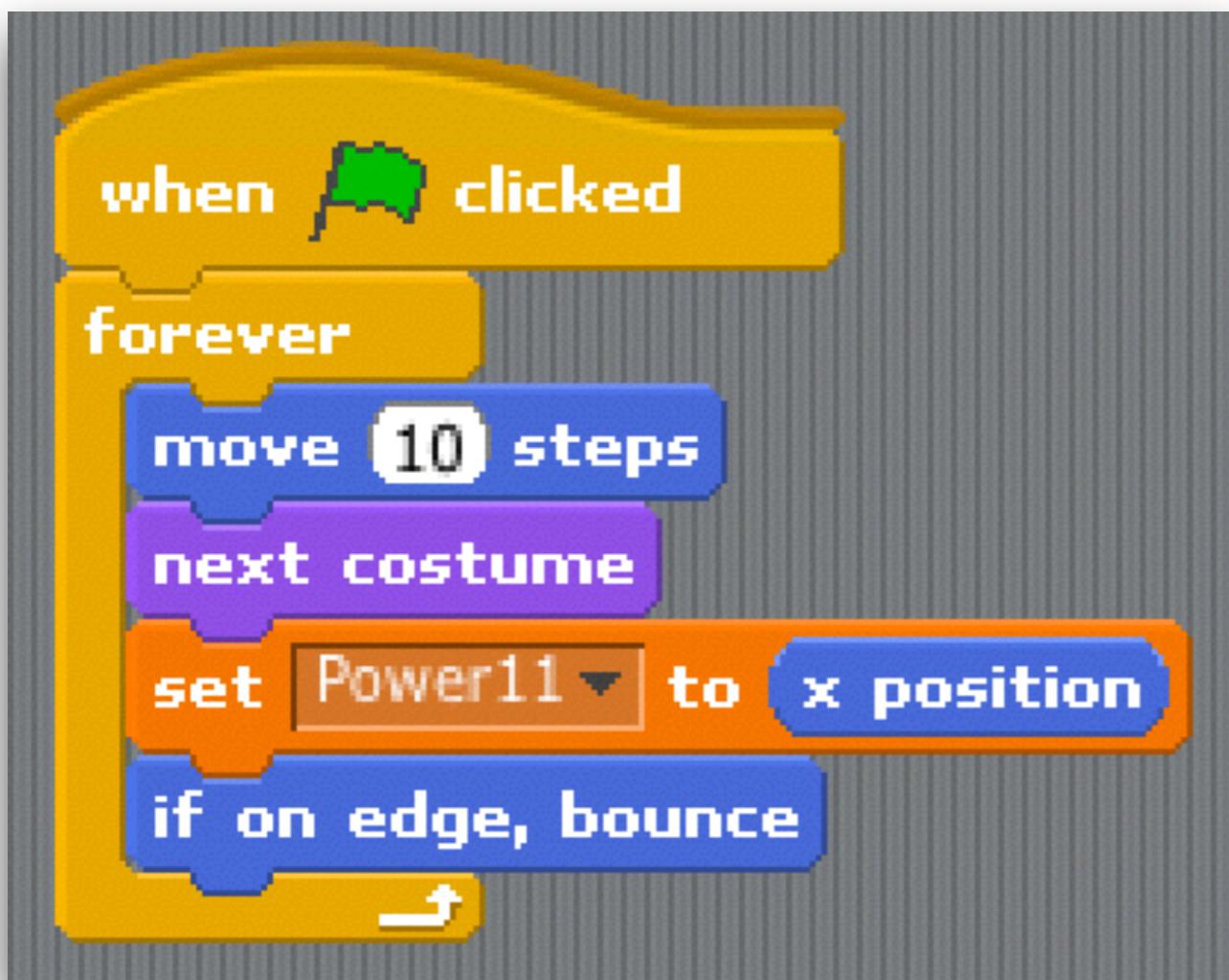
Final Hands-on: Closer to edges, Brighter the light

- When a cat moves to right/left and it's closer to edges, change the LED light brighter.
- Hint: You may need to know the position of Cat by using some block(s) in Motion.



Final Hands-on: Closer to edges, Brighter the light

Sample Answer:



Summary



For further topics, you can replace LED light with something like:

Piezoelectric Loudspeaker
to control sounds:



Vibrating Motor
to vibrate something:



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References

- Raspberry Piではじめる どきどきプログラミング (はじめるプログラミング シリーズ) [単行本] 阿部 和広 (著, 監修), 石原 淳也 (著), 塩野 複隆 (著):

<http://www.amazon.co.jp/Raspberry-Piではじめる-どきどきプログラミング-はじめるプログラミング-シリーズ/dp/4822297314>

(Available only in Japanese)

- PEG (Programming Education Gathering):
<http://pegpeg.jp/> (Available only in Japanese)

- Scratch GPIO version 4

<http://cymplecy.wordpress.com/2013/04/22/scratch-gpio-version-2-introduction-for-beginners/> (Available only in English)

- Raspberry Pi – Wikipedia:

http://en.wikipedia.org/wiki/Raspberry_Pi