

# Scratch + Raspberry Pi Workshop: Control LED Lights by Programming

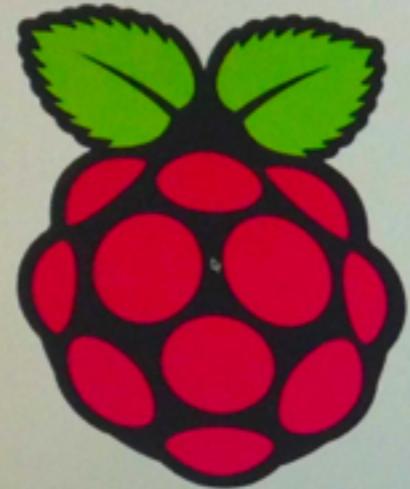


2014/04/17 (Sun)  
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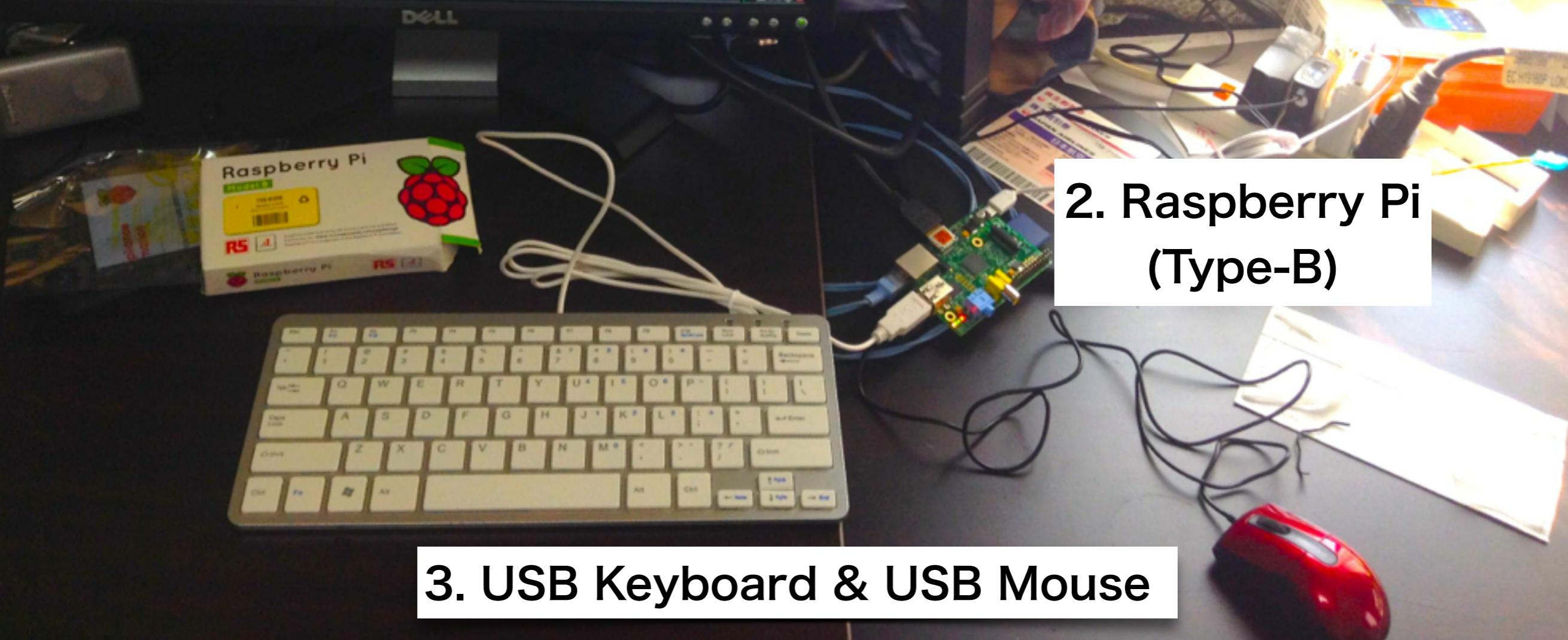
# Note for Instructors

- 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

Ethernet  
to access Web  
(option)

HDMI  
to display

USB Mini  
to power

2 USBs  
for keyboard  
& mouse

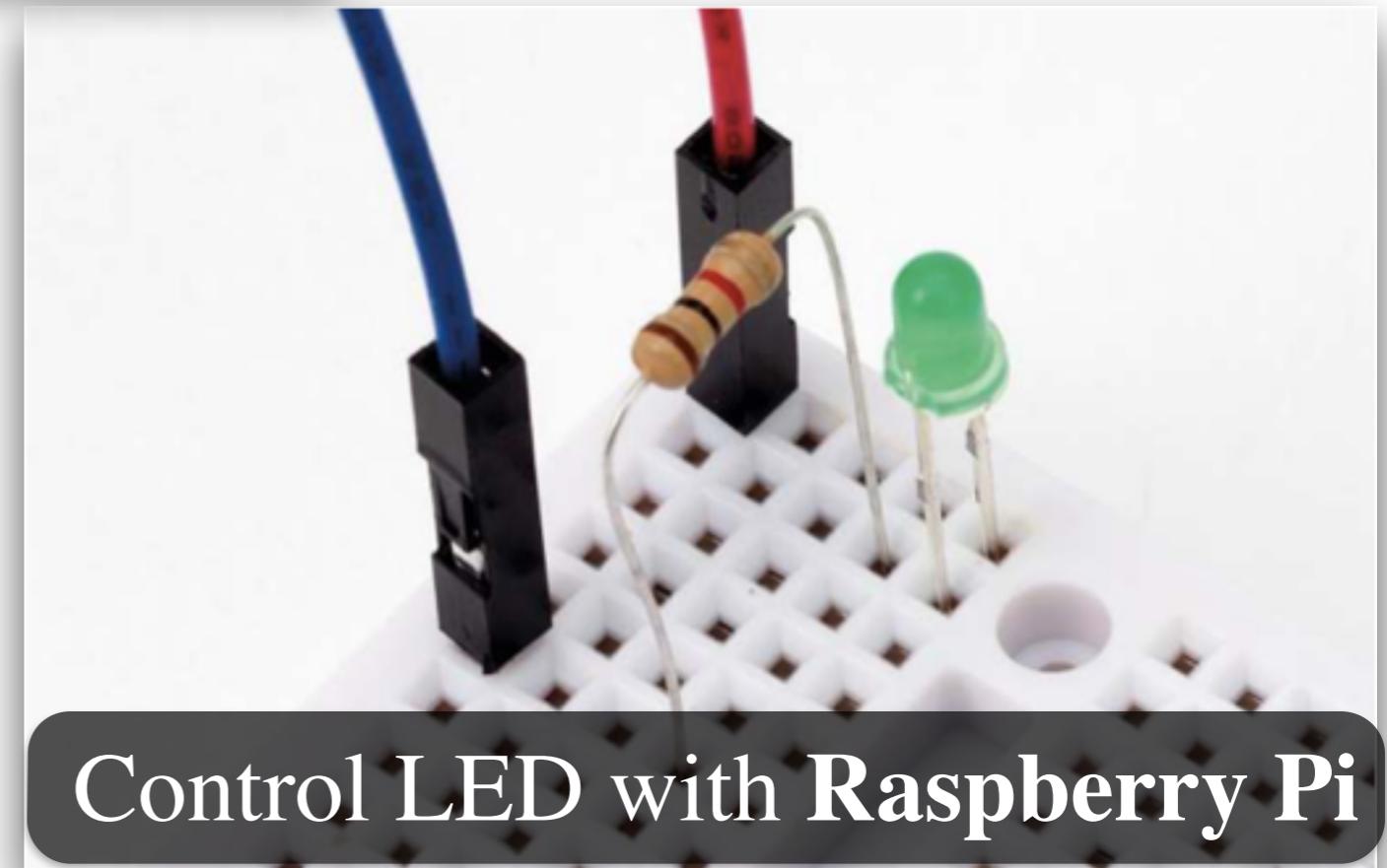
Pins for  
prototyping

SD Card (on  
the back) to boot

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

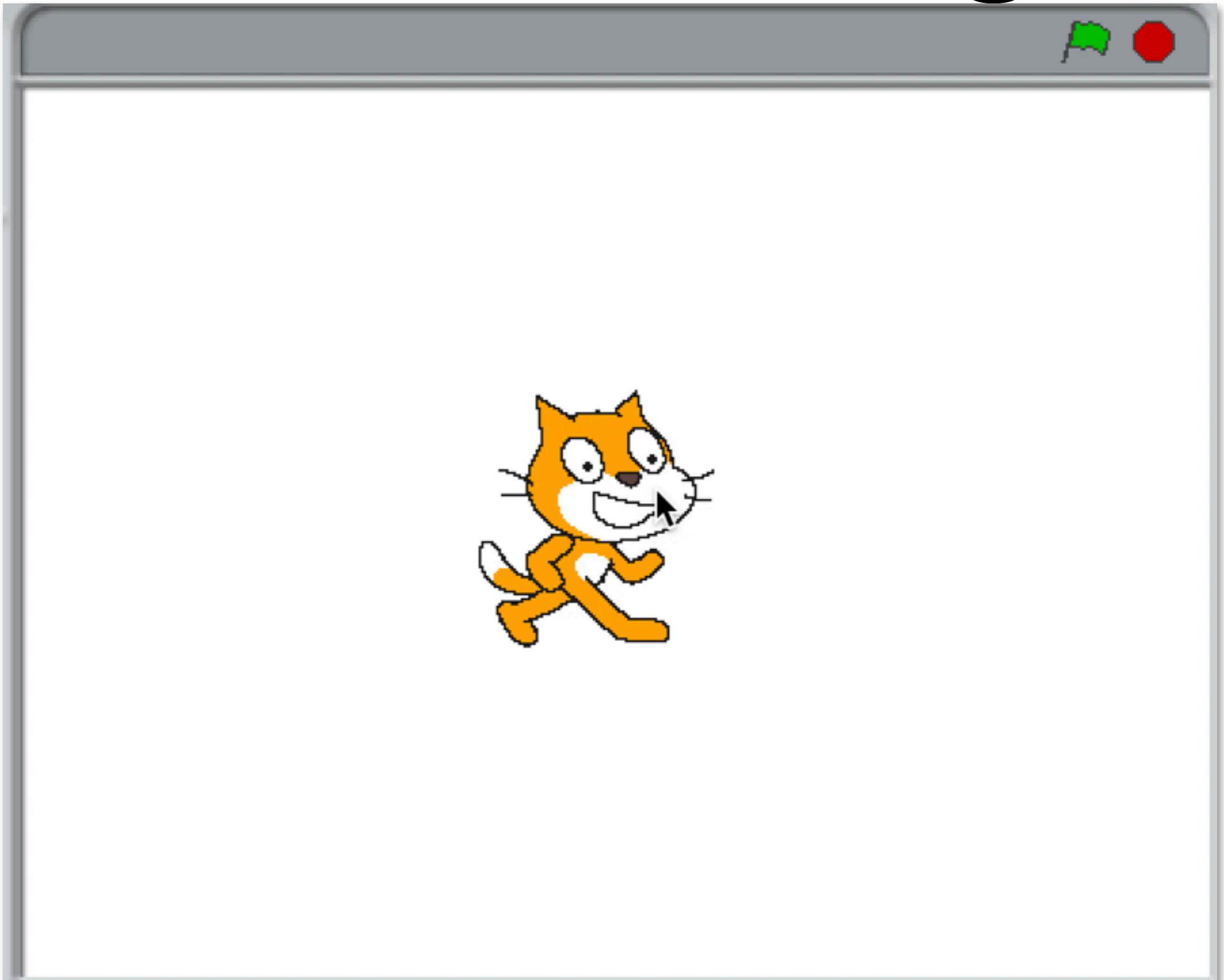
x: -453 y: -118

Making a program with Scratch is really easy.

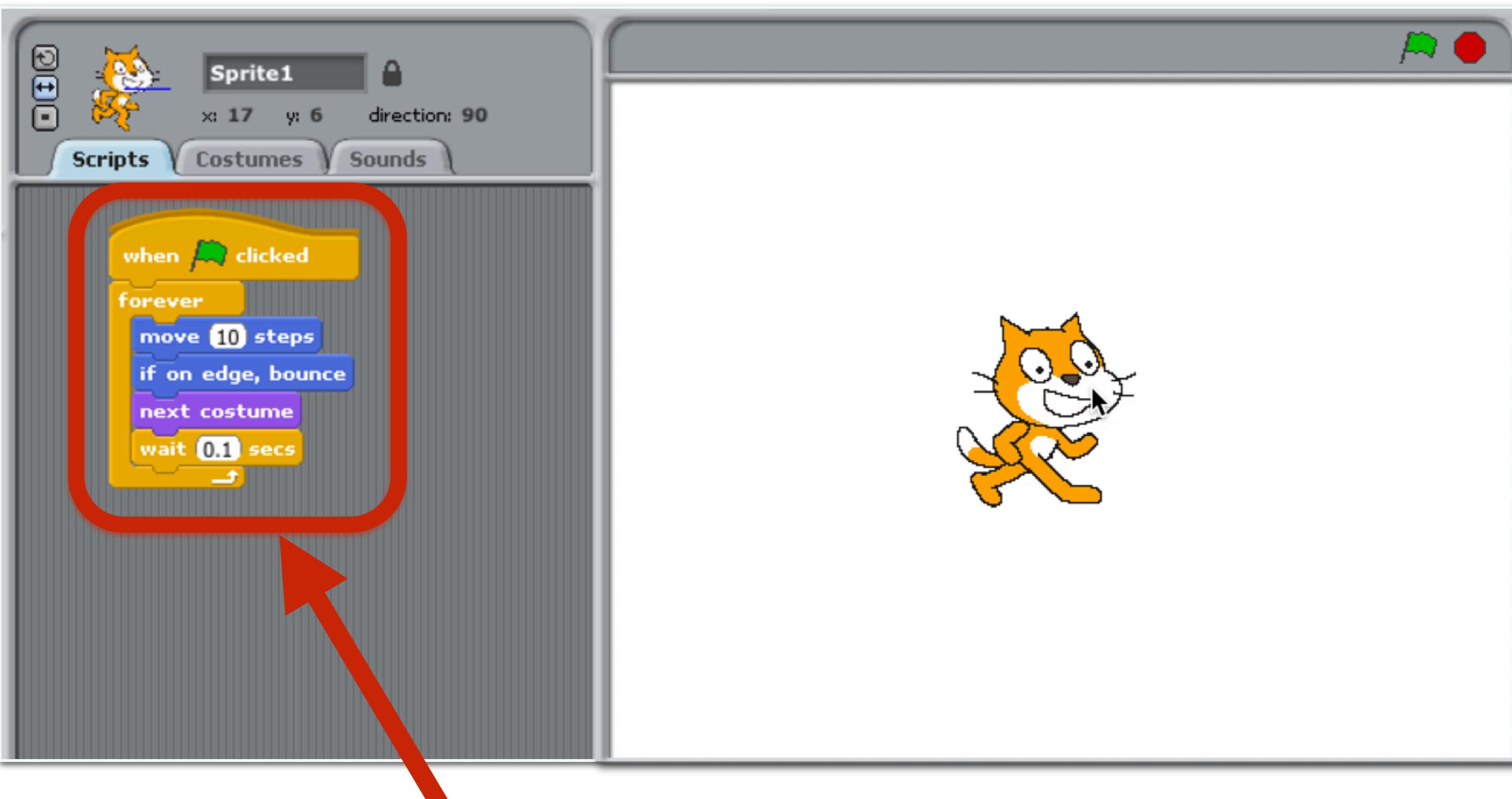
You can run Scratch by double-clicking this icon on Desktop:



# Hands-on: Walking Cat



# Hands-on: Walking Cat



This is one of answers that makes a cat walk.

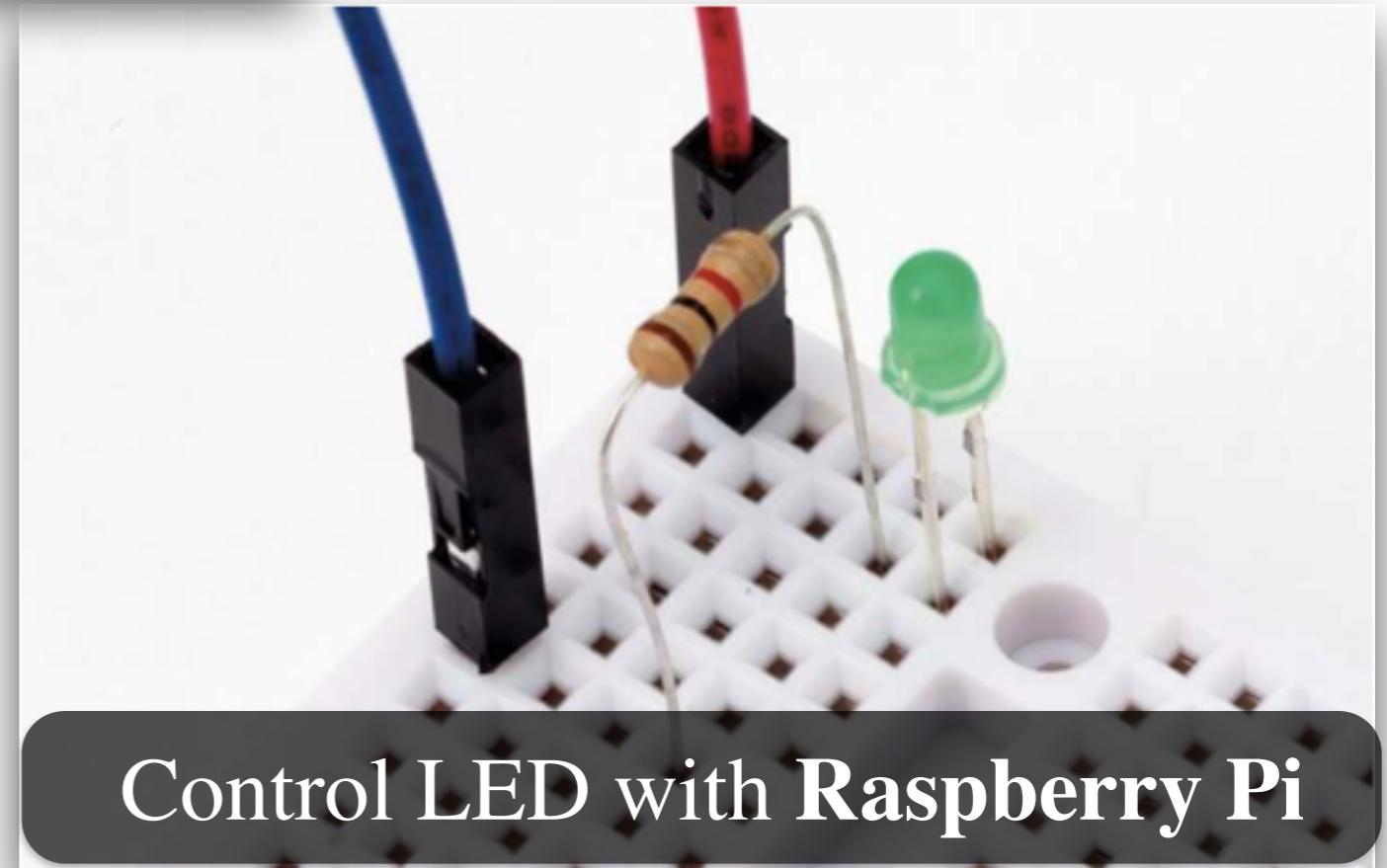
# Other Sample: Whack a Cat



# Other Sample: Escape from Cat



# Summary



# LED:

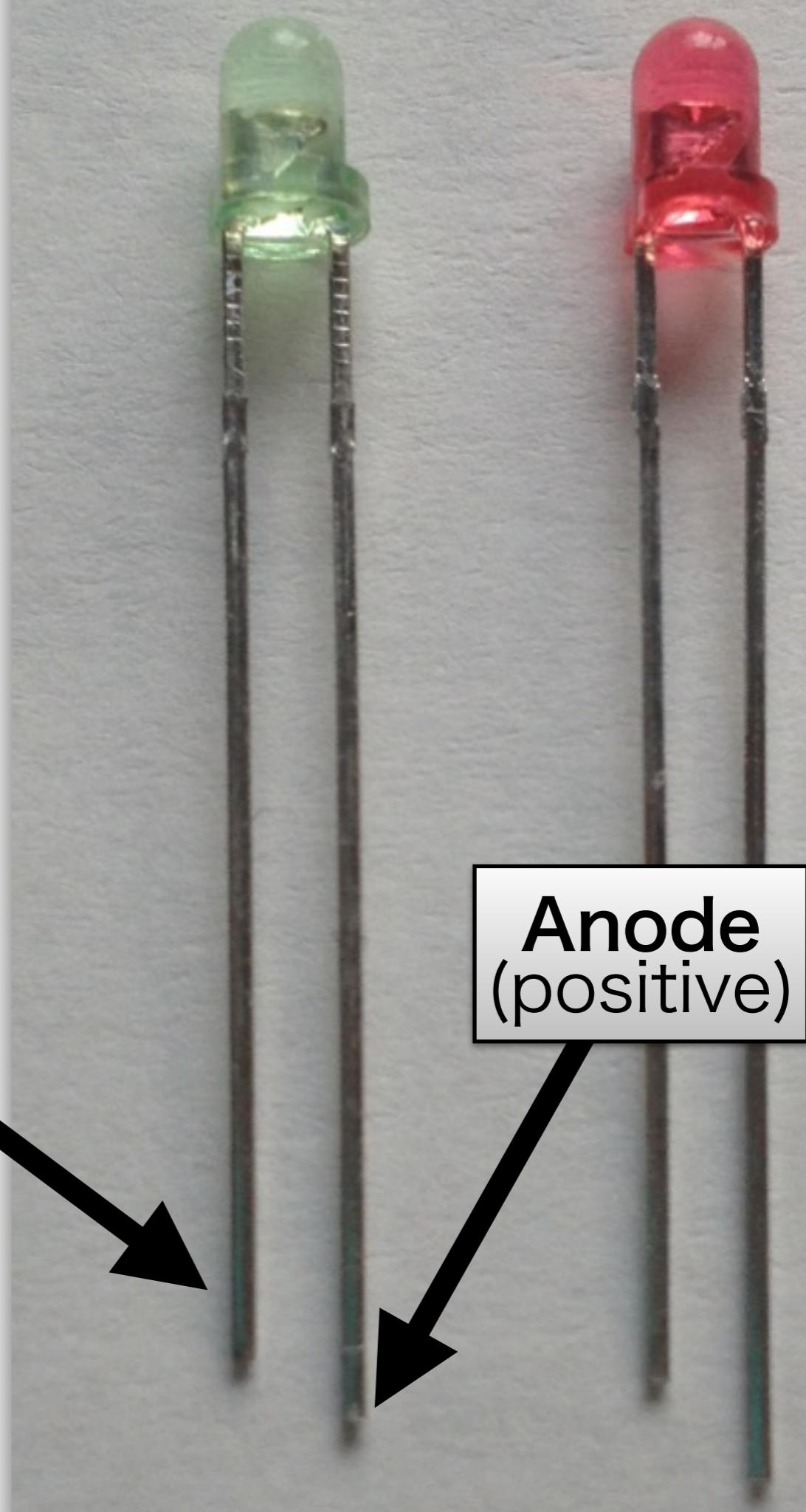
## Light Emitting Diode

The length is different.

- Shorter is negative.
- Longer is positive.

**Cathode**  
(negative)

**Anode**  
(positive)

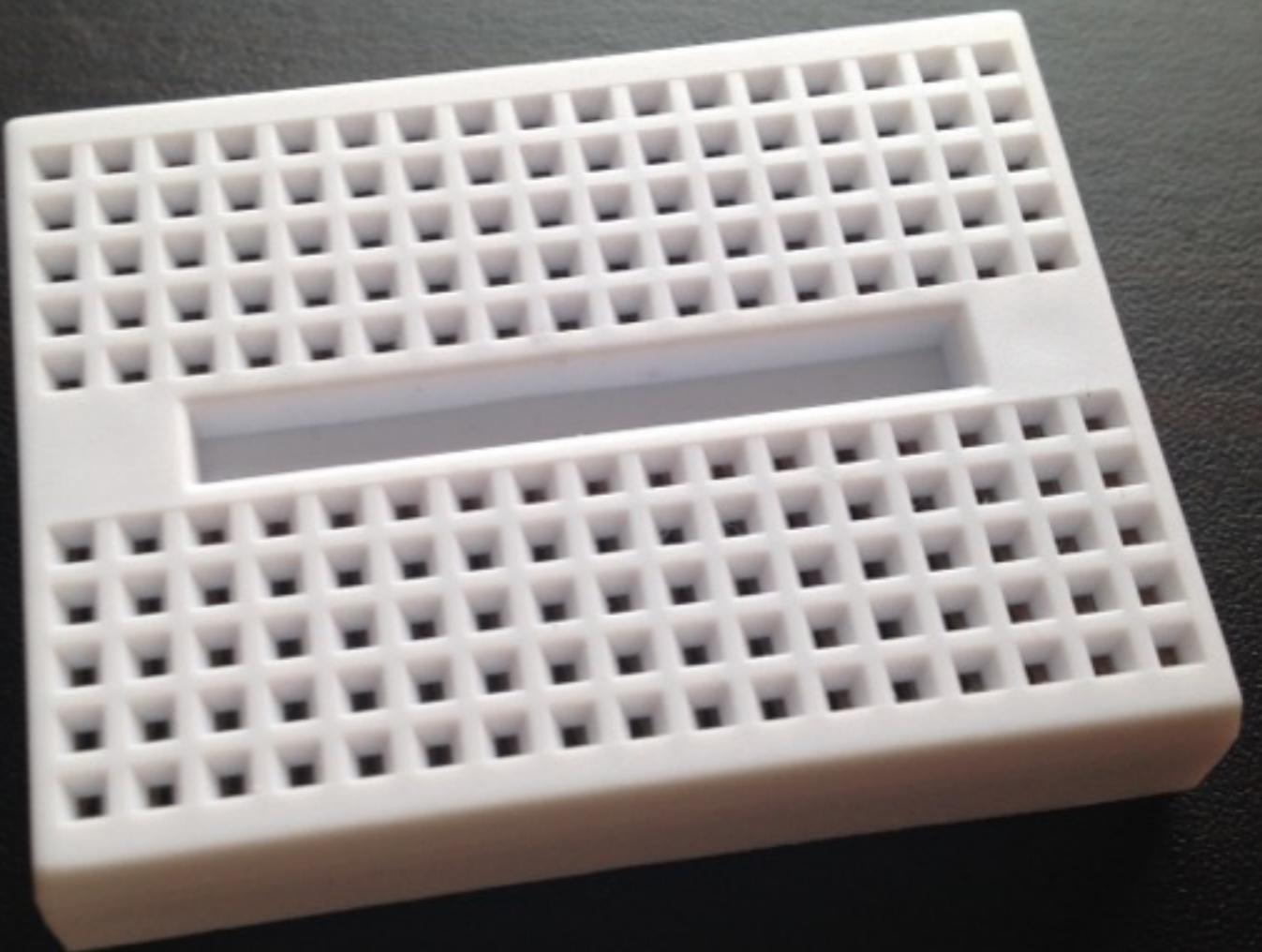


# Breadboard

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)



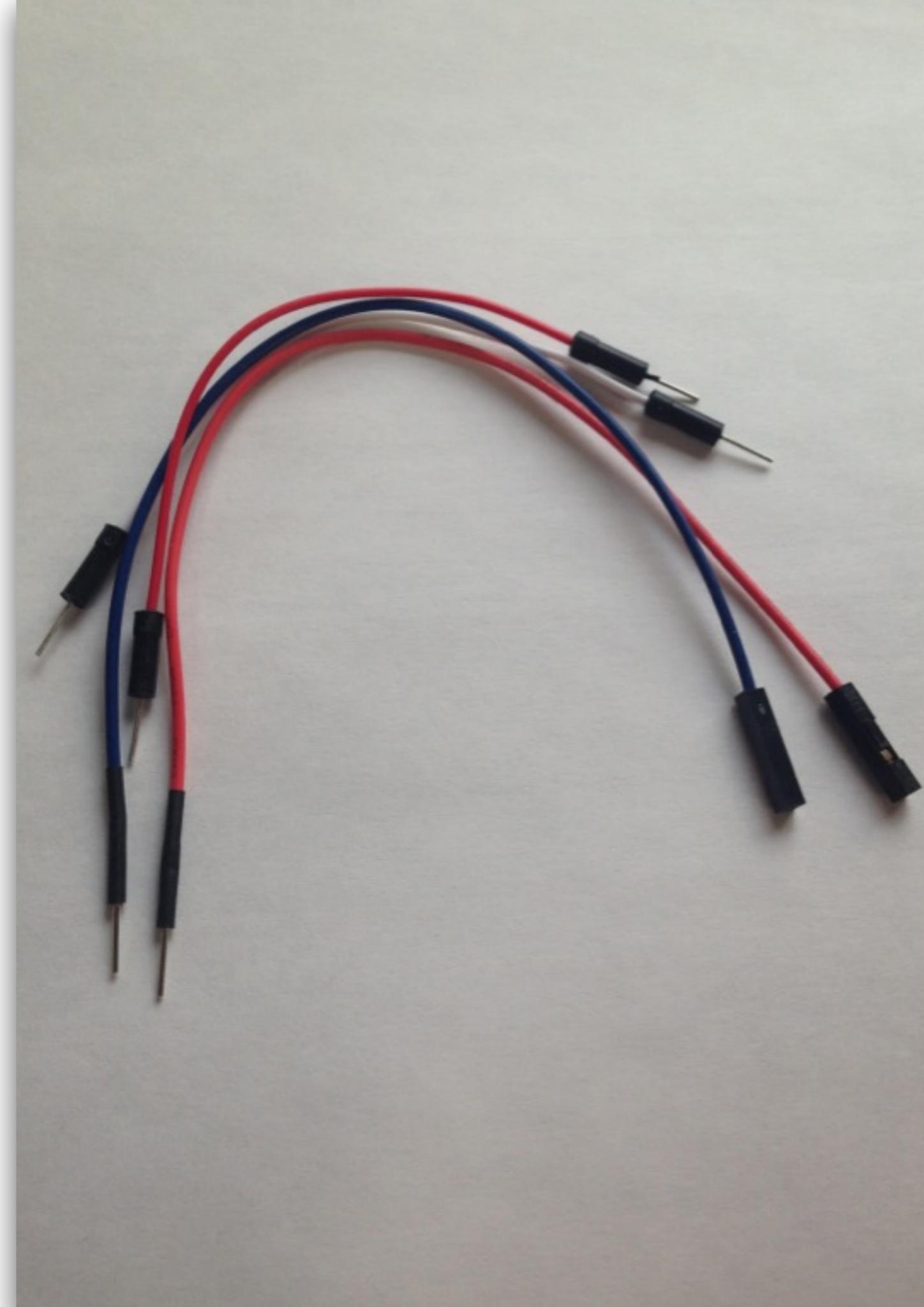
# Jumper Wire

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.



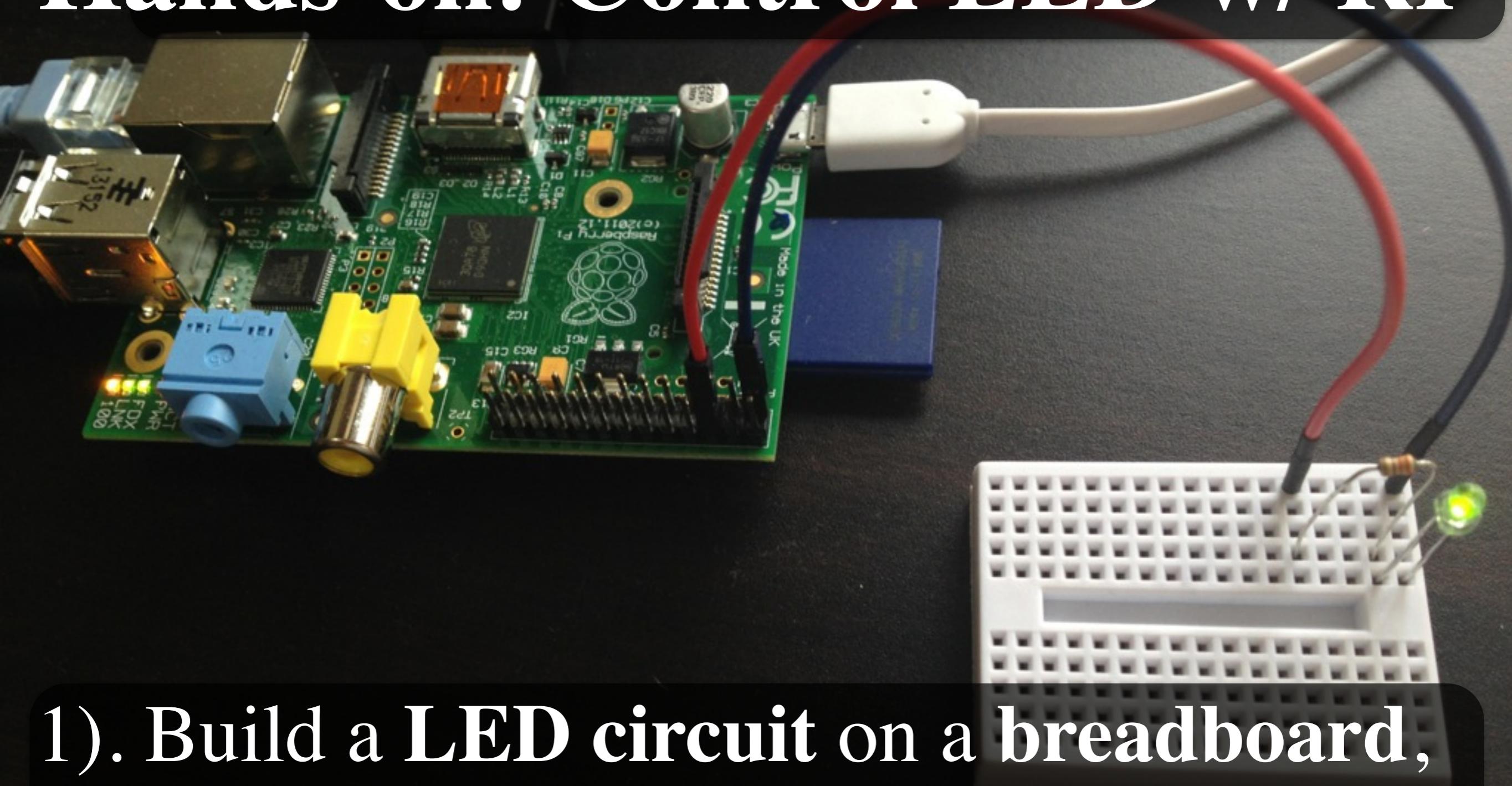
# Resistor

is an electronic element to control current to LED

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

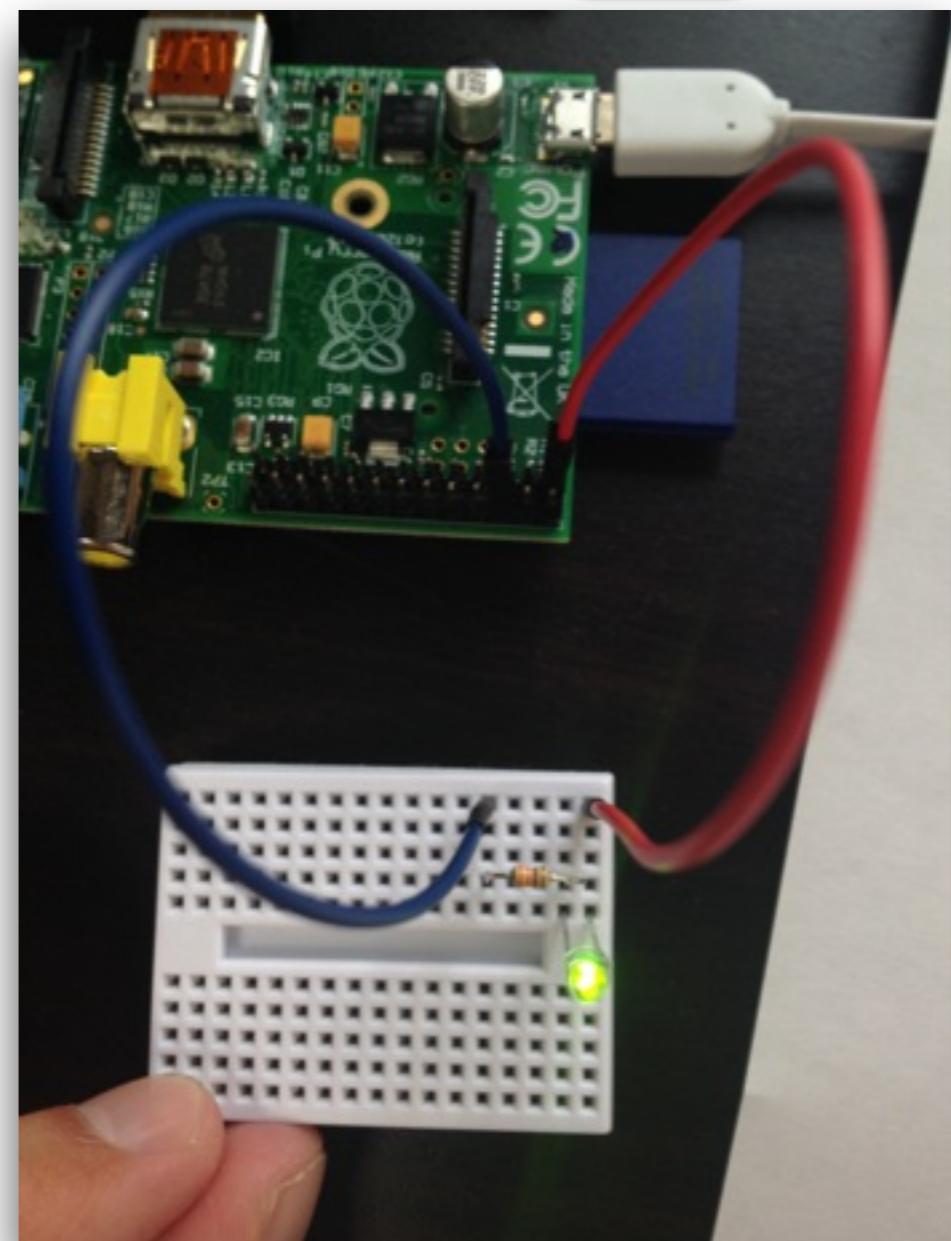
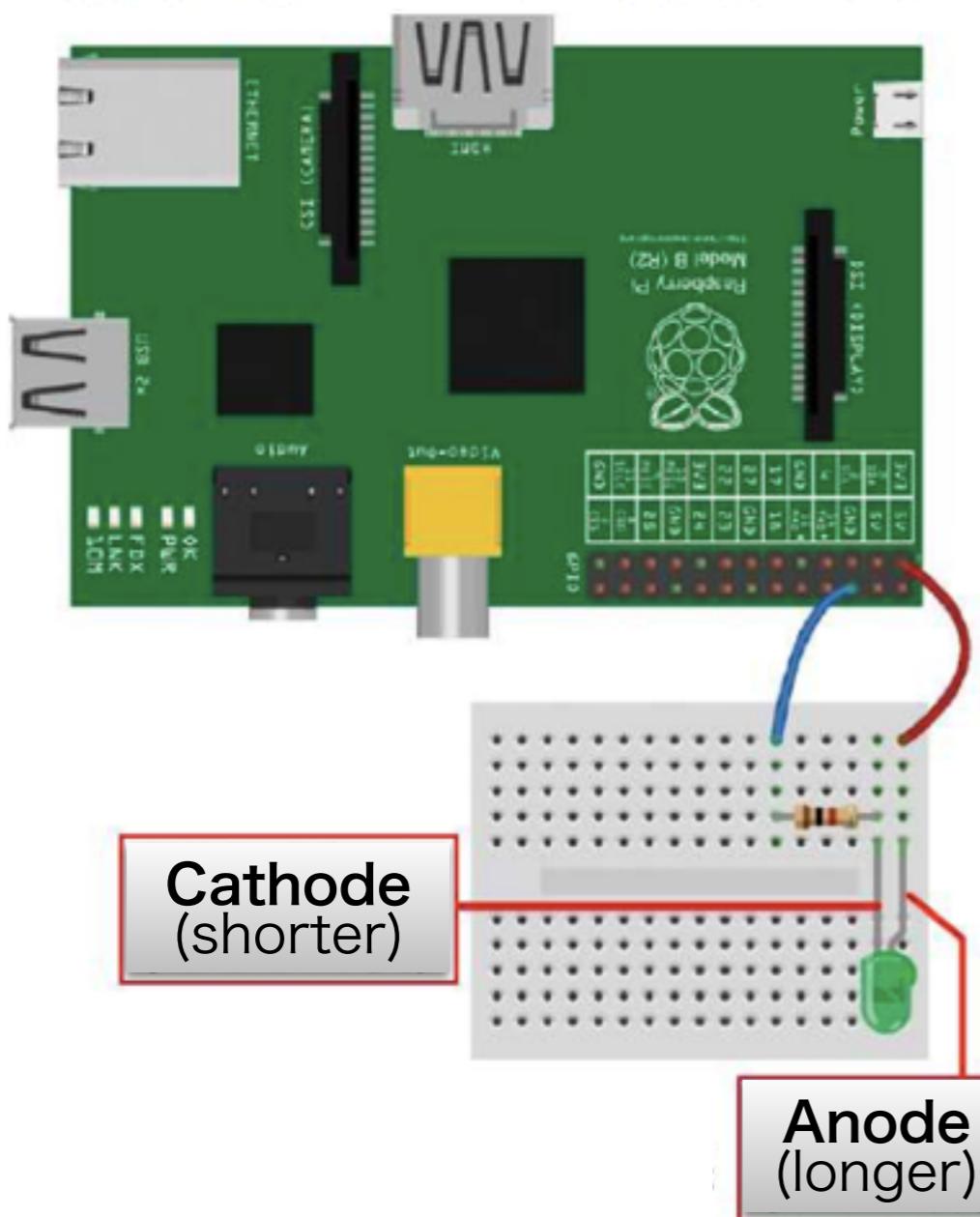
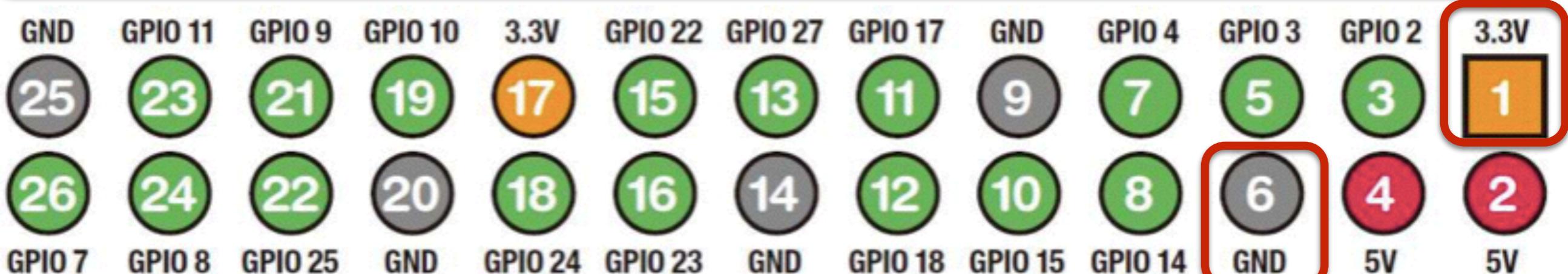


# Hands-on: Control LED w/ RP

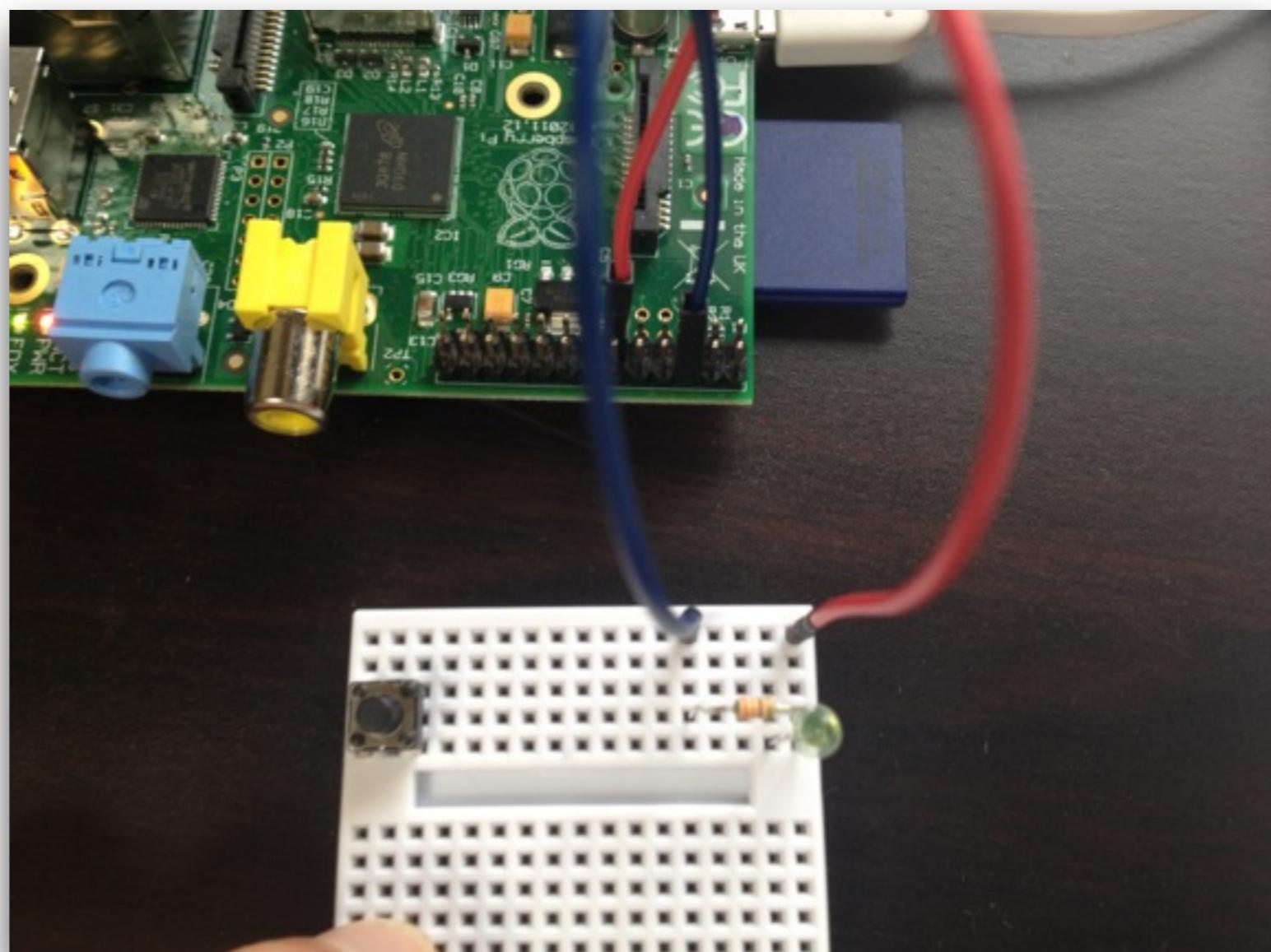
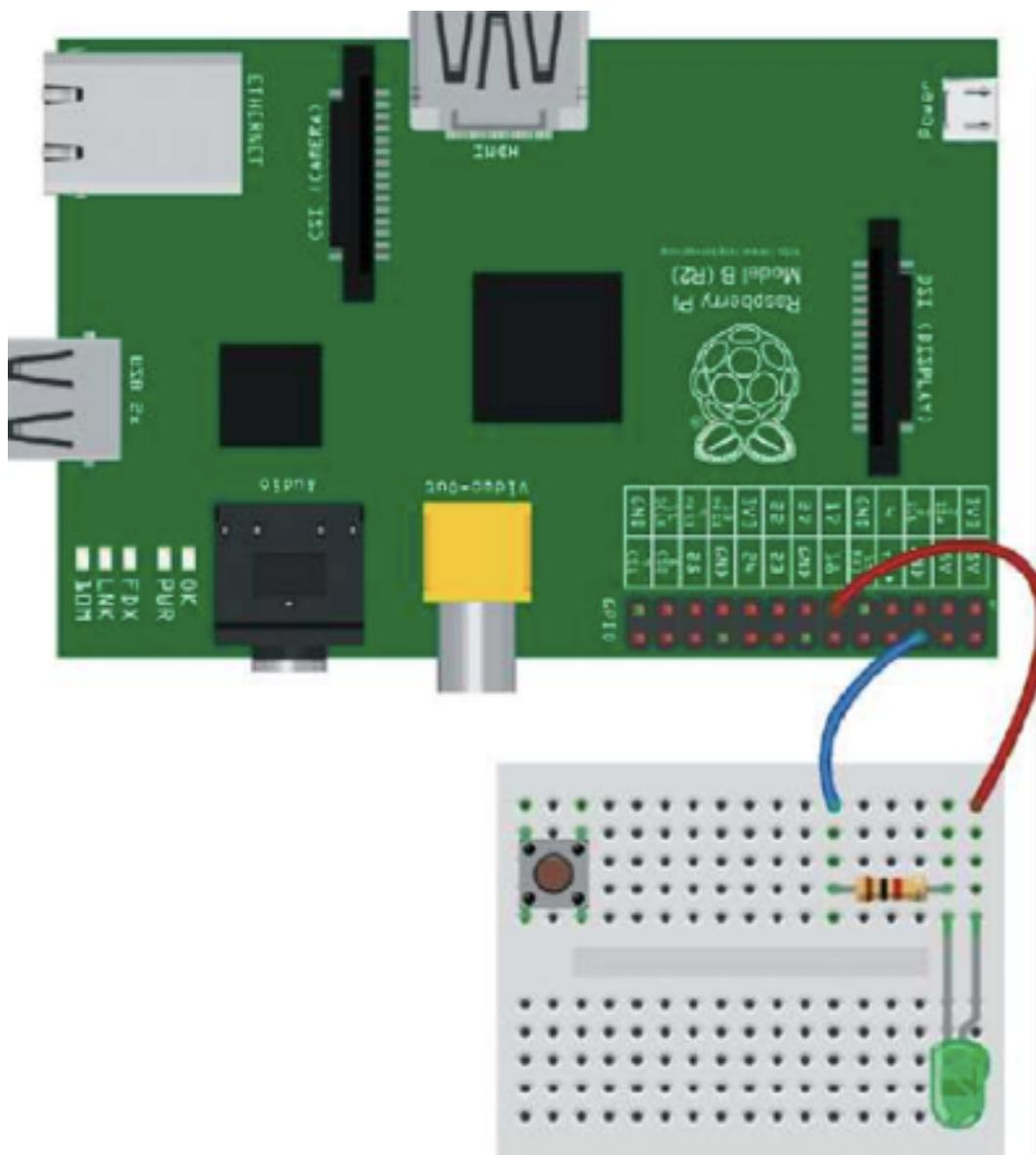
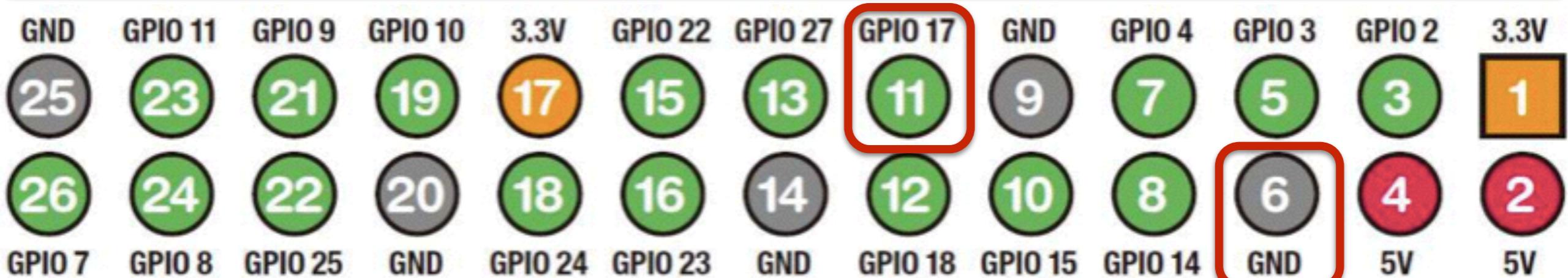


- 1). Build a LED circuit on a breadboard,
- 2). connect it to Raspberry Pi's GPIO, and
- 3). control LED light from Scratch.

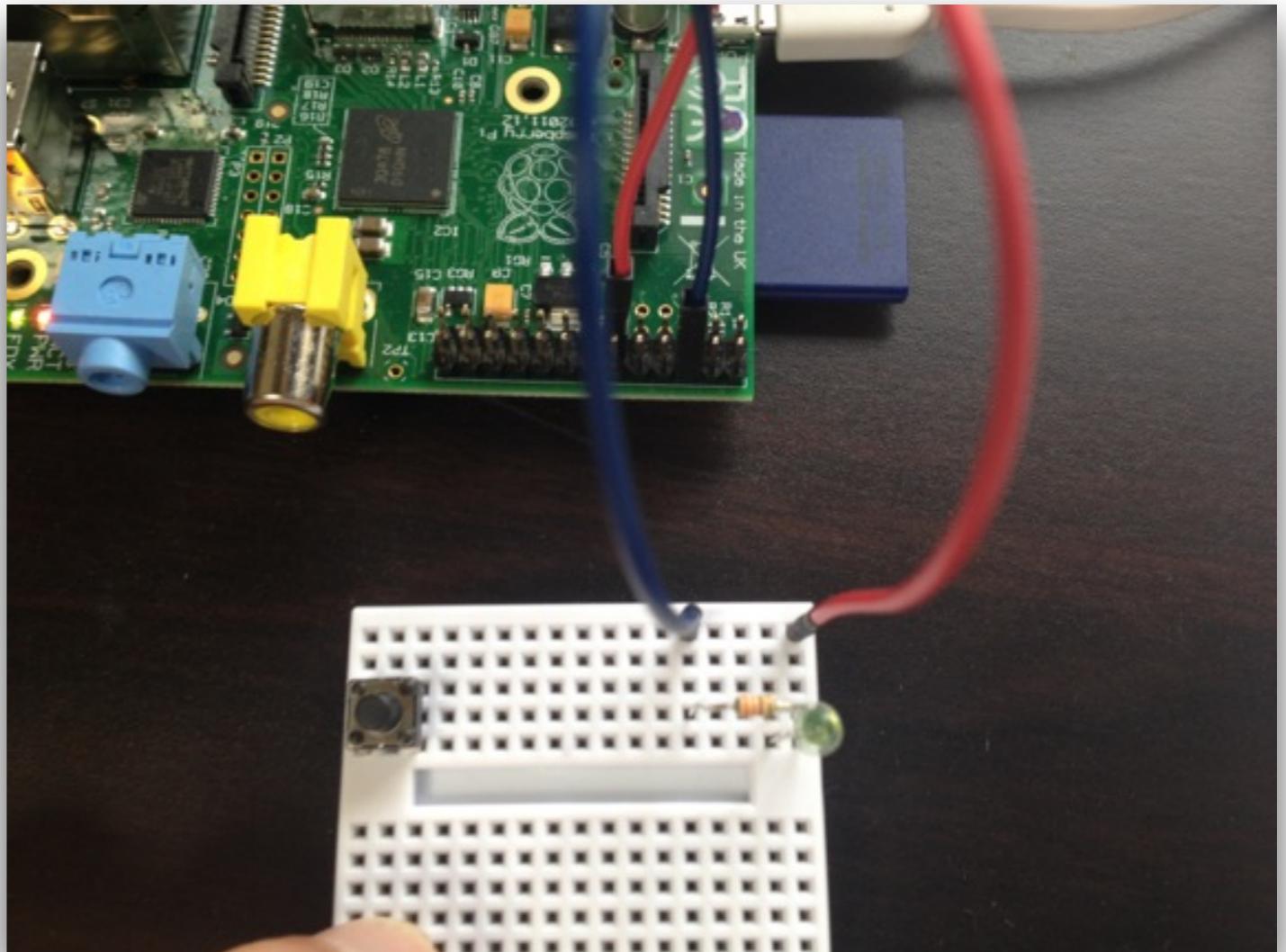
# 1). Build a LED circuit on a breadboard



## 2). Connect it to Raspberry Pi's GPIO



# 3). Control LED light from Scratch



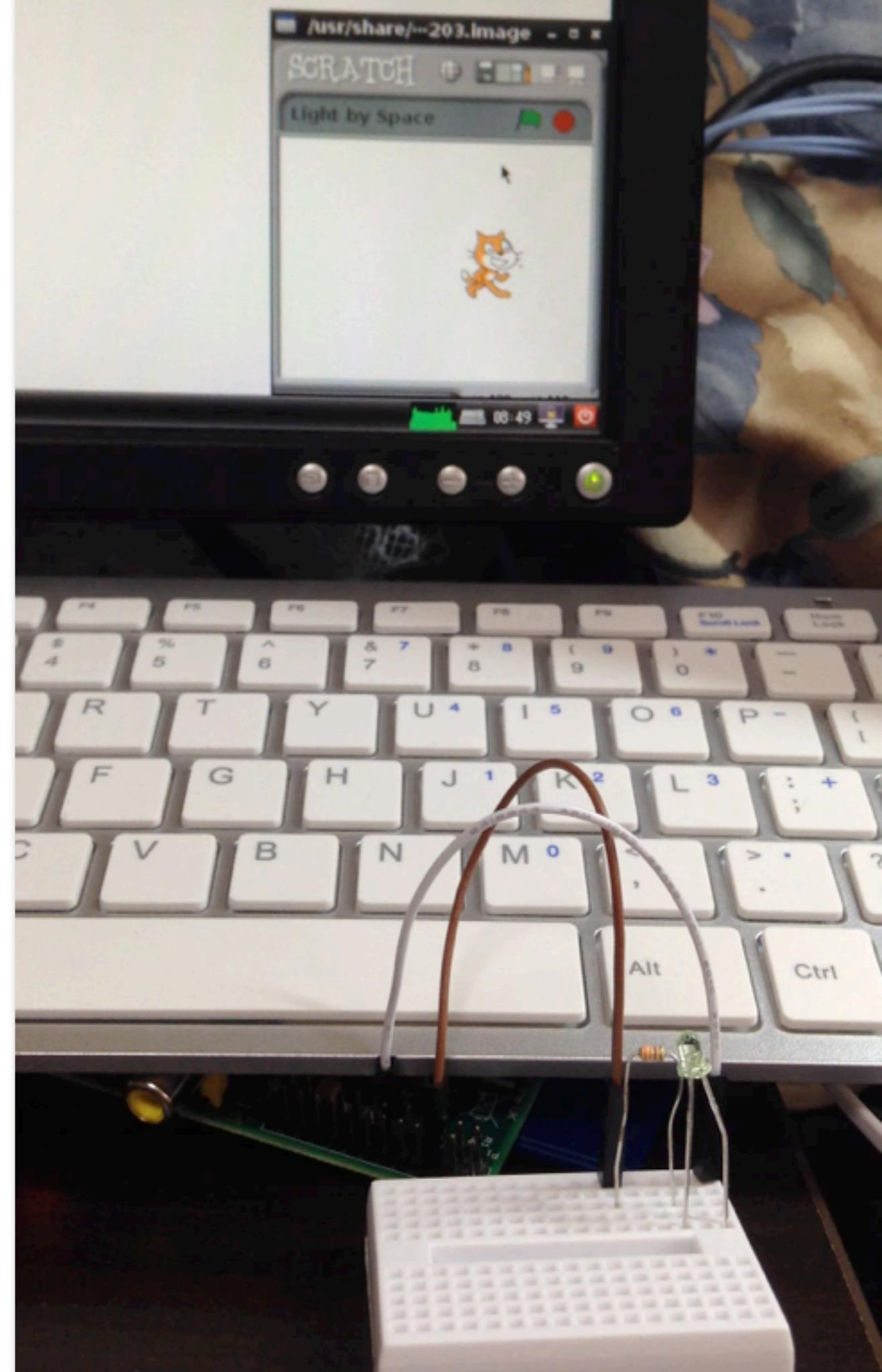
1. Close Scratch window.
2. Open Scratch GPIO4.
3. File -> Open **blink11**.
4. Click the green flag.



Scratch GPIO4

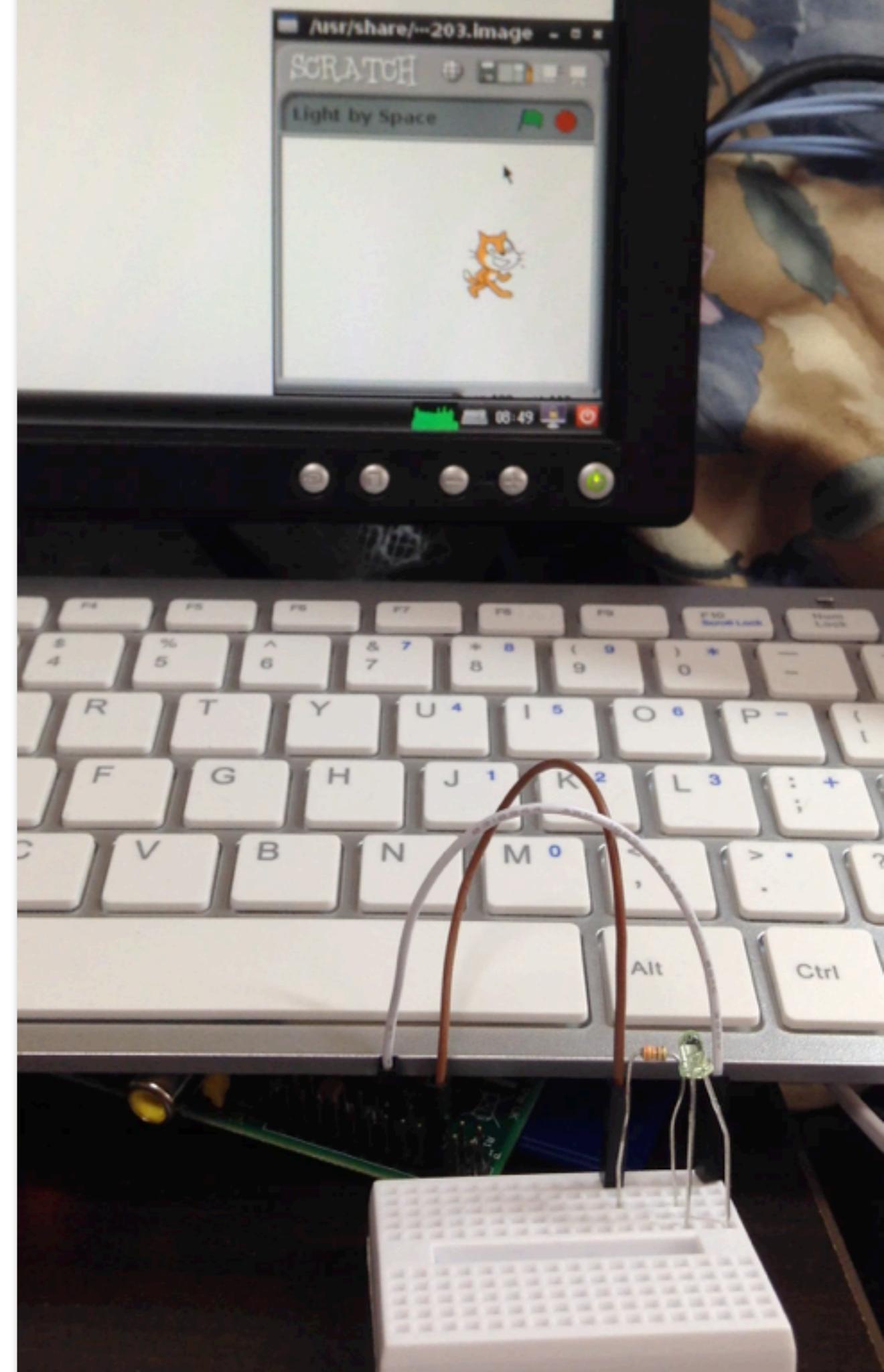
# Hands-on: Light by Space

- 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

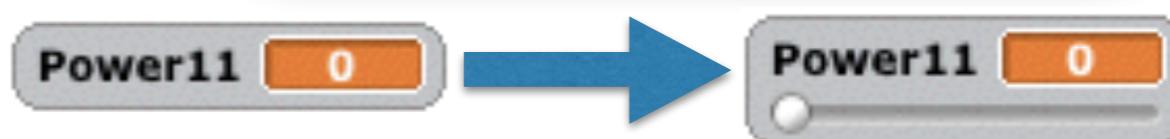
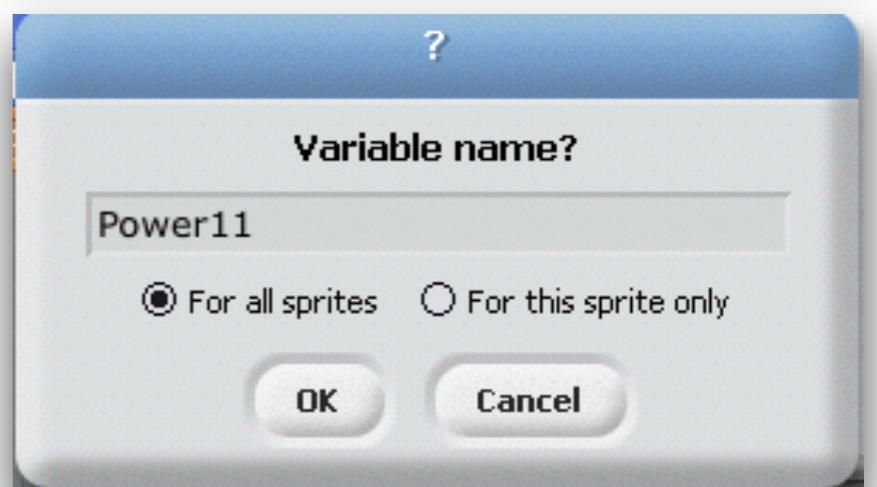
Sample Answer:



# Control from 0/1 to 0~1

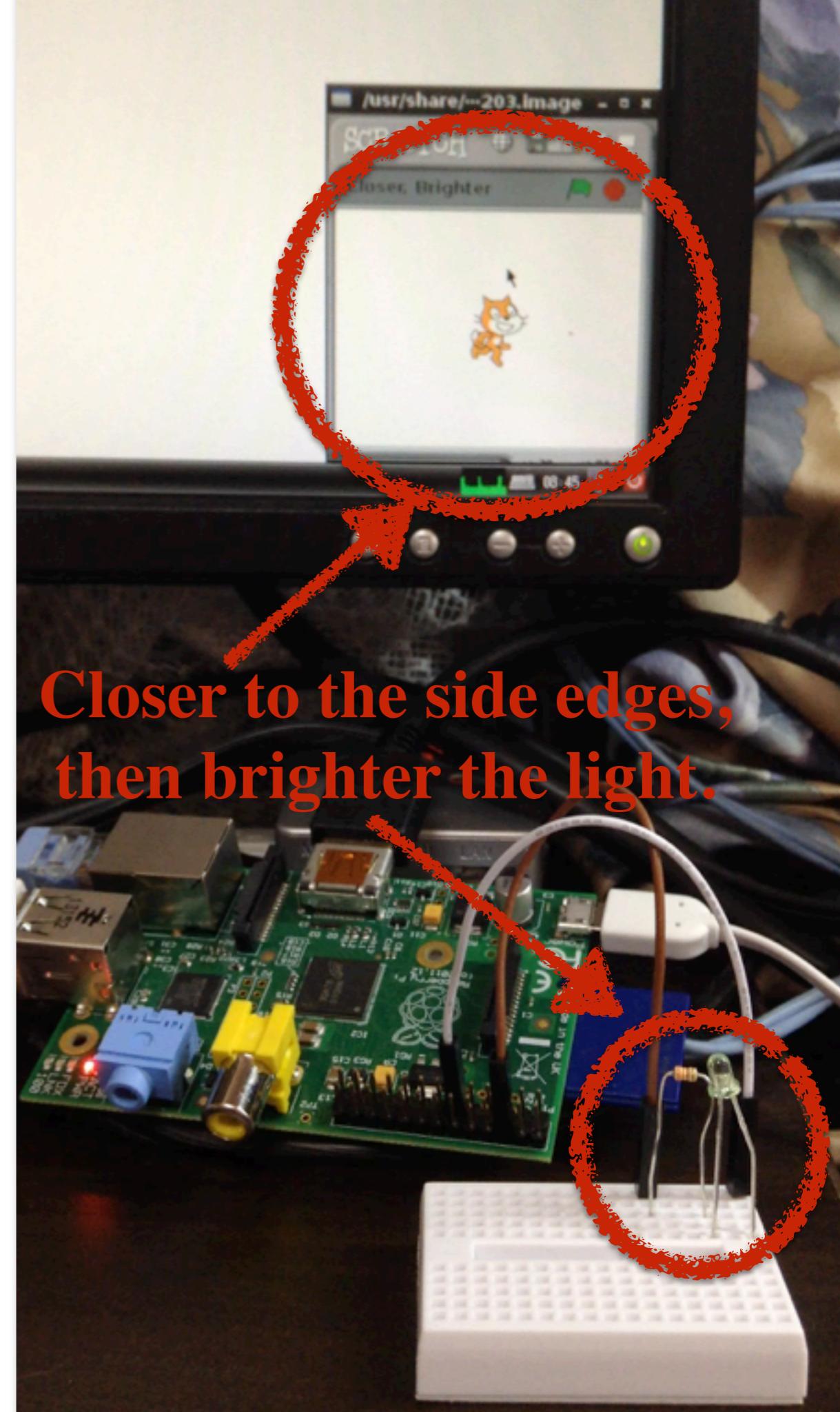
Let's control brightness of LED light by using **Variables** (orange block).

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**.



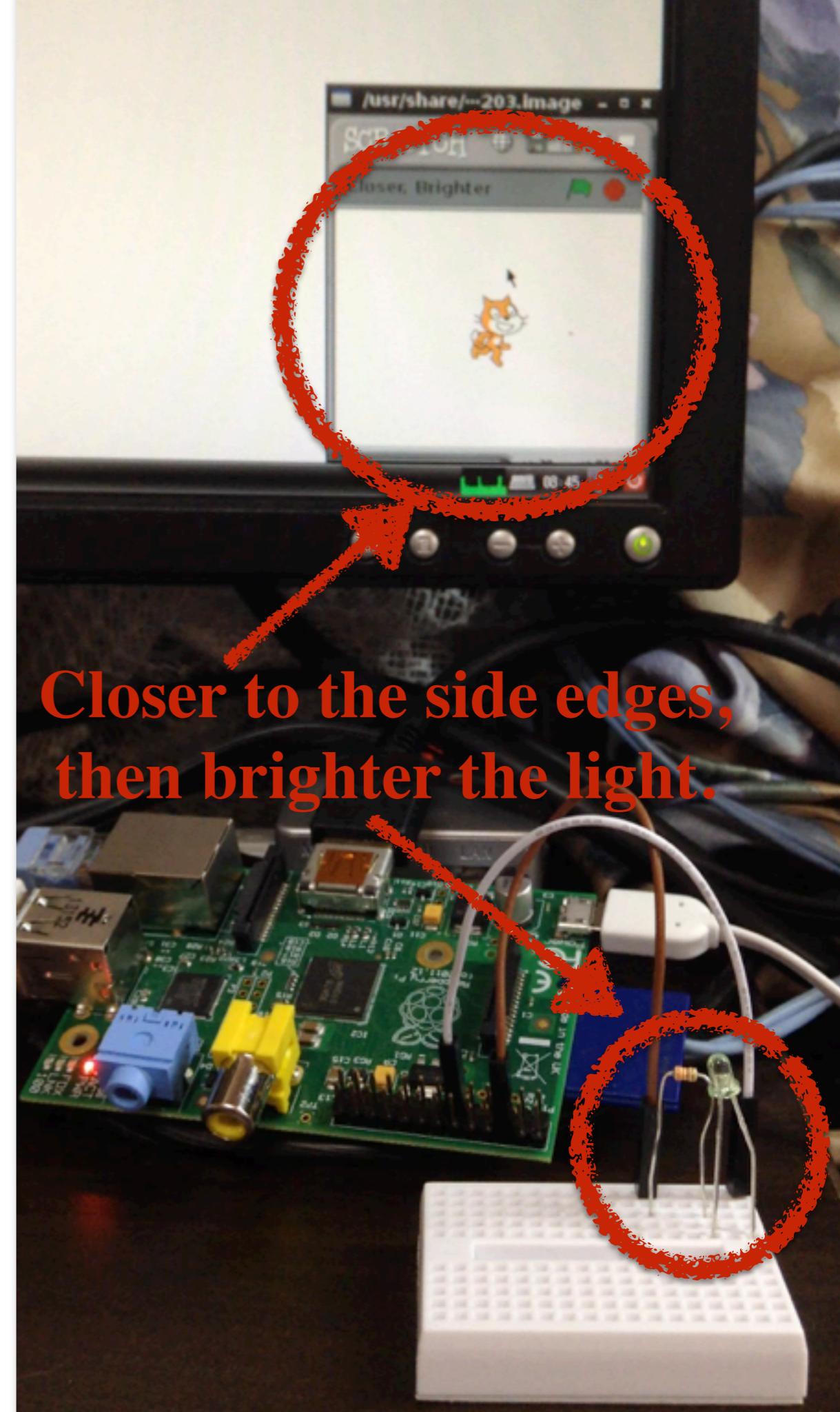
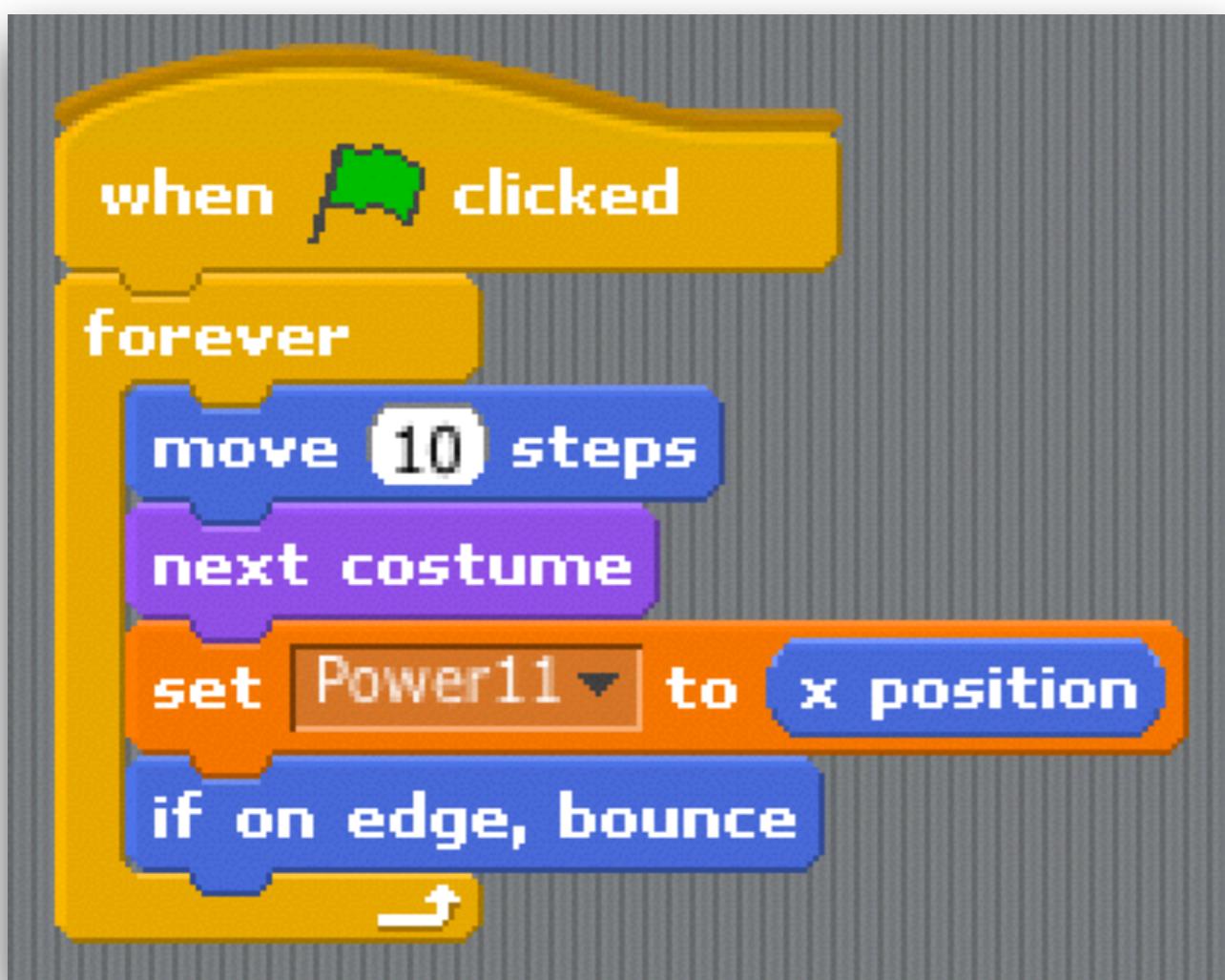
# Final Hands-on: Closer to edges, Brighter the light

- 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](http://en.wikipedia.org/wiki/Raspberry_Pi)