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.

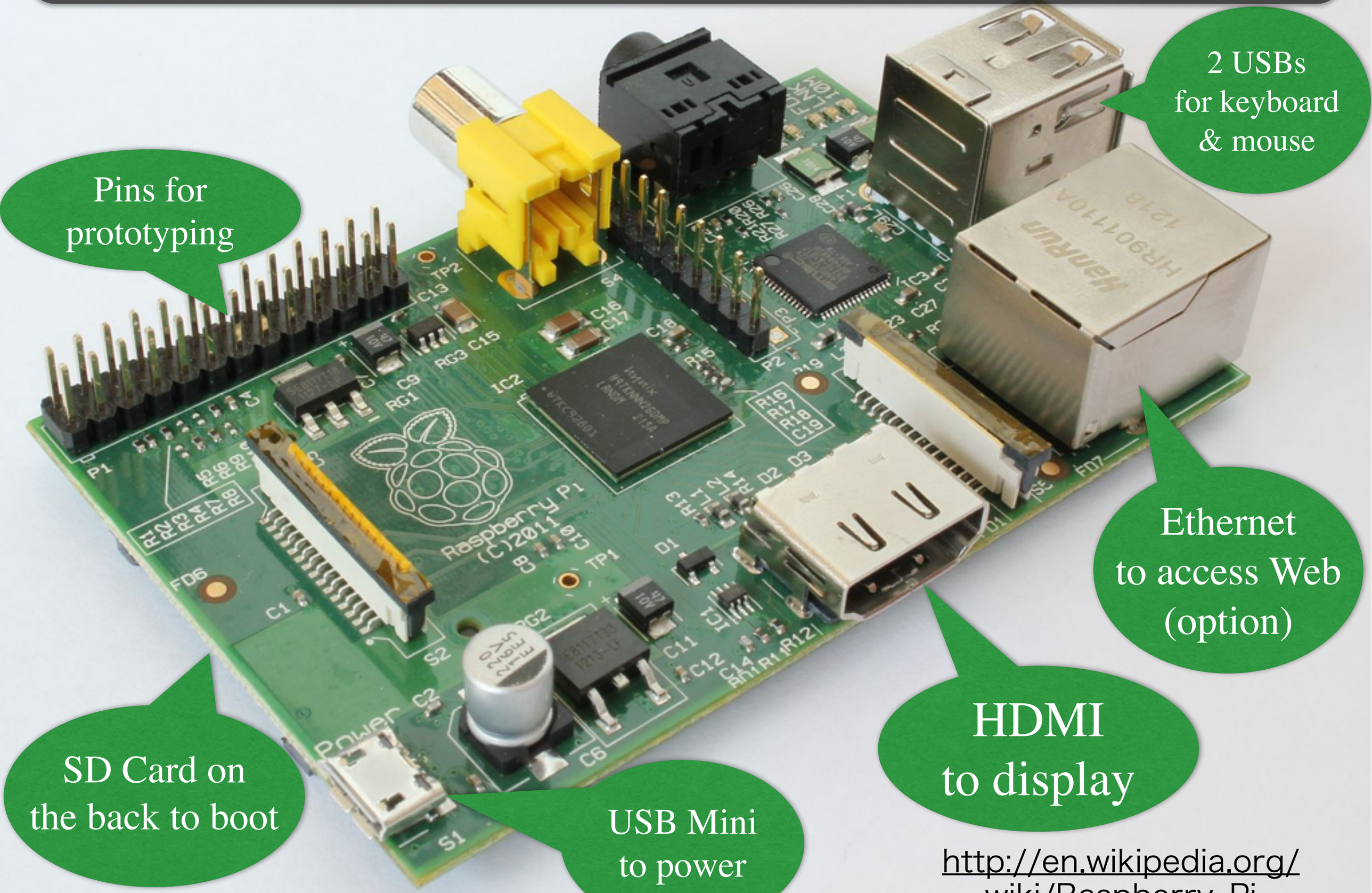
Hands-on: Let's set up Raspberry Pi!

1. HDMI Display

2. Raspberry Pi (Type-B)

3. USB Keyboard & USB Mouse

Ports we'll use in this workshop



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

Summary


Stage
Scripts
Backgrounds
Sounds
when clicked
set score to 0
forever
change score by 1
hogehoge
score 32
Make a program with Scratch


Control LED with Raspberry Pi

hogehoge- Scratch

SCRATCH File Edit Share Help

Motion Control
Looks Sensing
Sound Operators
Pen Variables

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

Stage
Scripts Backgrounds Sounds

when clicked
set score to 0
forever
change score by 1

hogehoge

score 32

x: -453 y: -118

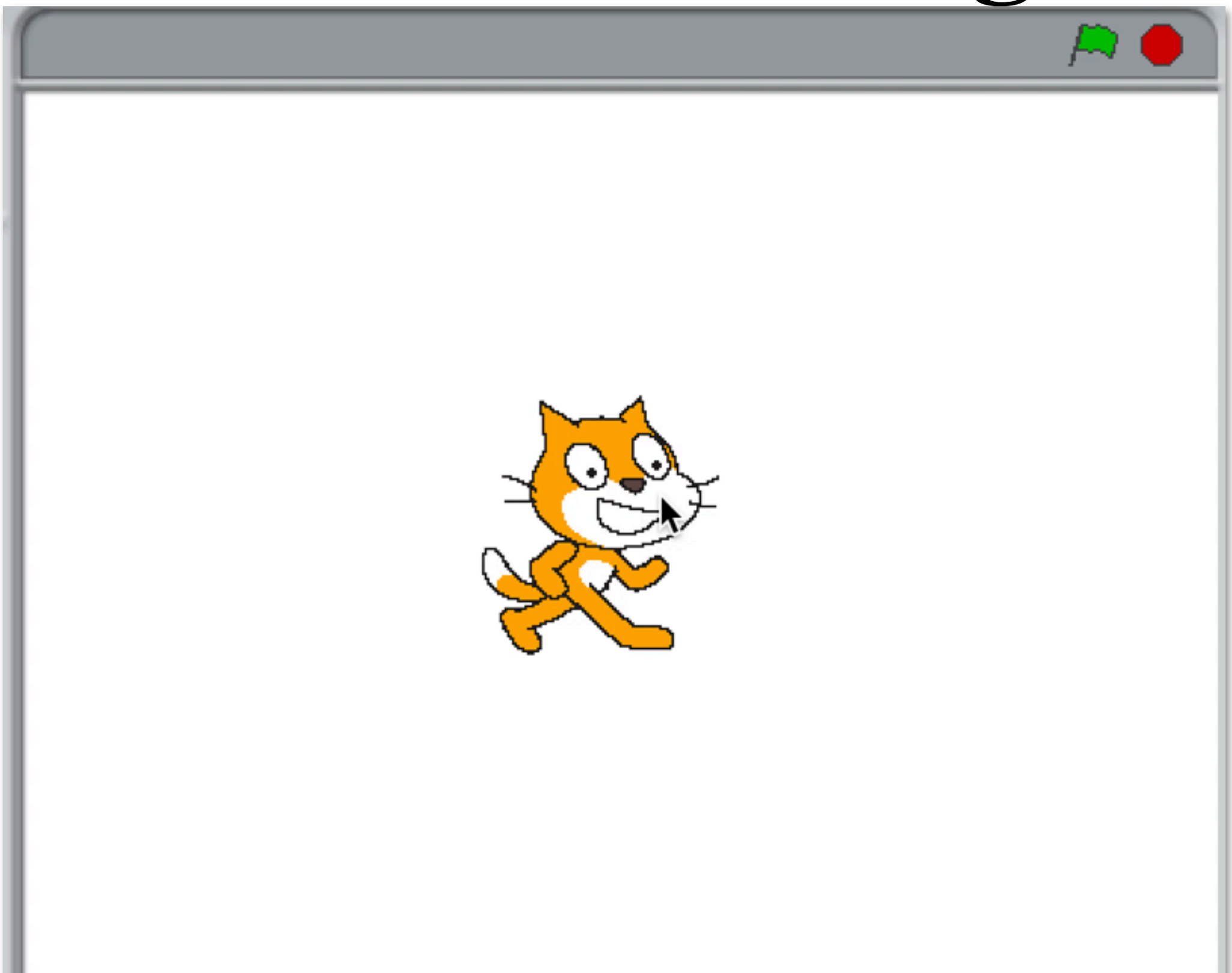
New sprite:

Sprite1 Sprite2 Sprite3

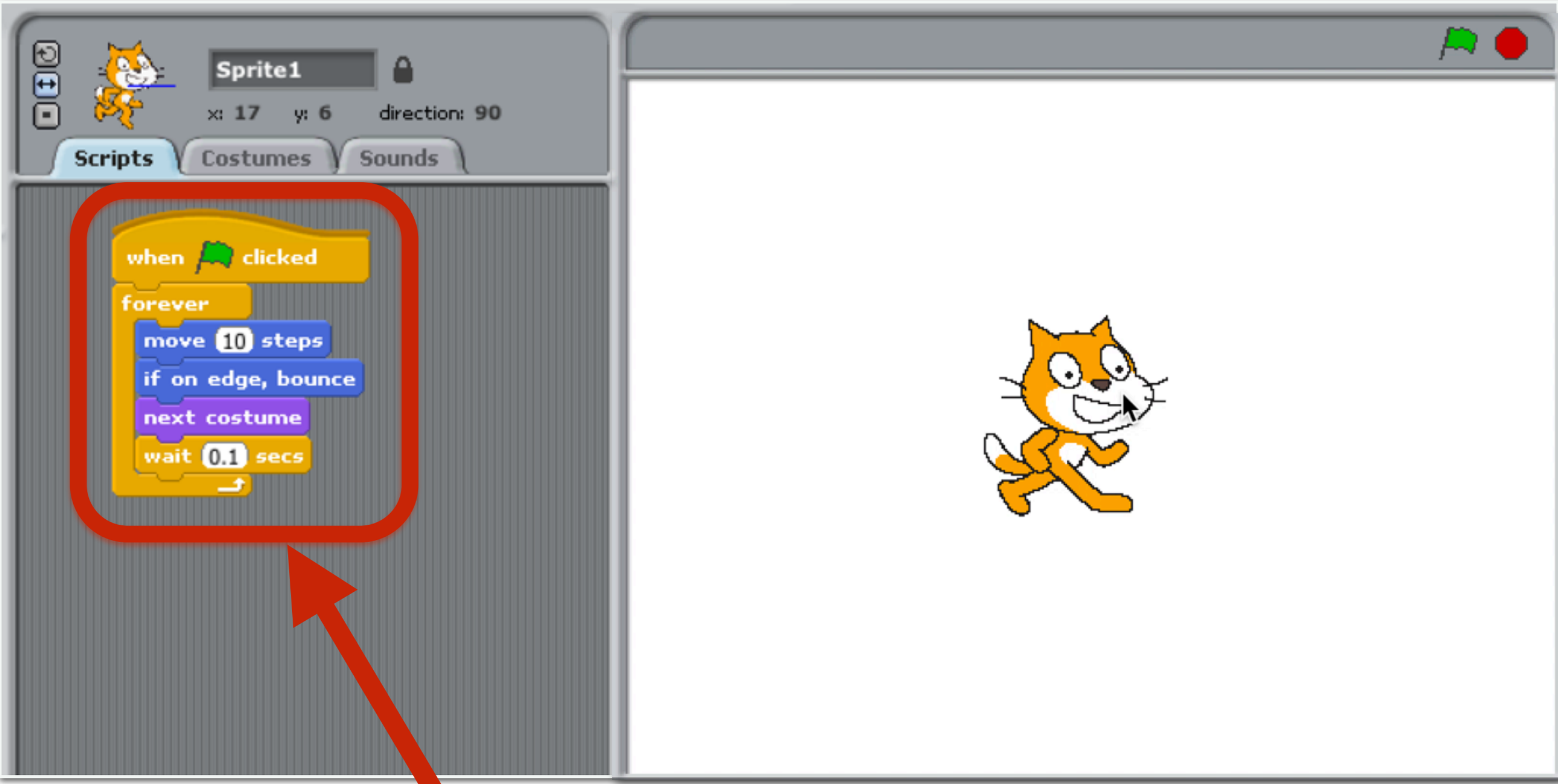
Stage

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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when
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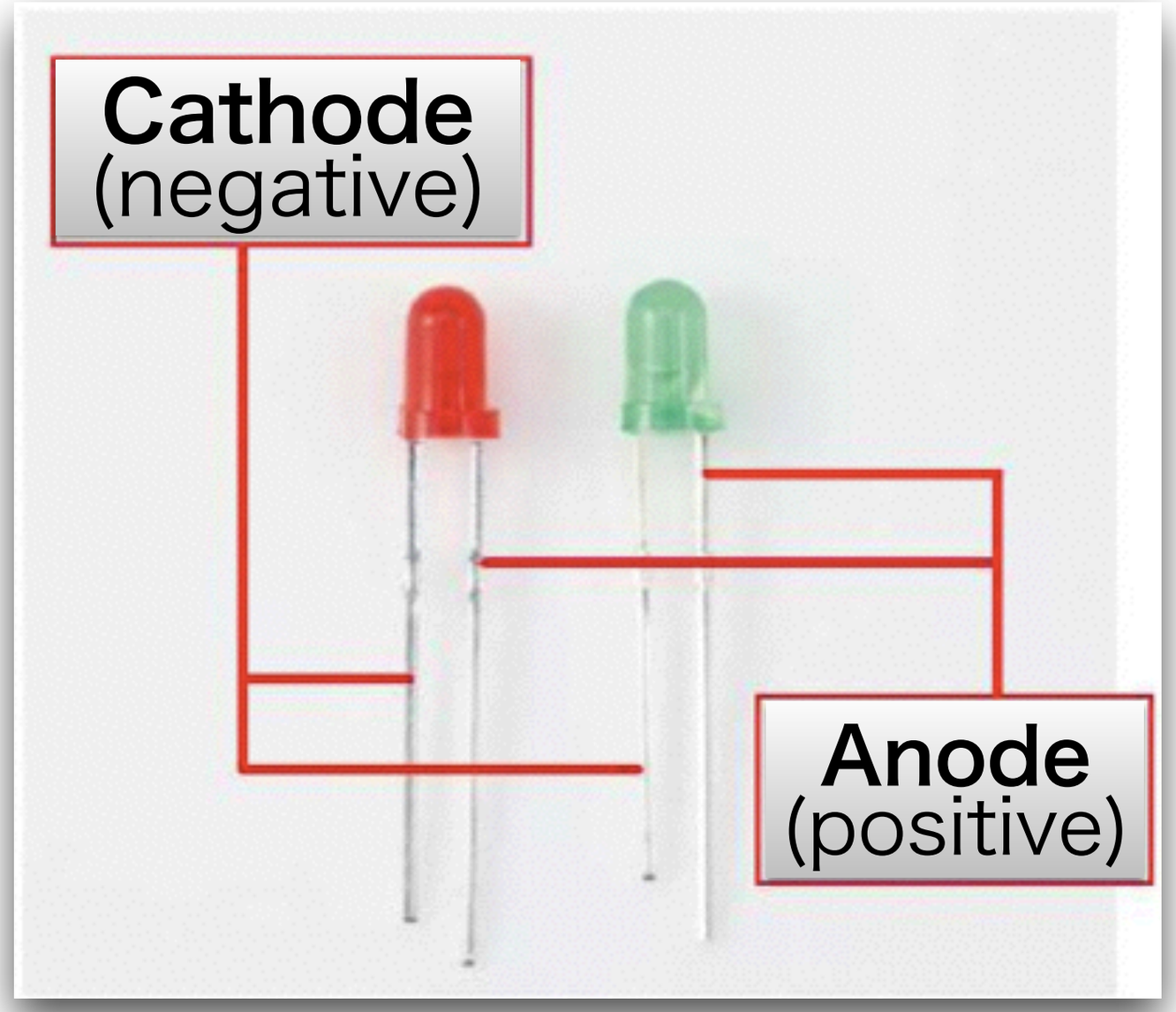
hogehoge
score
DONE!
Make a program with Scratch


Control LED with Raspberry Pi

LED: Light Emitting Diode

The length is different.

- The short is negative.
- The long is positive.

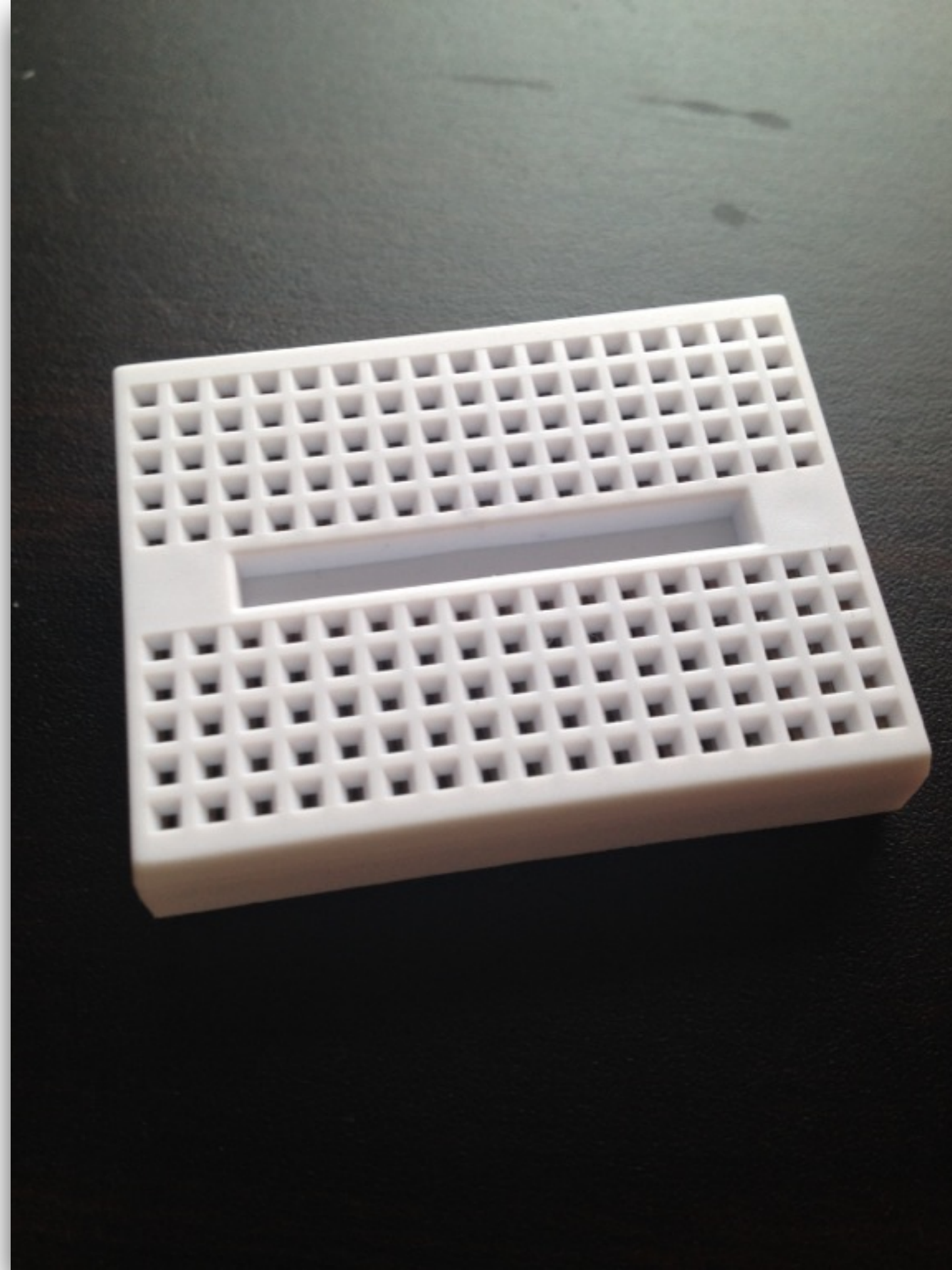


Breadboard

is usually a construction base for prototyping of electronics.

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

(http://en.wikipedia.org/wiki/Breadboard)



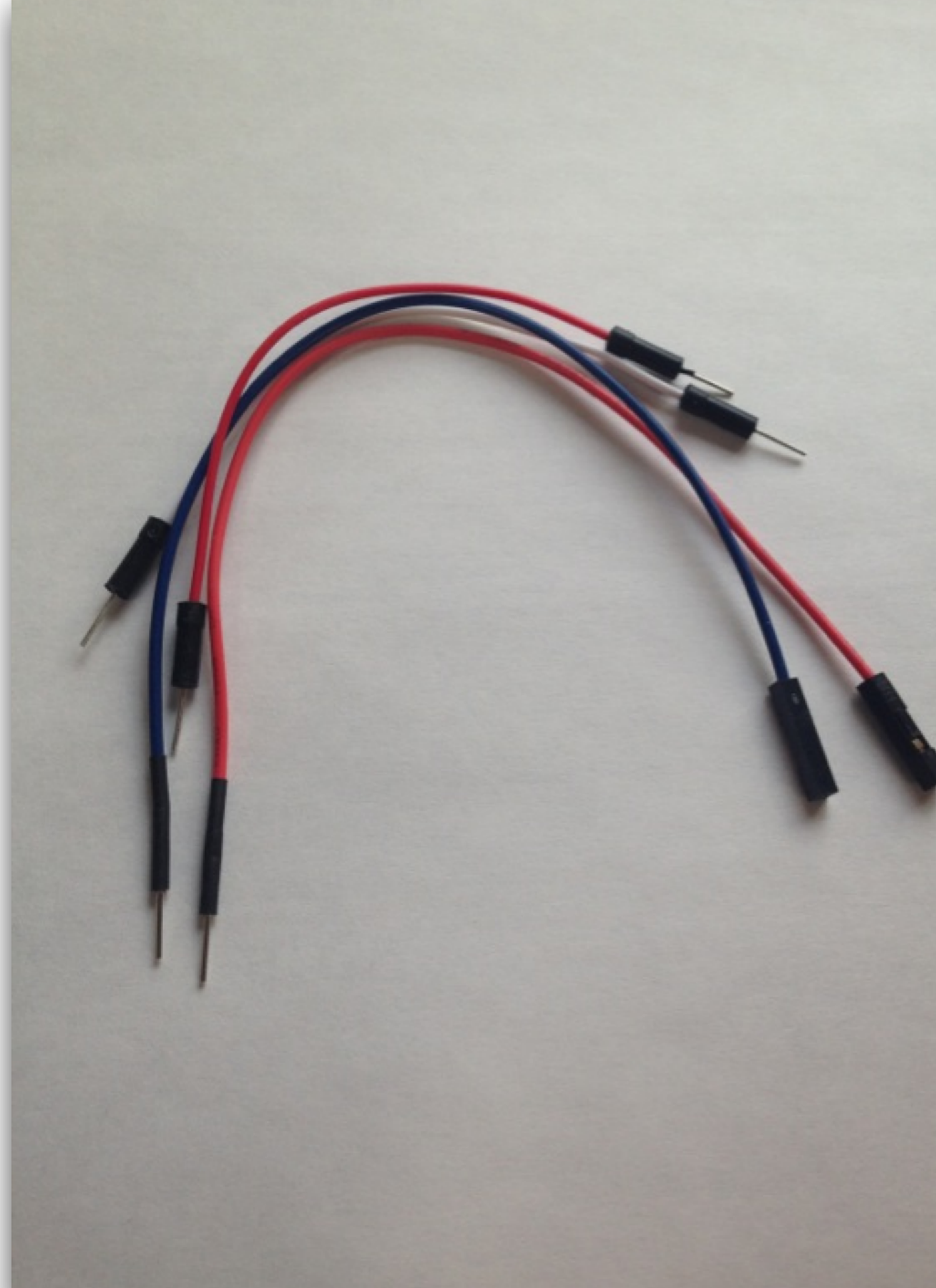
Jumper Wire

There are two types for connecting between:

1. Raspberry Pi and Breadboard

2. Breadboard and Breadboard

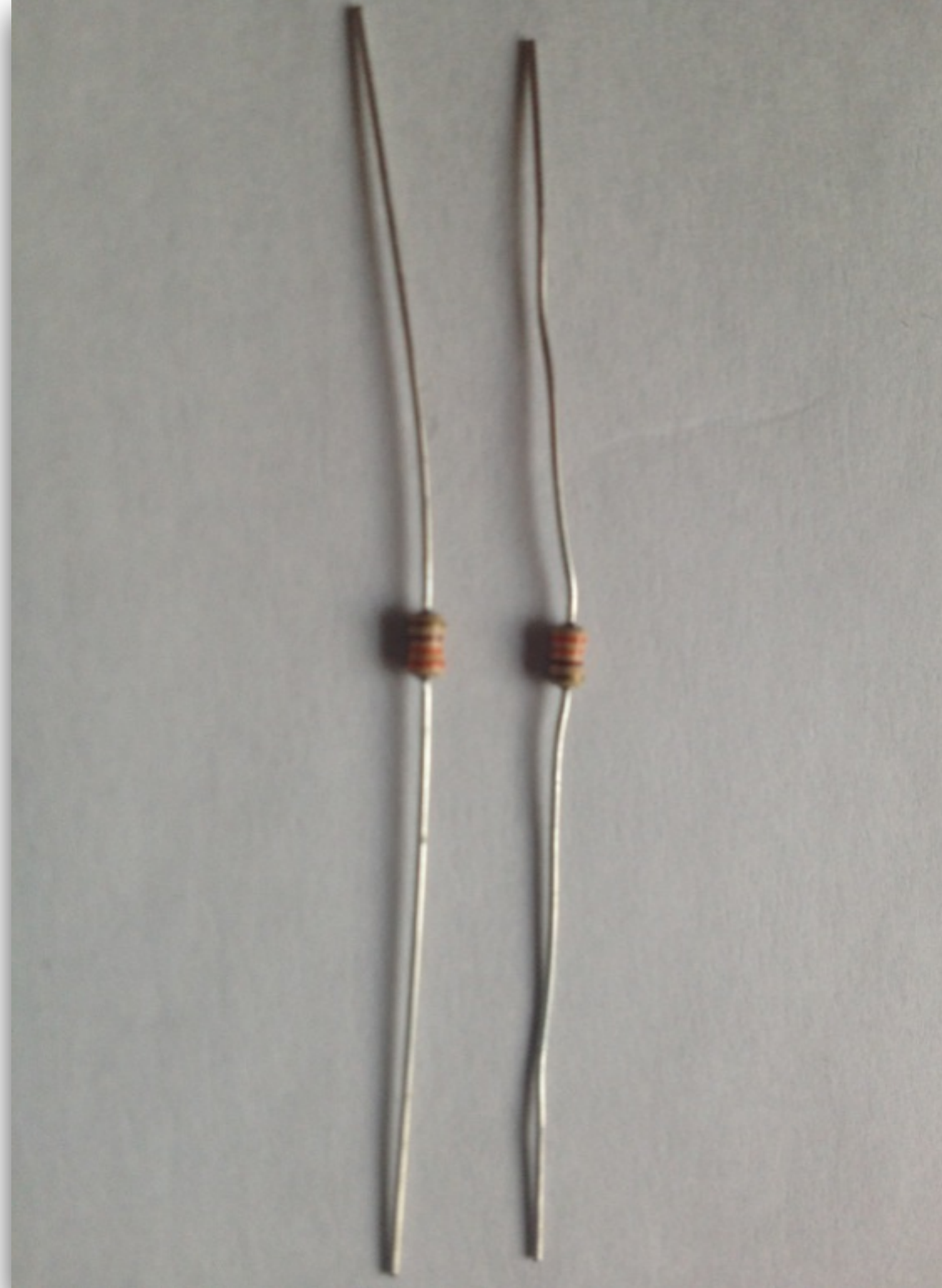
* You don’t have to care about it’s color.



Resistor

is an electronic element to control current to LED

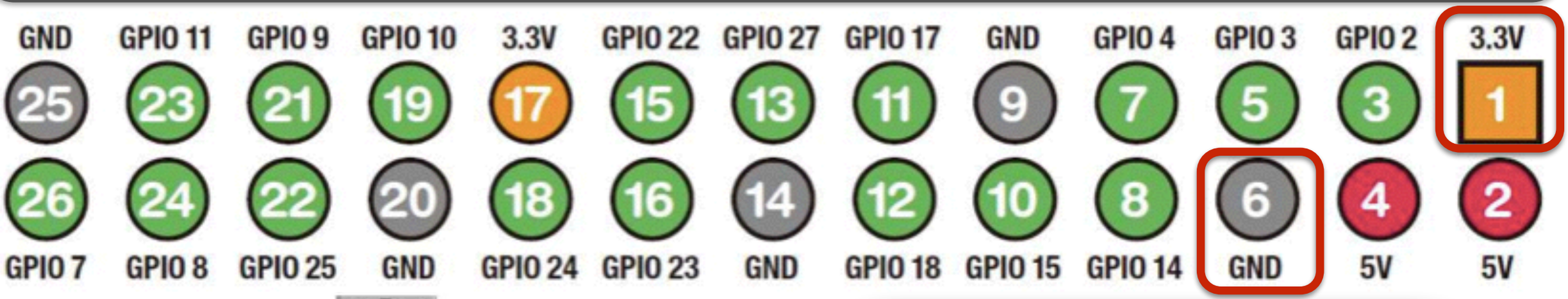
Bend a resistor ‘C’ shape to wire it into your breadboard.

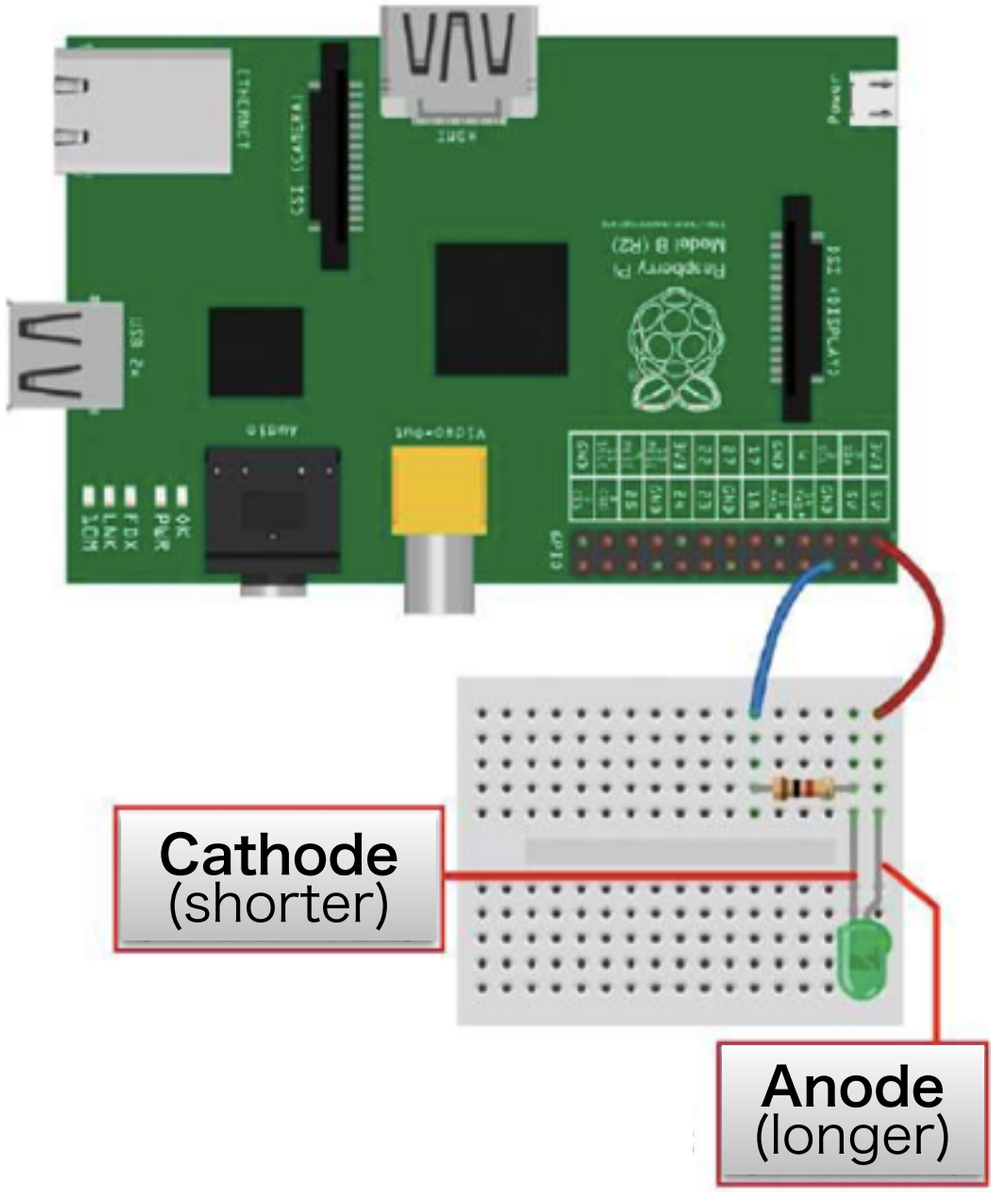


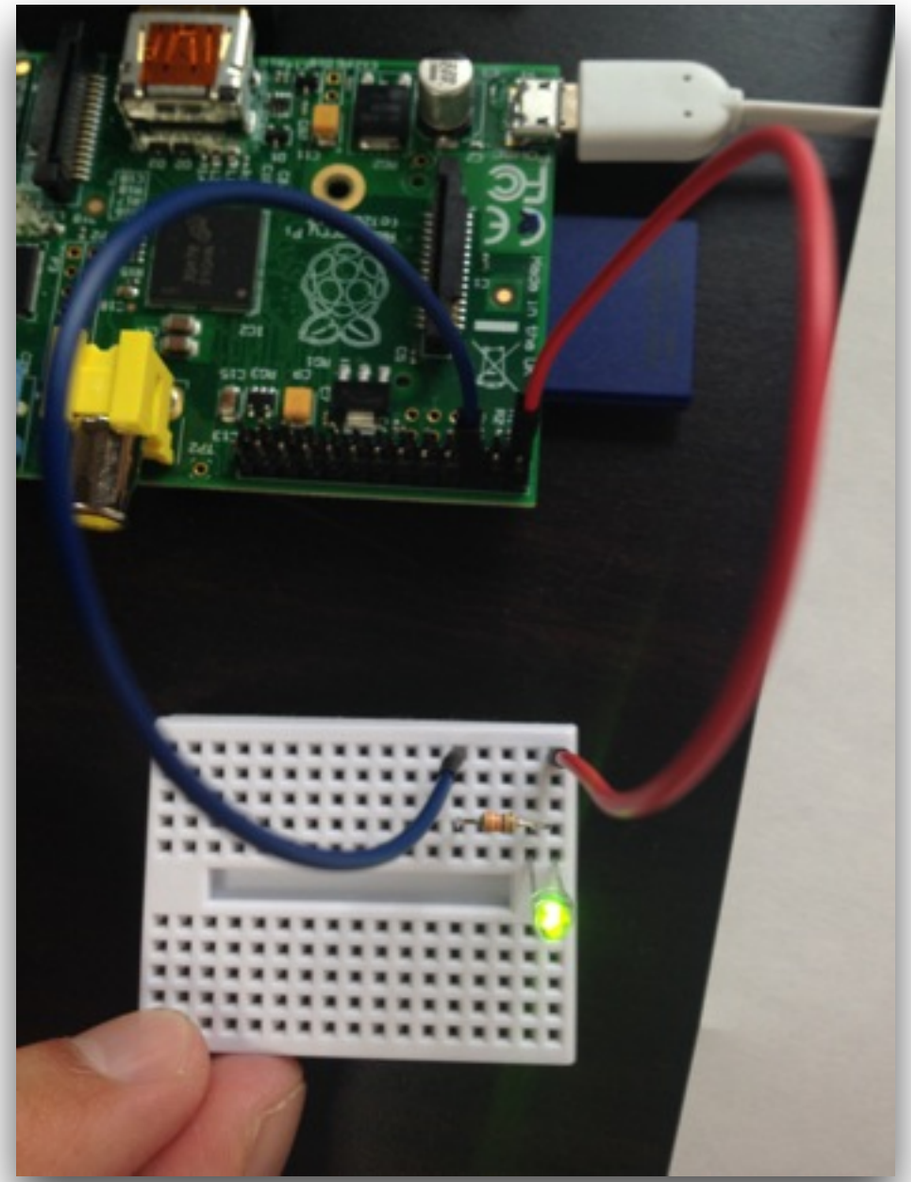
Hands-on: Control LED w/ RP

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

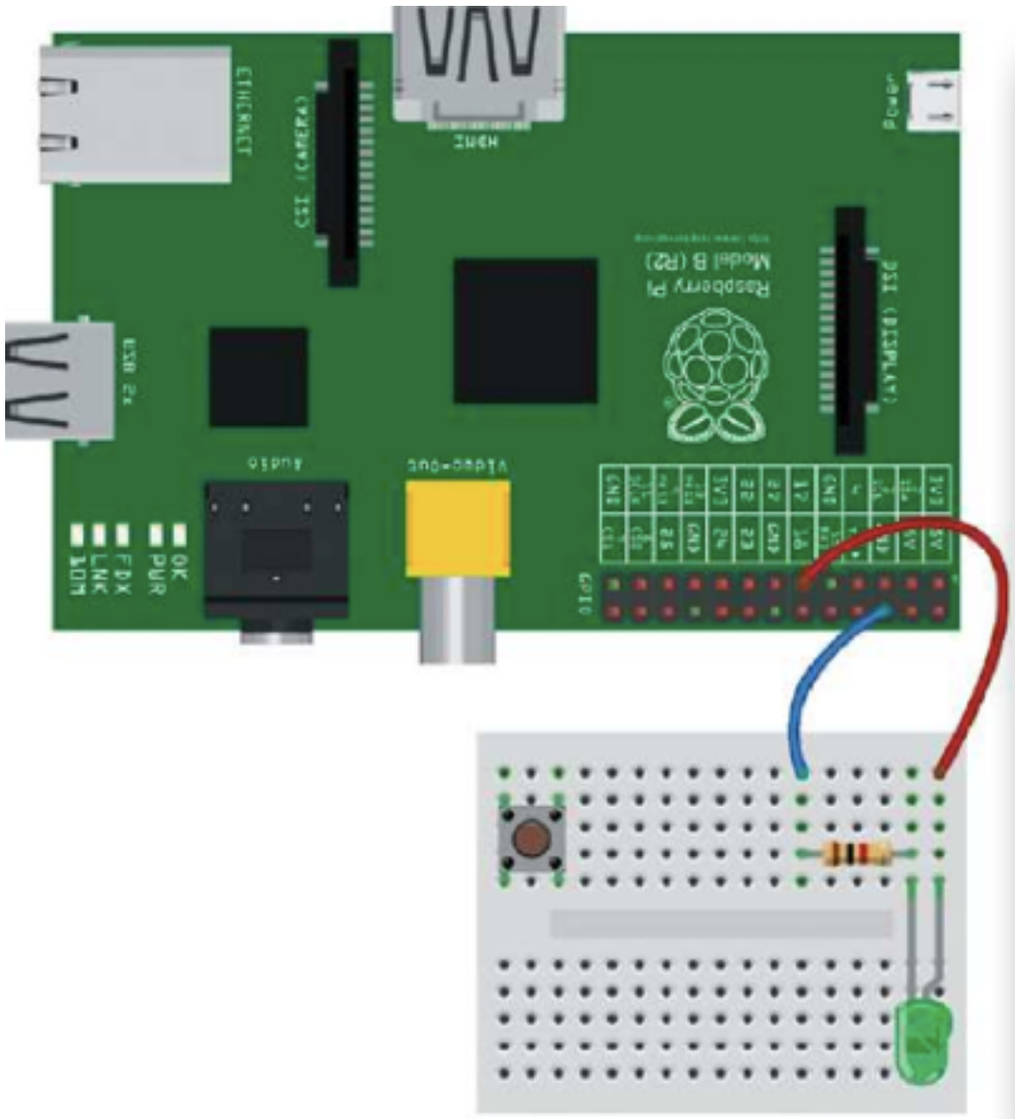
1). Build a **LED circuit** on a **breadboard**

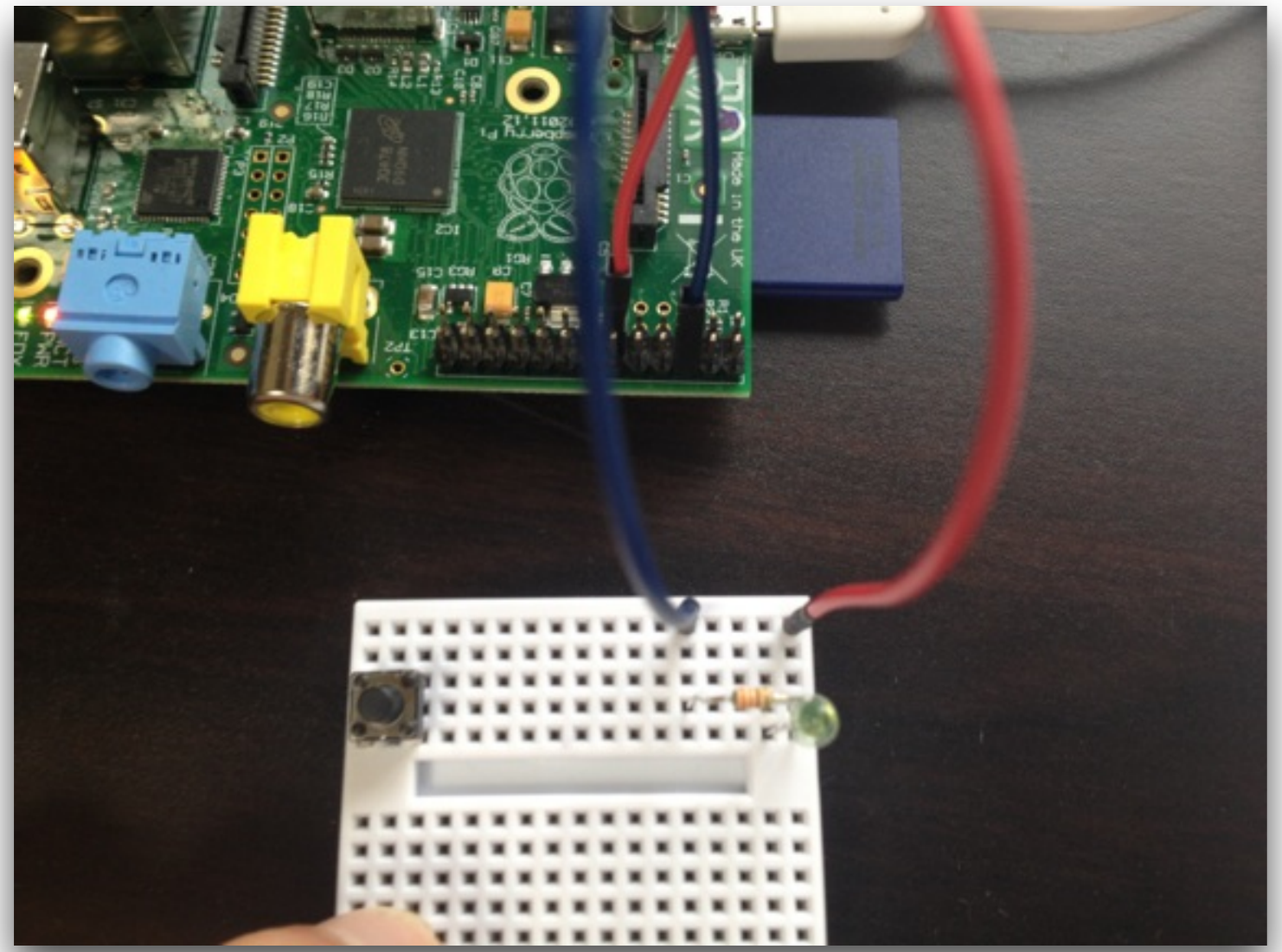




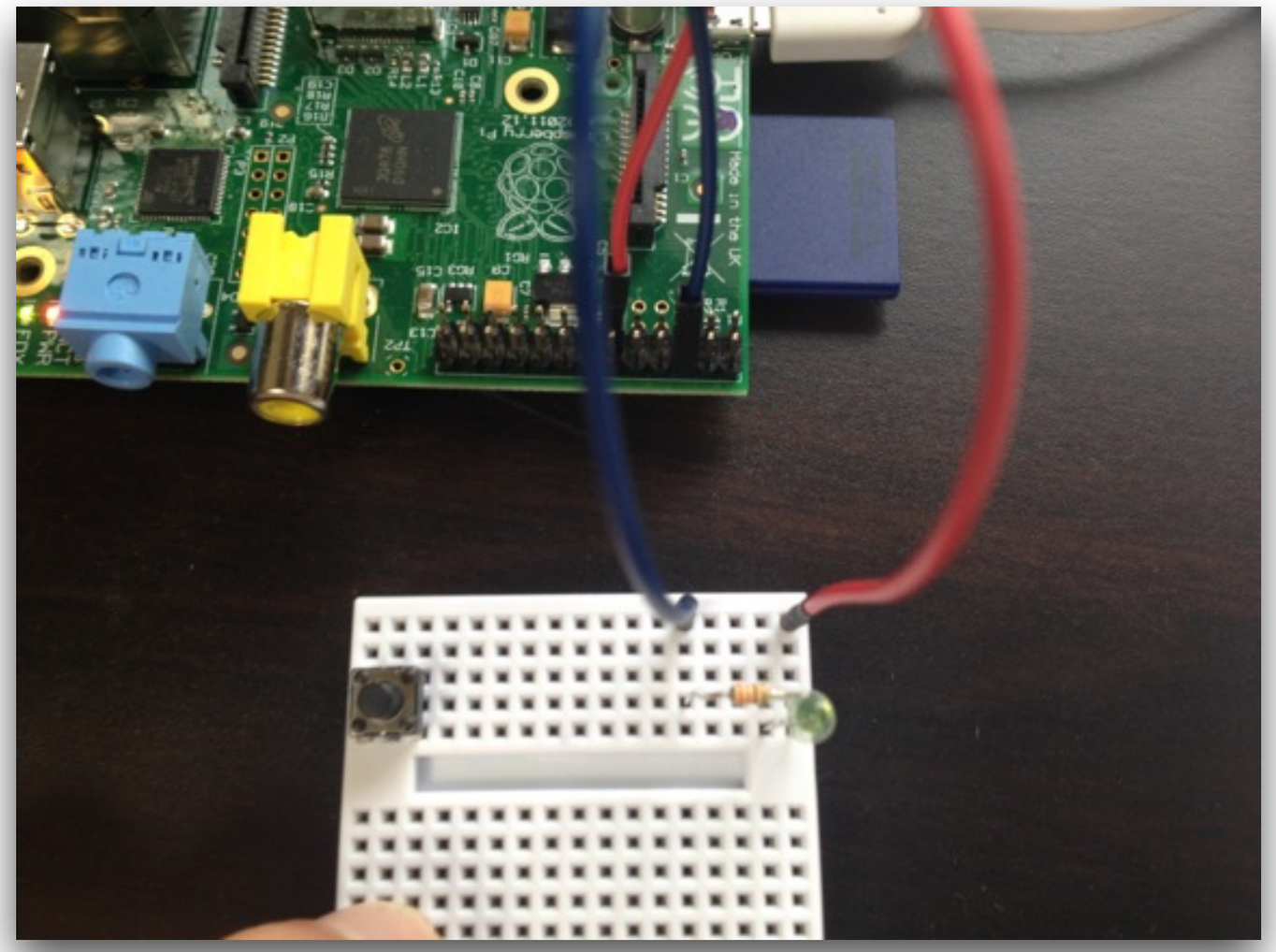


2). Connect it to **Raspberry Pi's GPIO**





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: Lightning 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.

Hands-on: Lightning by Space

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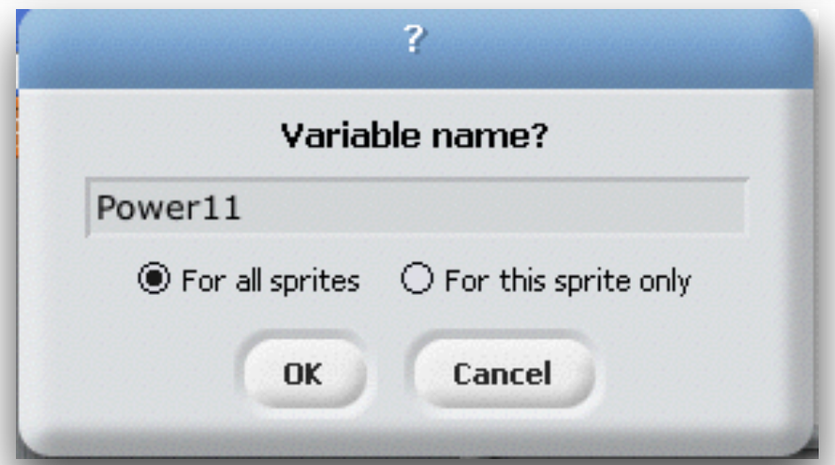
Control from 0/1 to 0~1

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

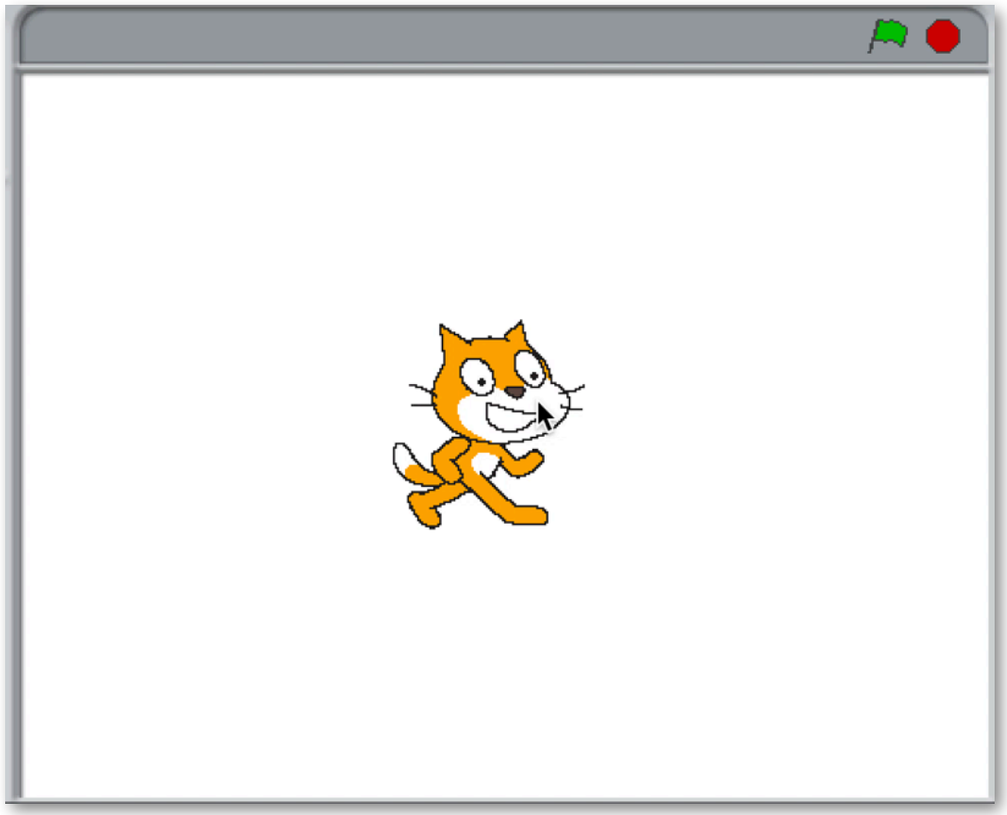
1. Go to **Variables**, and click **Make a variable**.
2. Name it **Power11**, and click **OK.**
3. Double click **Power11** appeared at the top left in the stage.
4. Change the number by dragging the slider next of **Power11**.

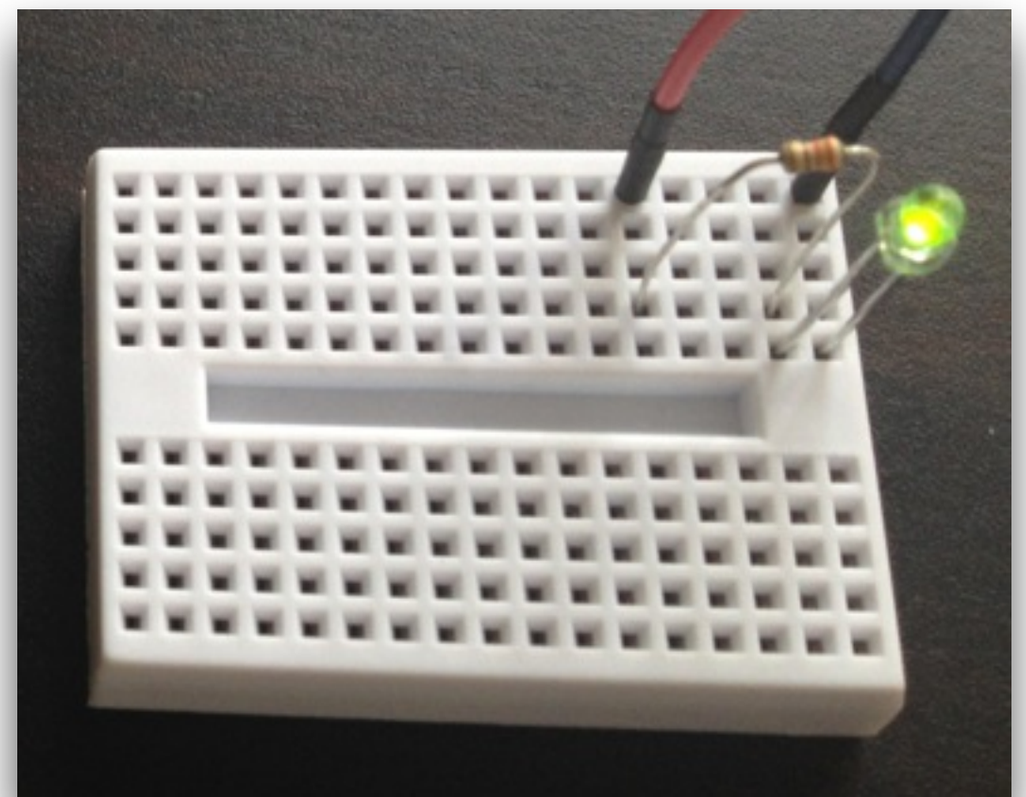


Hands-on: Cat closer to Edge, brighter Light

- 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**.





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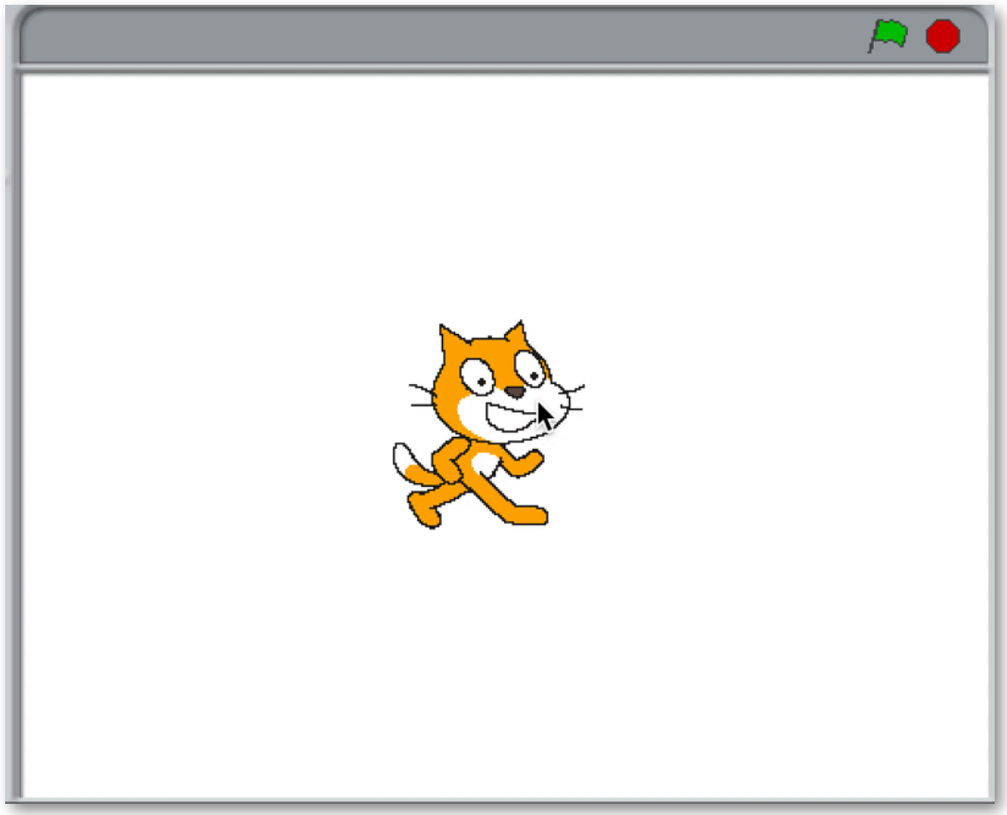

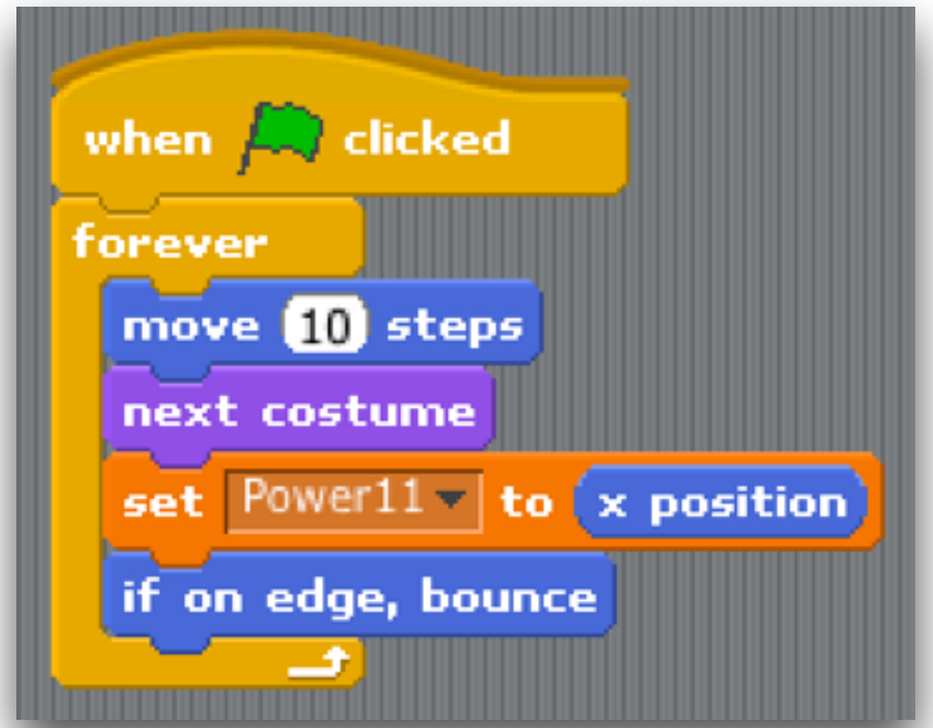

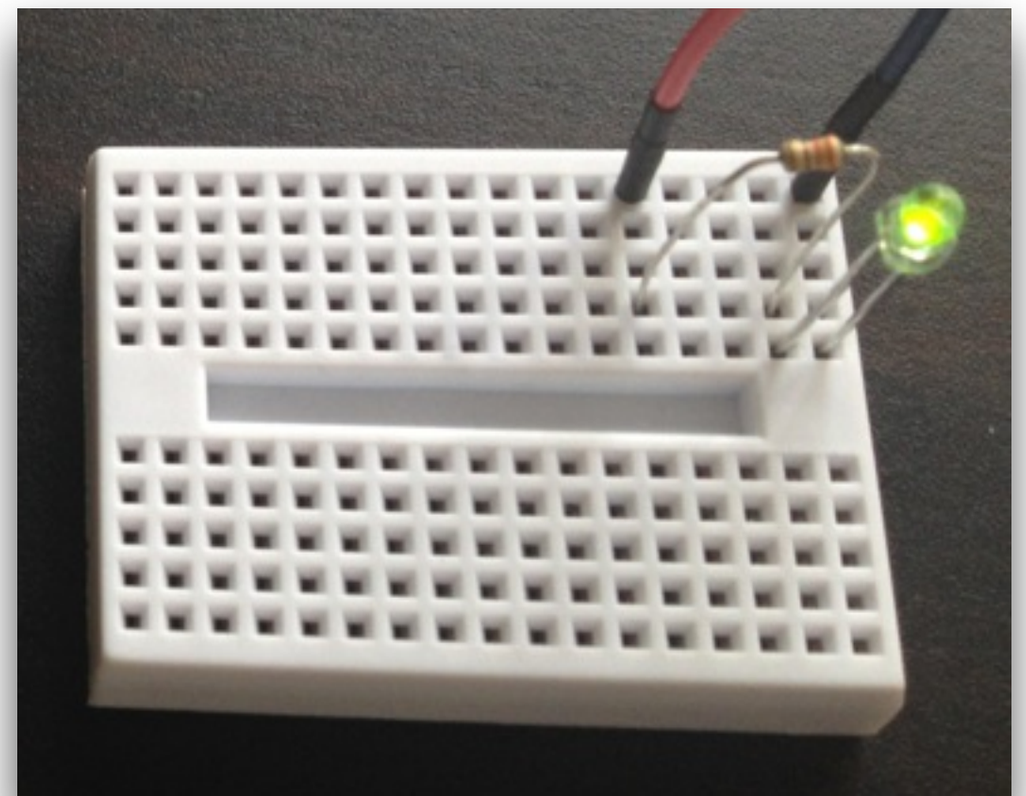

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Ma a progr m with Scratch


DONE!
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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 禎隆 (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