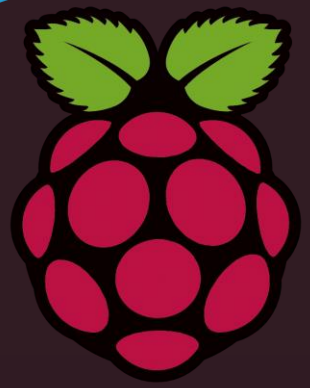
Introduction to Scratch and Raspberry Pi



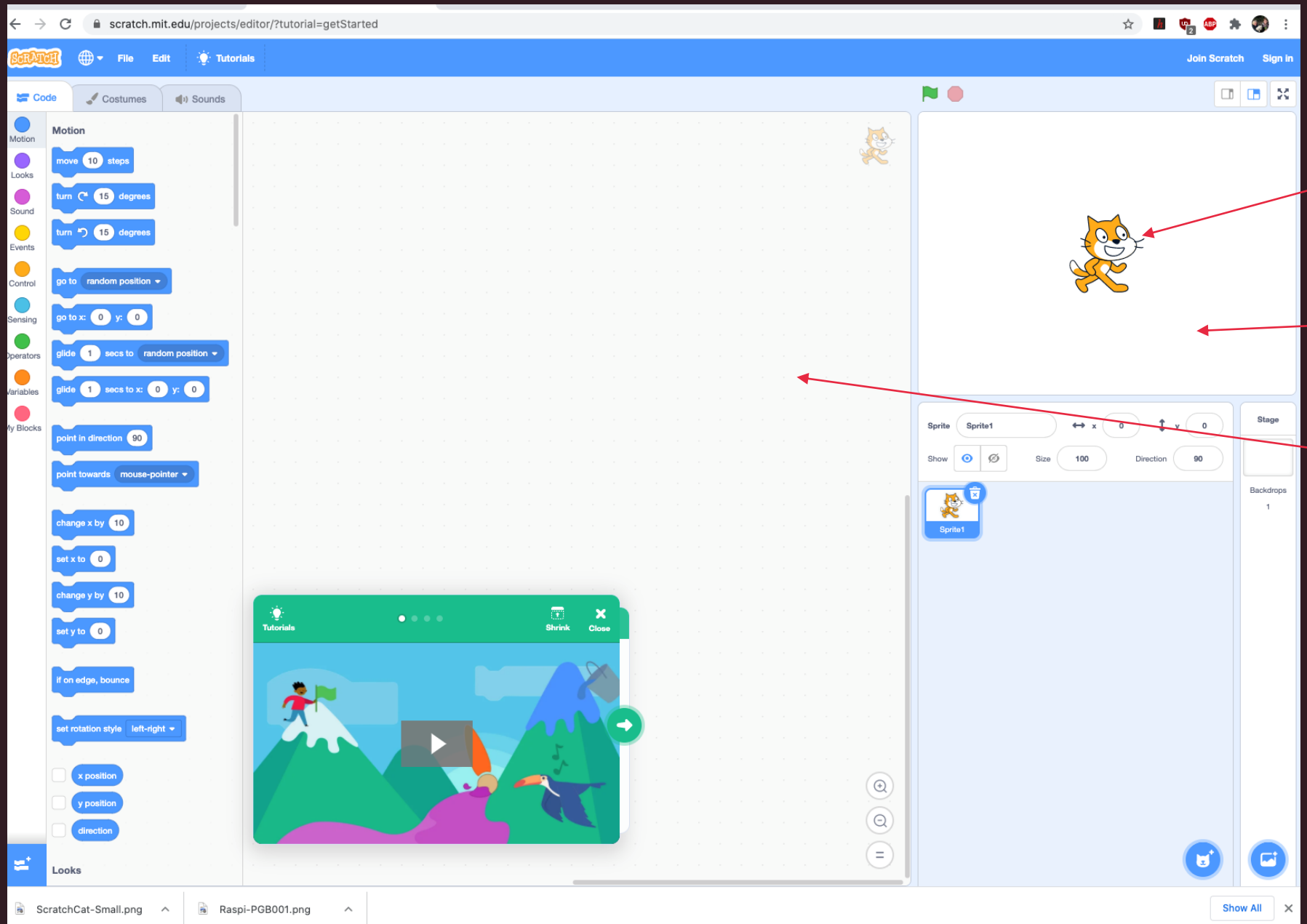
By: EileenA

SCRATCH

- Scratch is a free block-based, visual programming language.
- It was created to help children learn to code.
- It was developed by the MIT Media Lab in partnership with the Playful Invention Company (Montreal)
- Versions 2.0 (2007) and 3.0 (2019) are both open source on GitHub
- Implementation language for versions 0.x and 1.x was Squeak,
  version 2.0 is ActionScript and
  version 3.0 is JavaScript
- As of September 2020, the official Scratch website had over 59 million projects, shared by 58 millions users, and almost 36 million visits monthly.
- Scratch 3.0 works with Microsoft Windows, macOS, HTML5 and Linux (via renderer). It is not only browser based, but also available as a Raspberry Pi desktop-based program.

https://en.wikipedia.org/wiki/Scratch_(programming_language)

Scratch Website https://scratch.mit.edu/



Blocks Palette

Sprite

Stage

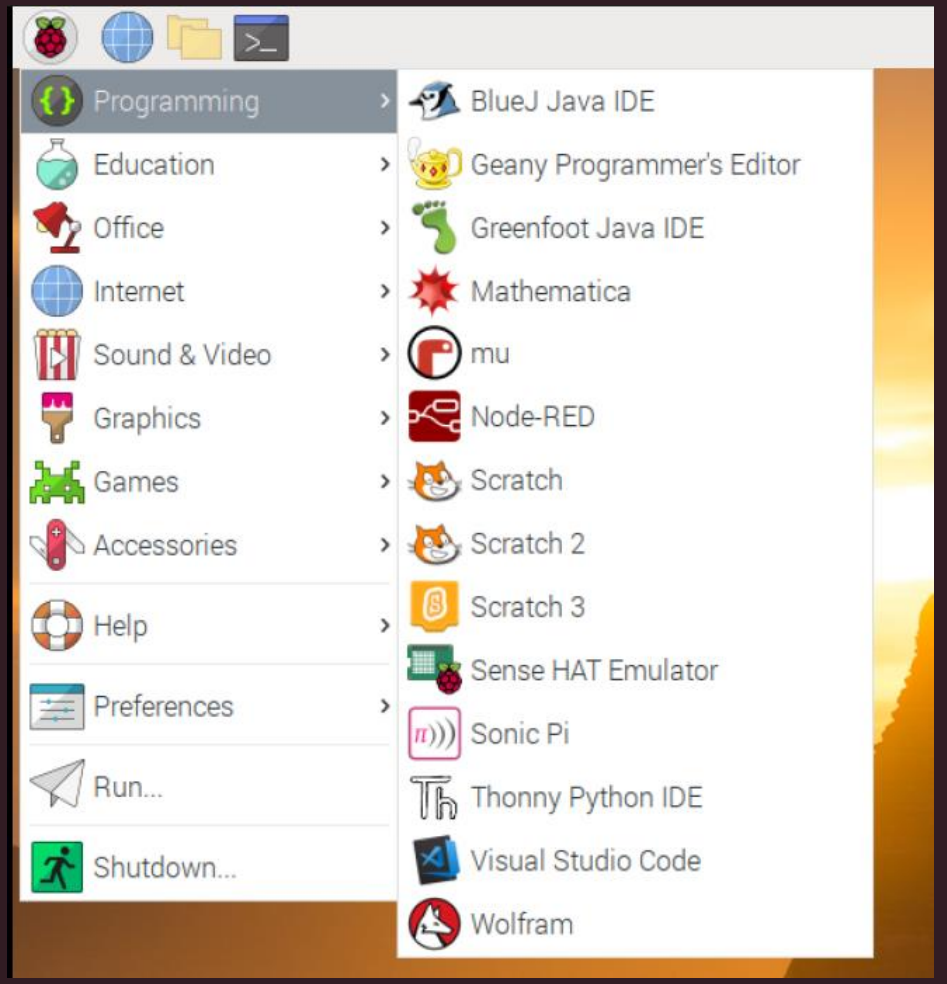
Scripting Area

Raspberry Pi OS

The recommended hardware to run Scratch 3.0 is a Raspberry Pi 4 with a minimum of 2 GB of RAM.

Depending on the OS you use, you may have to install Scratch 3.0, by typing sudo apt-get install scratch3 in the terminal.

With Raspberry Pi OS, all versions of Scratch come preloaded.

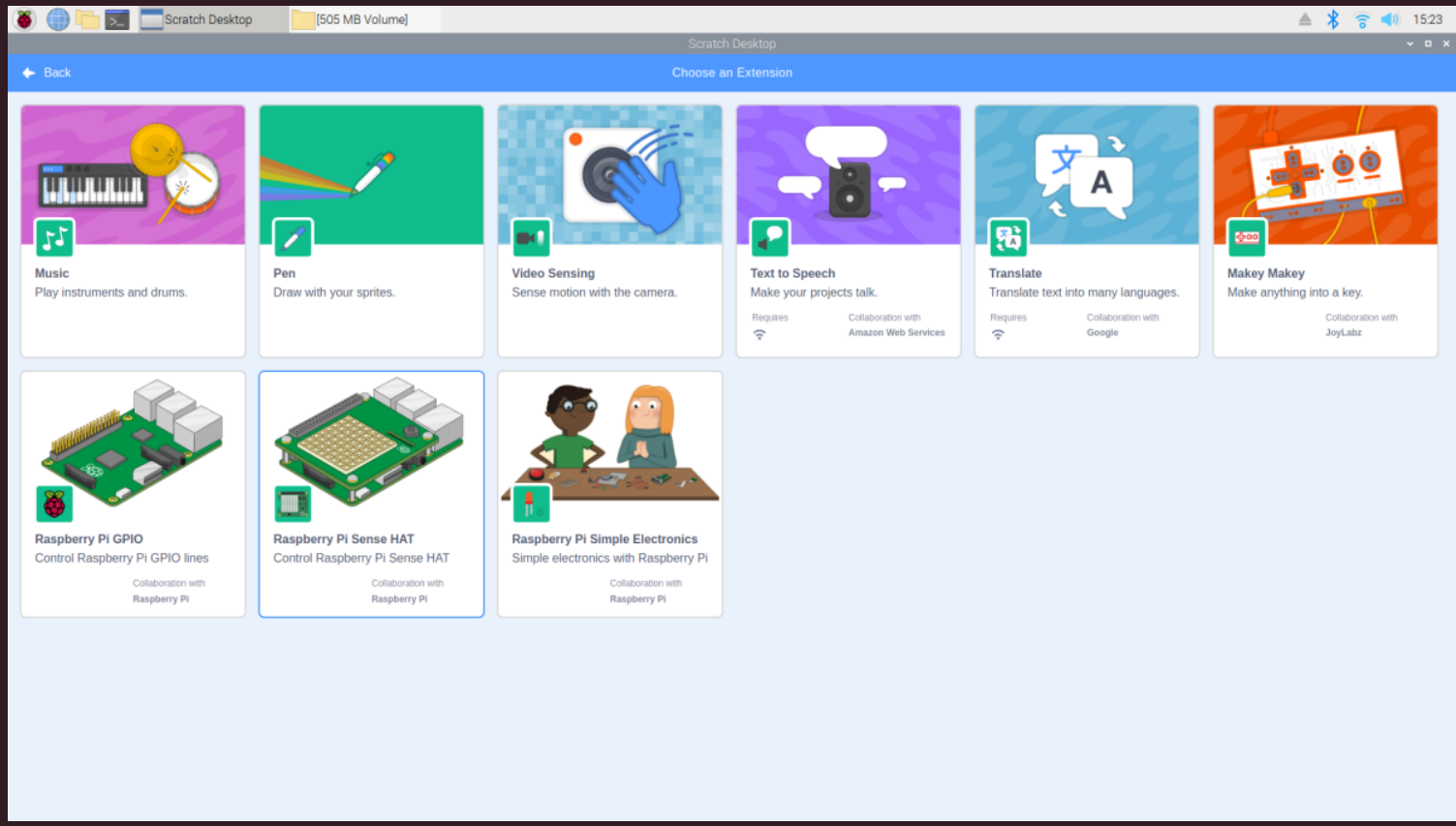


Physical Computing

In order to have access to the GPIO pins on the Raspberry Pi, you will have to add an extension.

Simply click on the extensions button in the lower left-hand corner of the Scratch main window.

Then click on Raspberry Pi GPIO. Note this is not available in the browser version of Scratch.

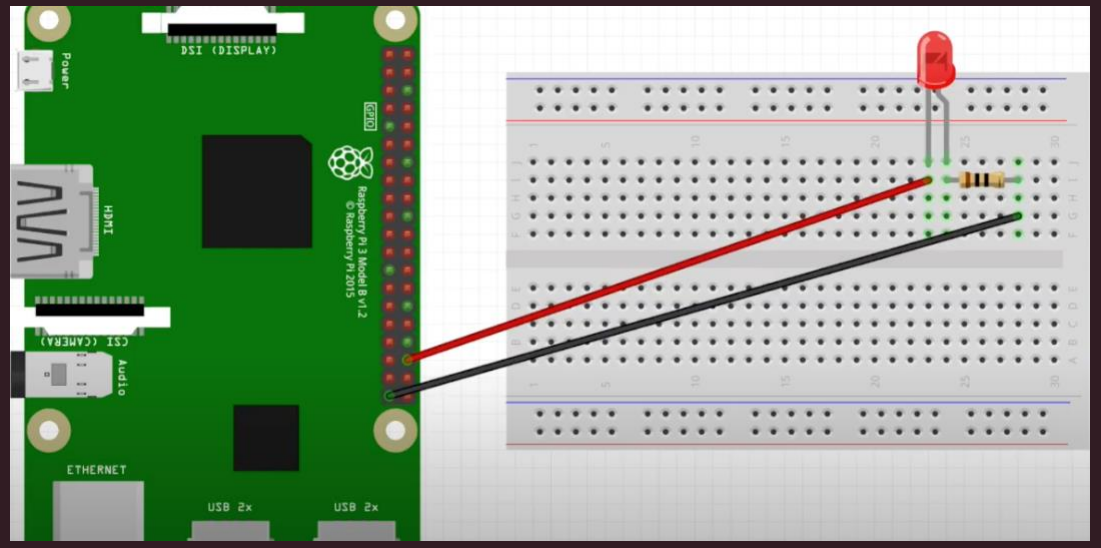


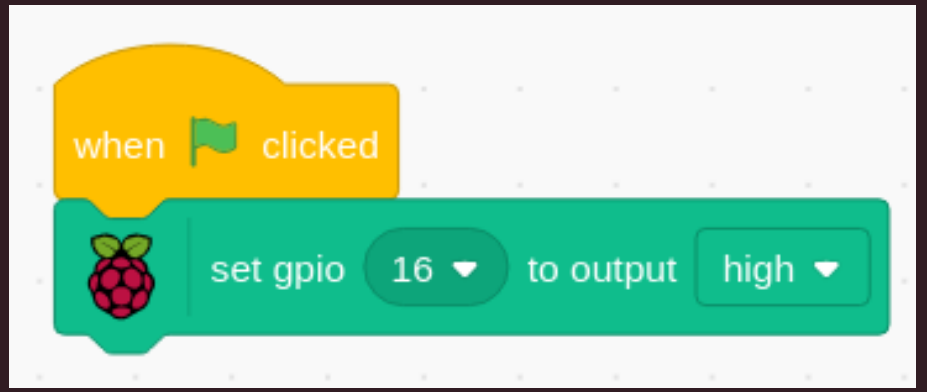
Physical Computing

Now when you open Scratch on your Pi, you should see the Raspberry at the bottom of the blocks list.

When you click on the Raspberry, you will see that four new blocks are available, which allow you to interact with the GPIO pins on the Raspberry Pi.

Flashing LED demo





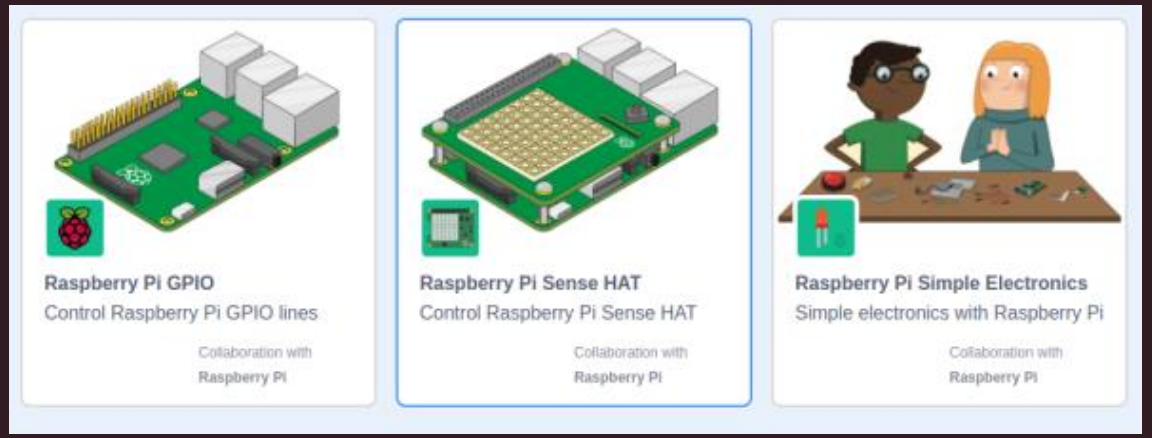
Red wire connects to positive leg of led and GPIO 16 on Raspberry Pi. Black wire connects to 330 Ω (connected to negative leg on led) and to ground on Raspberry Pi.

Only 2 Blocks are required to turn led on:
1. the event block
2. the "set gpio" block
Set this block to pin 4 and high (or on)

There are 2 other Extensions Available

One of the extensions allows you to interact with the various sensors embedded in the SenseHat (which use to be known as the AstroHat).

The other allows you to create simpler circuits. This last extension will work with any component even if an LED is pictured on the block.



Some of my Conclusions

- I was surprised at the power of Scratch as a programming language. I took on Jim's first coding challenge as a way to learn more about Scratch and was able to obtain the various outputs with relative easy, considering I am not really a coder.
- As a teacher, I was excited by the prospect of being able to create my own animations to demonstrate various concepts to my students and recognized how it could be used in the classroom to help them learn scientific and computational thinking skills.

Limitations

- Because Scratch 3 is relatively new, there are not as many projects and forum posts to help you navigate problems or find inspiration.
- Apparently in Scratch 2, there was a feature where each block was described and some example code was provided to help you understand how the blocks work. Scratch 3 does not have this feature, which would be helpful especially with the Raspberry Pi GPIO extension

These few things aside, I have found using Scratch very easy and intuitive. It will definitely be a go to tool for me in my teaching.

Thanks!

- Many thanks are due to a few people who helped me with the logistics of getting this presentation to you today (assuming I got here).
- Thanks to the Friday Hangout group for troubling-shooting a major meltdown last night. In particular: Mark, Don and George. Your knowledge and support was amazing.
- Thanks to Cody. She is my rock!