PRACTICAL DEV COMPANION

A charrold303 companion guide

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TABLE OF CONTENTS

WELCOME!

Thanks for attending one of my workshops, IoT for Smart Cities, Manufacturing, and Advanced Analytics from scratch! I am very excited that you have chosen to invest your time with me today, and in the spirit of respecting that investment, I have prepared this guide to make sure you have as much information as possible at your fingertips. It is broken into three sections:

1. *The glossary of terms lists common terms I will use during the presentation that you should know*
2. *The Useful Things section has some materials to help you during the course of the workshop that we will be using – charts, diagrams, etc.*
3. *Important Links has links to everything we will be using in a shortened format, so you can type them in from a printed copy more easily (they will work automatically from the digital copy of course)*

Thank you again for joining me today, and for investing in this session. I have worked hard to make sure you walk away with some new knowledge and skills that you can use to get started with your own projects!

GLOSSARY

Technology is full of acronyms that are really important and often times poorly or completely misunderstood. This glossary of terms will be helpful for understanding the presentation and materials we will cover in our workshop, and just for general knowledge!

HARDWARE TERMS:

Single Board Computer - a complete computer built on a single circuit board, with microprocessor(s), memory, input/output (I/O) and other features required of a functional computer.

Raspberry Pi – an example of a Single Board Computer that was designed for hobbyists and enthusiasts to offer a low-cost, fully functional computer in a small form-factor.

Sensor – a piece of hardware that detects some sort of condition and provides a signal based on the condition. Our sensor detects sound.

PIN – A part on a circuit board where an external device, sensor, input or output may be connected.

GPIO – an acronym that stands for General Purpose Input/Output. It is used to refer to any pin that is not defined by the pin itself but is defined at runtime (see "runtime" under Software Terms).

Breadboard - A breadboard is a construction base for prototyping of electronics. TRIVIA SIDE NOTE: (Originally it was literally a bread board, a polished piece of wood used for slicing bread. This was popular with early electronics builders because they were cheap, sturdy, and did not conduct electricity!)

Male and Female – this refers to the type of connection that a wire, sensor, or pin can accept. Breadboards are “Female” connections and so require a “Male” connector. The GPIO pins on the Raspberry Pi are “Male” and thus require a “Female” connector.

LED – Light Emitting Diode – a small device that uses a lot of very deep scientific principles to emit light. For our purposes, it is a small, electric light that can operate at VERY low voltage.

Circuit – any complete electrical connection is a circuit. From the lightbulb and light switch you used this morning, to your phone charger, to the circuit you will build in this workshop. Electricity flows from + to – through a circuit. No circuit, no flow of electricity.

Resistance – a property in electronics that allows us to reduce and control the flow of electricity through a circuit.

Resistor - a passive two-terminal electrical component that implements electrical resistance as a circuit element. This is the fancy way of saying that it causes the amount of electricity flowing through it to be reduced. Think of it as an electricity traffic cop for your circuit.

Pinout – this is the map of the Pins on the SBC to their function. Pinouts are critical for wiring a circuit – without it you do not know what the pins do!

Potentiometer a “variable resistor” that allows you to control the resistance of electricity through a circuit. Often embedded on a sensor, but can also be added by itself

ESP8266 – a type of single board computer with a very small form factor that runs a stripped-down basic OS for real-time command and control of hardware devices like sensors and LEDs

NodeMCU – a type of ESP8266 with a fully integrated wifi, GPIO, and power circuit subsystem, making it much more simple to use for prototyping.

SOFTWARE TERMS:

Code – the underlying construct of any computer software, app website, or anything that has to do with computers. There are many, many types of code. Code is written in different languages. Like all languages, all different code languages have their own syntax, grammar rules, and general flow.

C/C++ – A type of code language. There are many, this one is one we will use. It is good for things like hardware interfaces because it is lightweight and extremely fast to execute.

NodeRED – Another type of code we will use. NodeRED is built on top of Node.js and is a “flow based” visual editor, meaning it uses drag-and-drop elements arranged in a workflow to provide structure to the underlying execution.

Runtime – the time during which your code is running. This is when all the things you are telling the computer through your code to do actually happen.

Bug – an undocumented feature of your code. This is a behavior that you did not expect based on a set of conditions that happen through the use of your cod.

Runtime Error (also debug error, compiler error) – happens because you have something incorrect in the code. Usually this is caused by poor syntax or trying to do things in the code that the code doesn’t allow.

Loop – a flow in code that is controlled by executing a test for a condition, and then responding by doing something until the test is passed. Examples of loops are: FOR, WHILE, IF, DO, and INFINITE

Comment – the most important part of any code. Comments are your notes to future generations about your code; why it is what it is, what it does, and how you got it there. Comment early and often for best results!

Comment Out – yes there is another type of comment! This one allows you to try different things without deleting code. By “commenting out” code you can keep it in the program and try different things.

Variable – much like the name implies, it is something that can have a variable definition. Variables are assigned to a value/values in your code and can be of many “types”

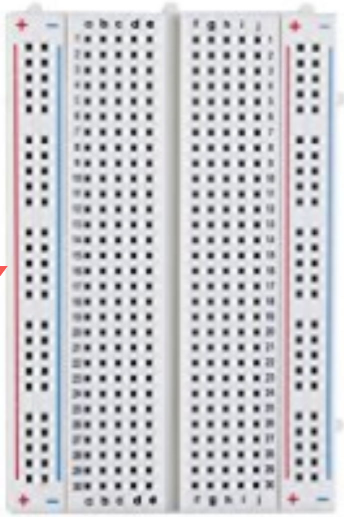
> **String** – just what it sounds like, a string is any string of text
>
> **Number** – numbers can have MANY types of values depending on the language.
>
> **Keyword** – keywords are reserved words that the language pre-defines and are key to the language itself. IF, ELSE, and END are all keyword examples

Code Block – a logical area of the code that is one part of the overall program.

USEFULL INFORMATION

WWW.CANAKIT.COM
CanaKit
CanaKit™ Raspberry Pi 3 Complete Starter Kit - 32 GB Edition (Black Case)

What's In The Box!?



PARTS LIST:

1 x PIR sensor:

1 x Breadboard:

3 x M:M and 3x M:F wires:

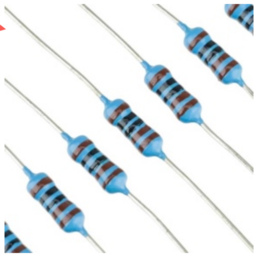
1 x Red LED:

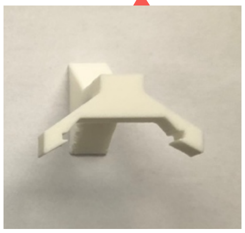
1 x Green LED:

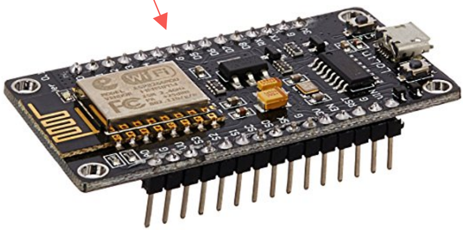
2 x Resistors:

1 x NodeMCU with power cord:

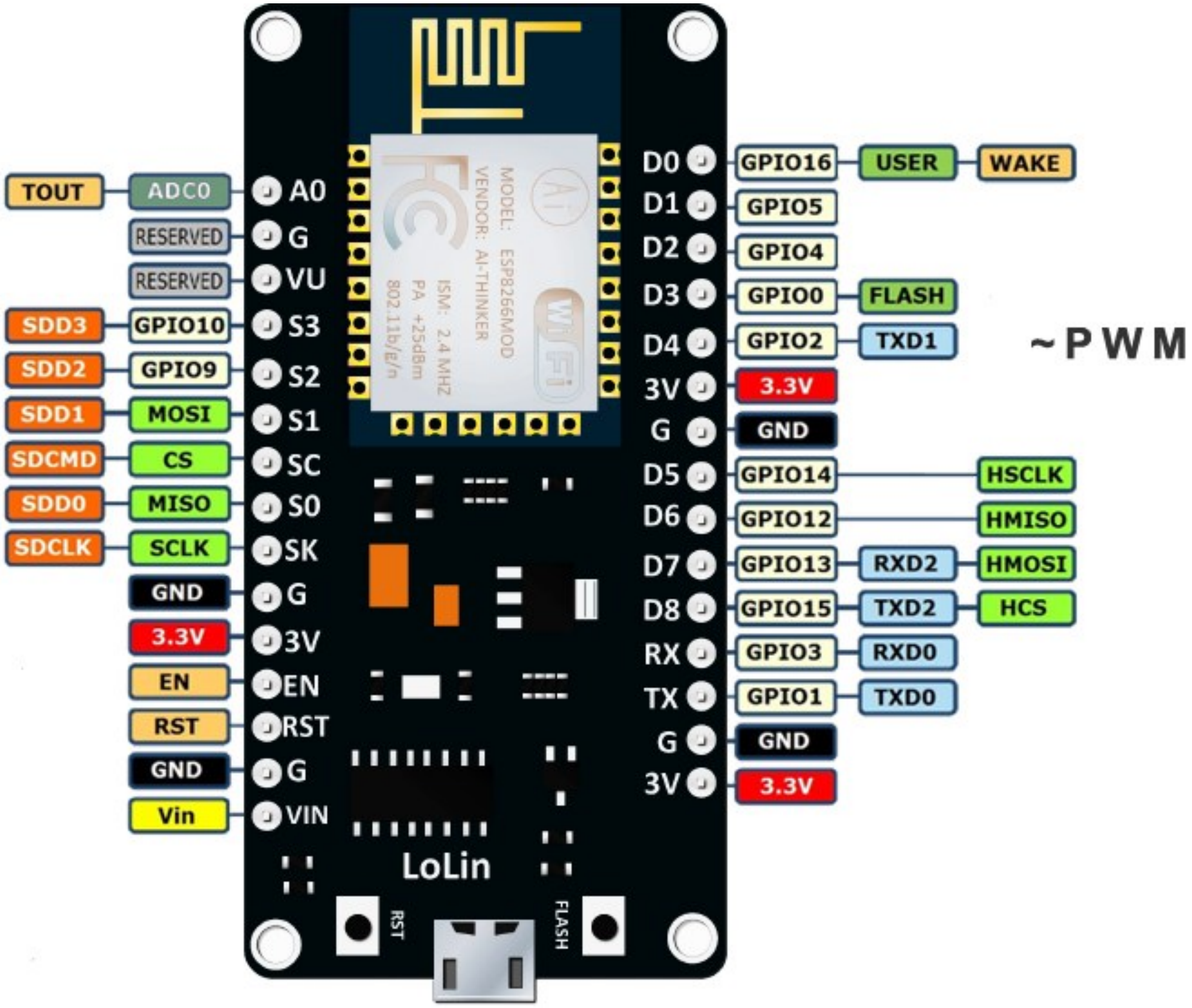
1 x 3D Printed Standoff:



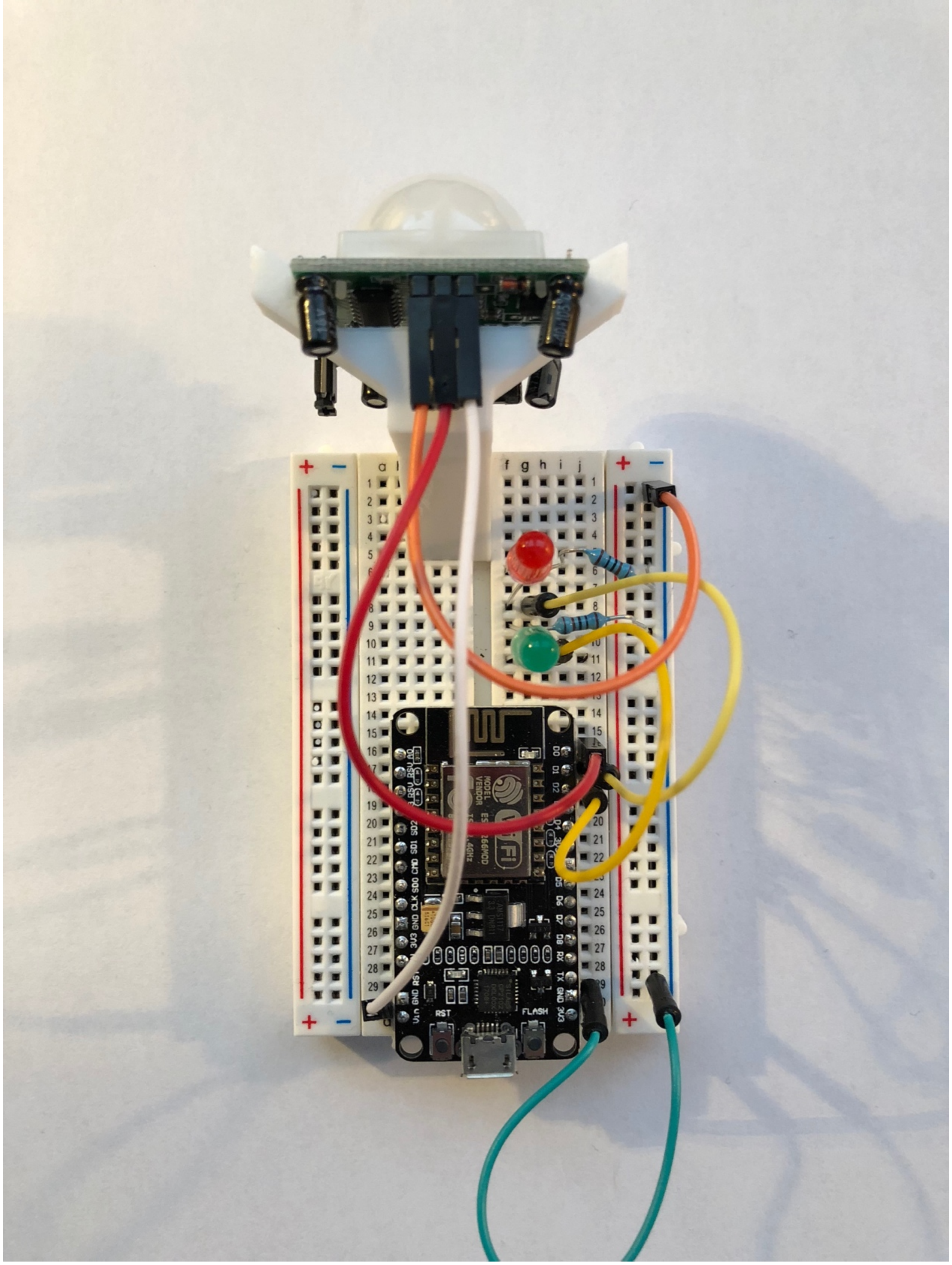


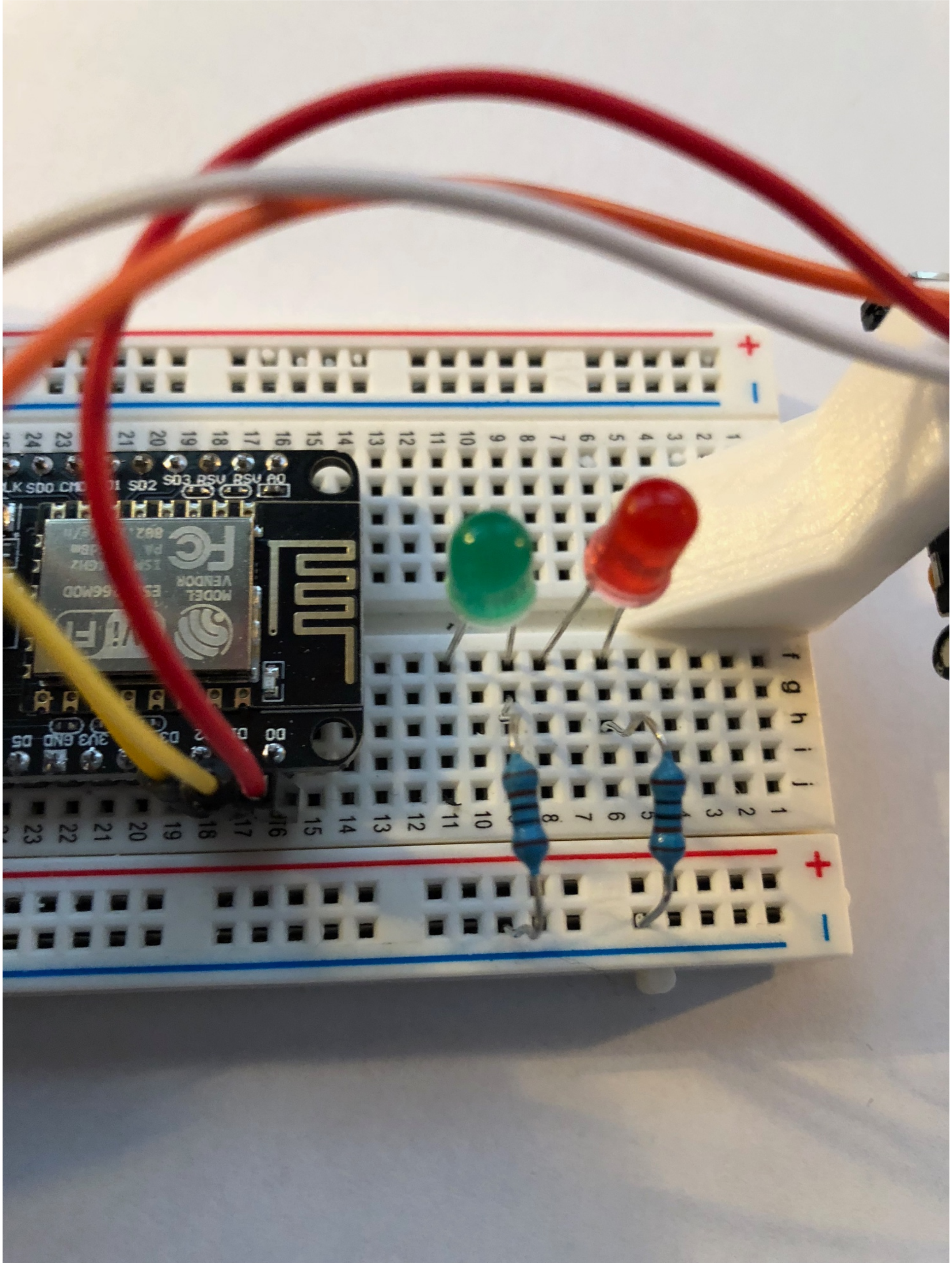


NODE MCU GPIO PINOUT DIAGRAM:

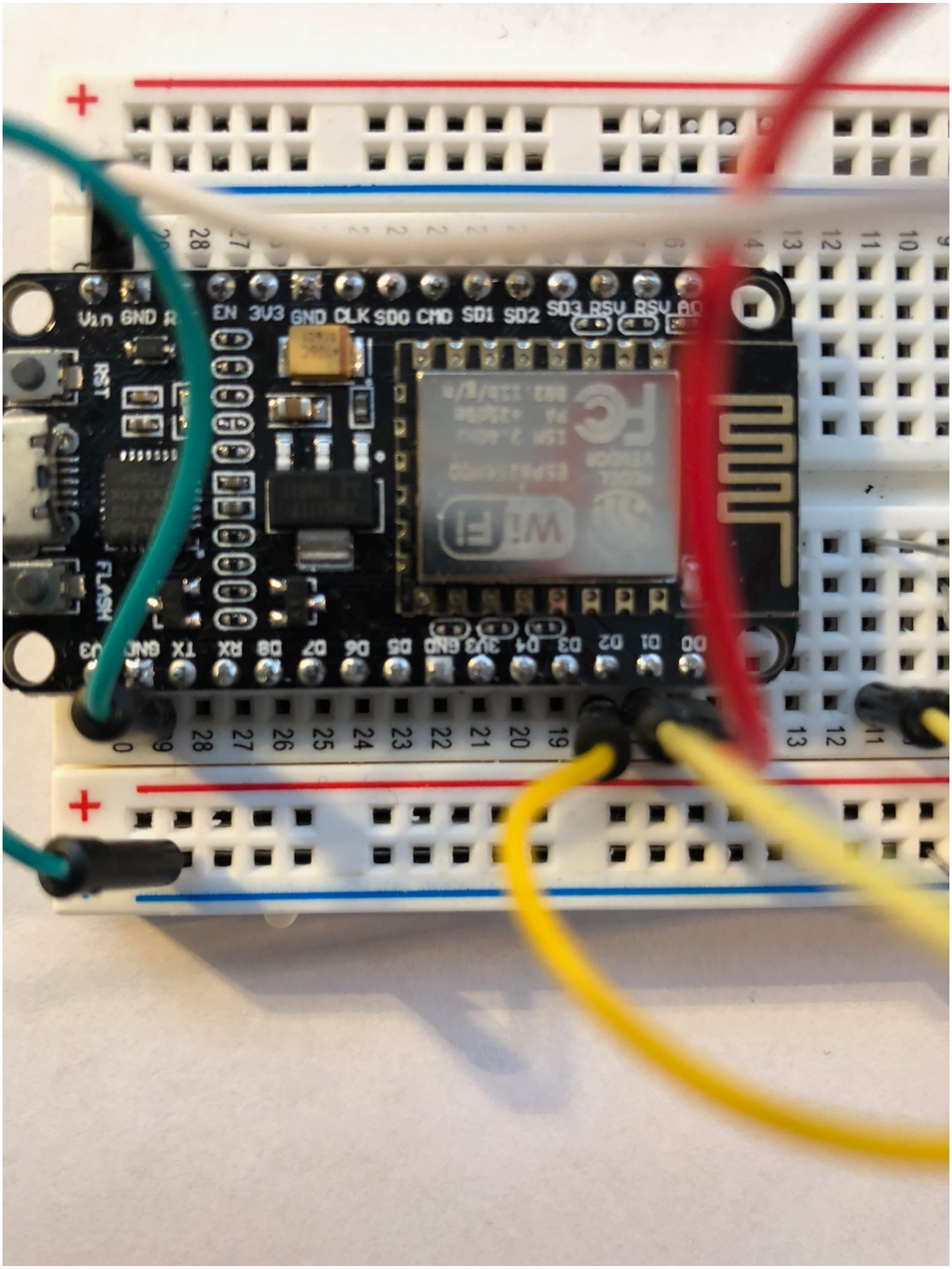


WIRING PICTURES TO HELP YOU GET WIRED:

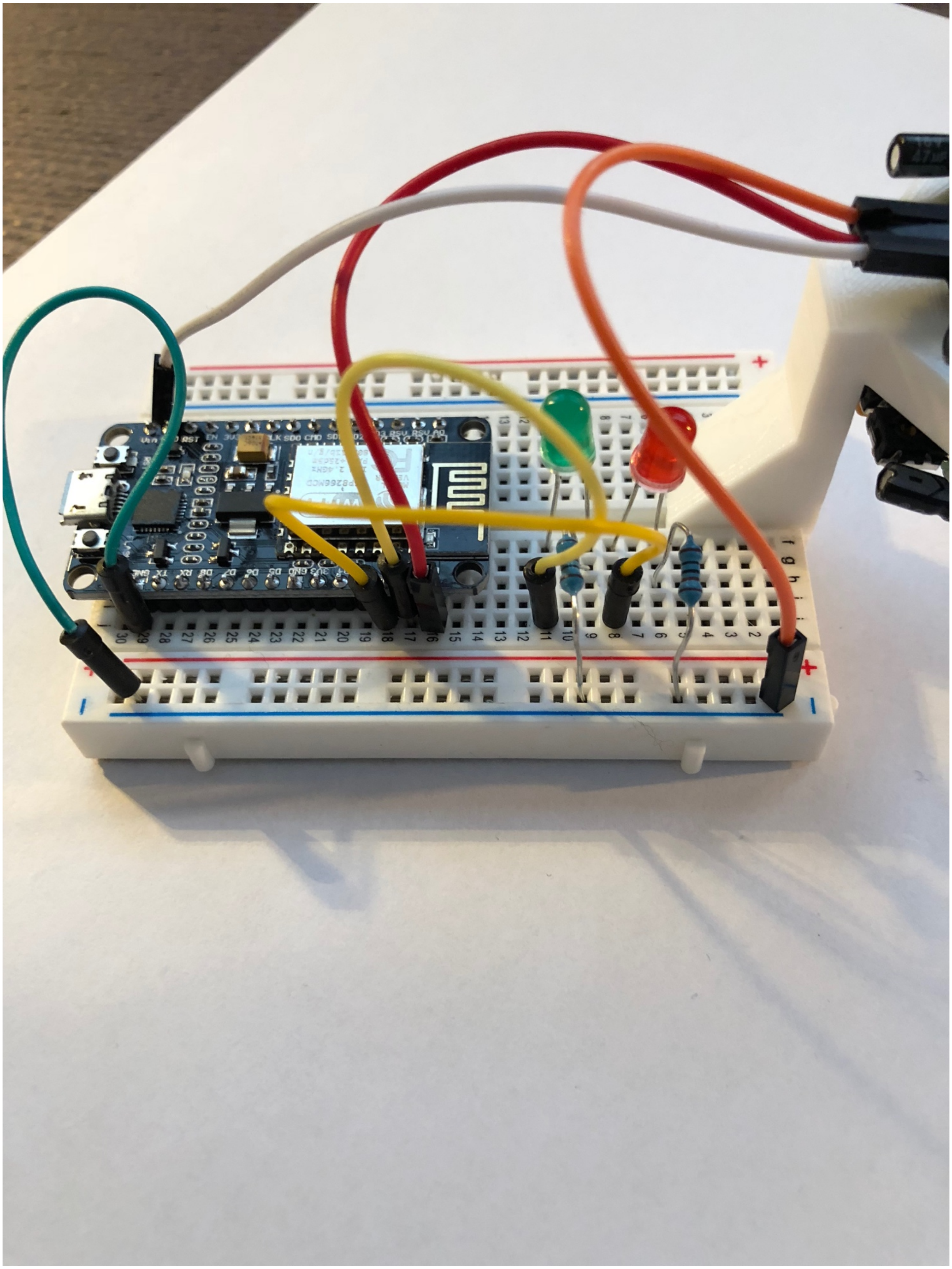




9


Vin
GND
EN
3V3
GND
CLK
SD0
CMD
SD1
SD2
SD3
RSV
RSV
A0
RST
FLASH
3V3
GND
TX
RX
D8
D7
D6
D5
GND
3V3
D4
D3
D2
D1
D0

10



11

IMPORTANT RESOURCES

Some good links and books for your ongoing education!

Programming the Raspberry Pi, Second Edition: Getting Started with Python – by Simon Monk

Raspberry Pi Cookbook: Software and Hardware Problems and Solutions – also by Simon Monk

ESP8266: Programming NodeMCU Using Arduino IDE - Get Started With ESP8266 – by UpSkill Learning

Quick Survey: How did we do? Was this worthwhile? Anything else?
http://bit.ly/charrold

GitHub Repository (code, this doc, other materials):

https://github.com/ChrisHarrold/CloudExpo2018/tree/master/IoT_Hands_On

NodeRED: NodeREd.org excellent website with documentation and how to's for using NodeRED
https://nodered.org/

Putty: A windows-based ssh client (if you use a windows machine you just have it in general!):
http://bit.ly/_putty

SCP: The preeminent file copy tool for Raspberry Pi! Not really, it's a UNIX command that you will want to know for copying your code from your computer to the Pi
http://bit.ly/scp_command

GitHub: The preeminent code repository system for sharing and collaborating on code (yes, really it is)
www.Github.com

ImgFlip: Because memes are life
https://imgflip.com/memegenerator

Fritzing: Great little tool for creating your own very simple and easy to read/share/use wiring and circuit diagrams:
www.fritzing.org

My Website (updates, other projects, blog, etc.):
https://www.charrold303.com