

Microsoft Student Partners

Introduction to Hardware and IoT

University of Pittsburgh



what is the “internet of things”

Internet of things

Syllabification (Inter•net of things)

noun

A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data:

"If one thing can prevent the Internet of things from transforming the way we live and work, it will be a breakdown in security."

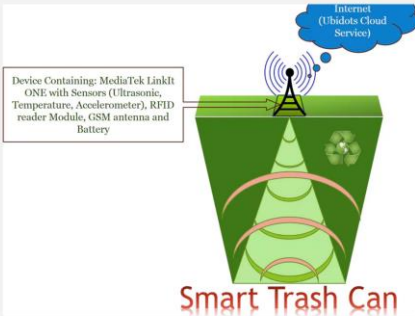
Source: [Oxford Dictionary](#), yep, it's really in the Oxford Dictionary. It got added mid 2013

~nifty~ IoT Projects

11101110
10101010
10101010

Smart Trash Can IoT System

Made by Amol Disale - Published in MediaTek Labs, SeedStudio, and Ubidots



ABOUT THIS PROJECT

Making Garbage Collection System smart and cloud linked. Thus, helping in optimization of route for garbage collection; saving fuel.

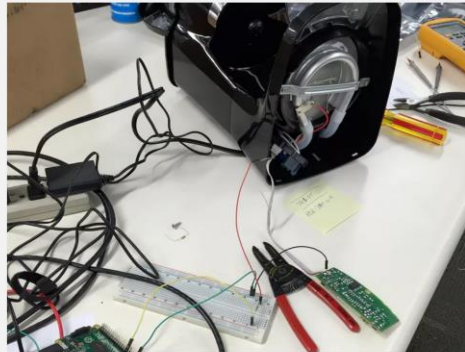
🔗 monitoring 🔗 internet of things 🔗 embedded

PROJECT INFO

Type ☒ Full Instructions provided
Difficulty **Intermediate**
Estimated time Over 1 day

Raspberry Coffee

Made by Team Windows IoT (Tre Von McKay and Windows IoT) - Published in Microsoft and Raspberry Pi



ABOUT THIS PROJECT

What do you get when mix a Coffee Maker, Raspberry Pi, and Windows 10 IoT Core voice enabled coffee maker

🔗 smart appliances 🔗 remote control
🔗 home automation

PROJECT INFO

Type ☒ Work in progress
Difficulty **Intermediate**
Published January 23, 2016
License CC BY-NC

👤 11,914 🌟 32 🎨

👍 Respect project 🗉 I made one

🔖 Bookmark 🗉 Share 🗉 Give feedback

Intelligent Healthcare Service by using Collaborations between IoT Personal Health Devices

Byung Mun Lee* and Jinsong Ouyang

Dept. of Computer Science, Gachon University, Korea,
Dept. of Computer Science, California State University Sacramento, USA

*Corresponding Author: bmllee@gachon.ac.kr, jsoyang@csus.edu

Abstract

Management of chronic diseases is important to self-management for health. The IoT concept plays a significant role in self-management for health. In order to accomplish it, personal health devices need two functions: such as application network protocol and intelligent service. But, most of them have only simple function such as indicating measured data and storing data temporarily. In this research, we proposed an intelligent service model for healthcare which gives an effective feedback to an individual. In order to do this, we introduced the collaboration protocol which transfers risk factors between IoT personal health devices. In addition to this, we proposed intellectualized service application algorithm which will be operated in the personal health device. Finally, based on the findings of the experiment, the effectiveness was confirmed on proposed model.

Keywords: Ubiquitous Health, Chronic Disease, Collaboration Protocol, IoT, Intelligence

1. Introduction

Ubiquitous health (UH) service was a model in which individual medical data was measured by a ubiquitous personal health device (UHD), and then sent to the health server to provide feedback to medical experts and patients [1]. Thus, most researches were focused on the function of sending the measured biomedical data to the server [1, 2, 3]. Due to this reason, the analysis and processing function of medical data were mostly conducted in the server.

As the concept of IoT (Internet of Things) was recently introduced, researches which attempt to apply the IoT model in different fields are being progressed [4, 5, 6]. If IoT technique is applied to UH, then UHD will break away from the simple functions of indicating measured data and sending them to the server and execute autonomous information exchange with neighboring systems (UHDS, gateway, server) and provide comprehensively assessed feedback immediately to the patient [4]. For instance, a blood pressure which is above 140mmHg is generally assessed as hypertension [7]. If the blood pressure measured from a patient with symptoms of diabetes mellitus is 135mmHg, then an intellectualized feedback service which assesses the condition as stage 1 hypertension instead of prehypertension can be provided [7]. This can be provided only when the mutual relationship between risk factors of the disease is identified.

In this research, we propose an intelligent healthcare service model that can enable personal health device to recognize the relationship between mutual diseases and risk factors and provide intellectualized feedback to the patient. In addition, suggestion is

ISSN: 2233-7849 IJSET
Copyright © 2014 SERSC

What is IoT

11101110
10101010
10101010

how do we build IoT projects

What is Hardware

11101110
10101010
10101010

Hardware

Syllabification (hard•ware)

noun

The machines, wiring, and other physical components of a computer or other electronic system.

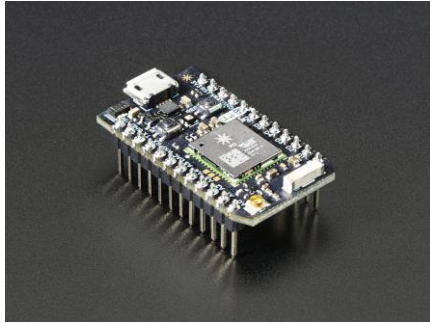
'select a software package that suits your requirements and buy the hardware to run it on'

Source: [Oxford Dictionary](#), also the Oxford Dictionary

Boards, Modules, Shields

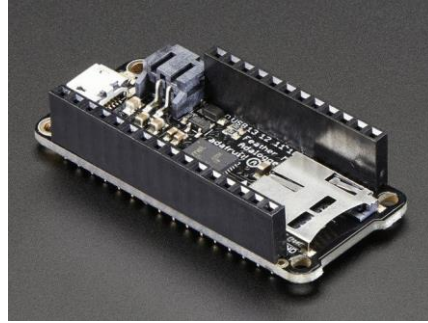
11101110
10101010
10101010

Microcontroller



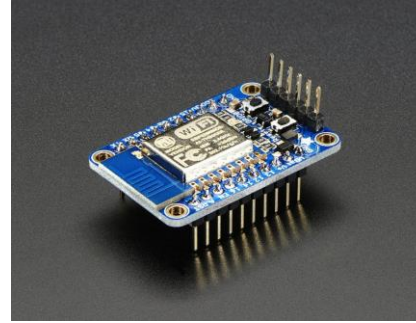
Particle
Photon

Microcontroller



Adafruit
Feather M0

Wi-Fi Module



Espressif
ESP8266

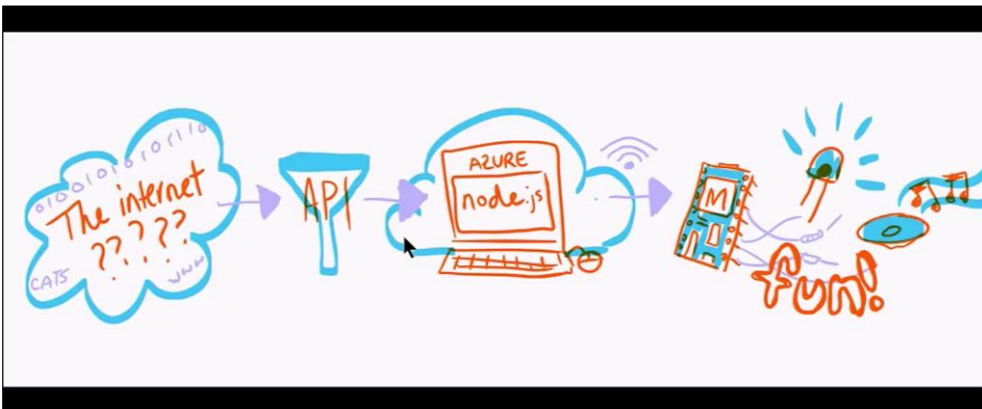
Module or Shield



Adafruit
CC3000

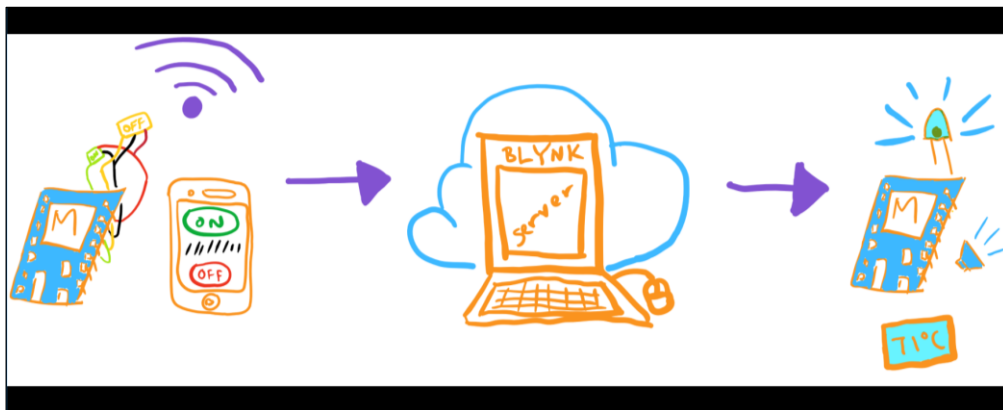
The general idea

11101110
10101010
10101010



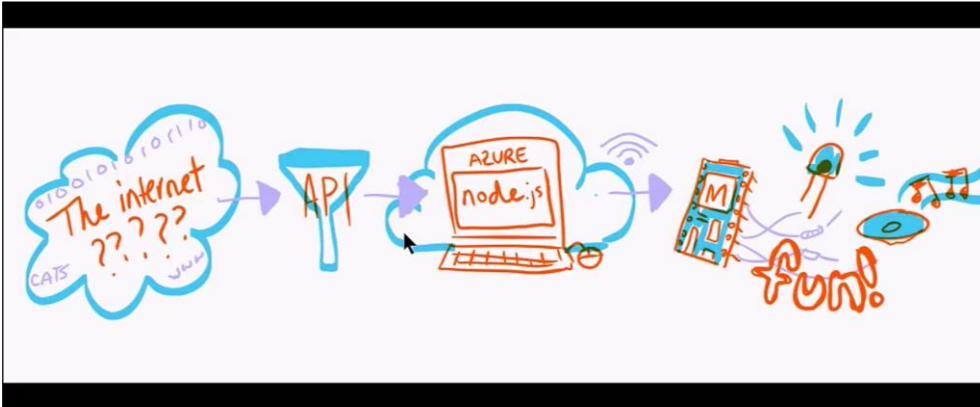
Passive Data Acquisition

Active Control



Breaking it down

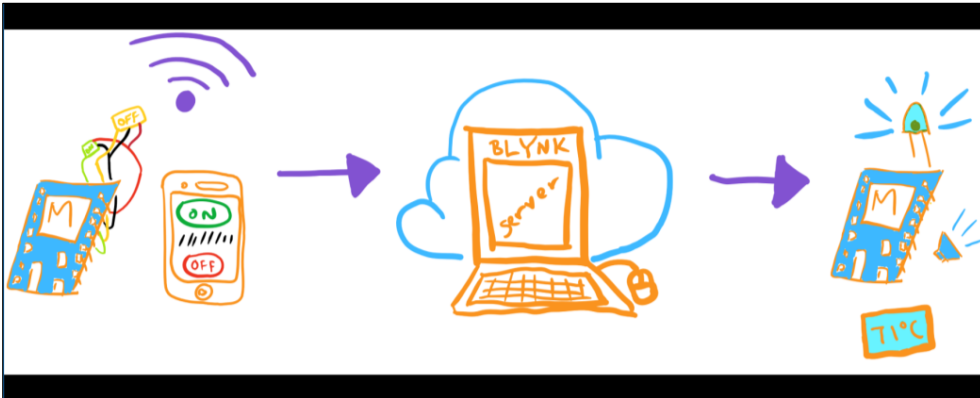
11101110
10101010
10101010



Hardware
(code, microcontrollers)

Cloud server
(data processing, comms)

API
free [big] data



Hardware
(breadboard, components)

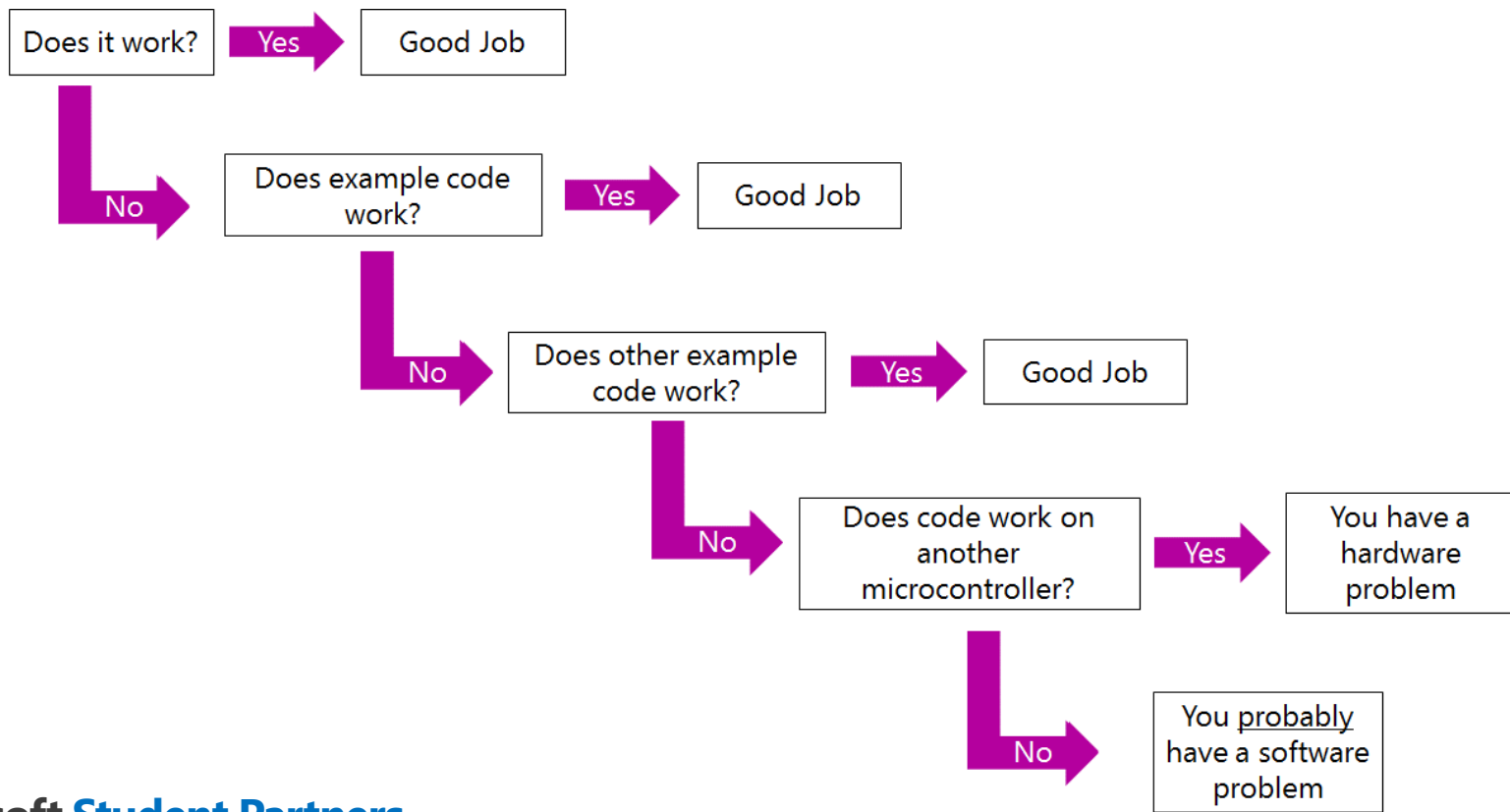
What are we doing?

Using the Microsoft Azure IoT Starter kits to learn the basics of working with microcontrollers, inputs and outputs.



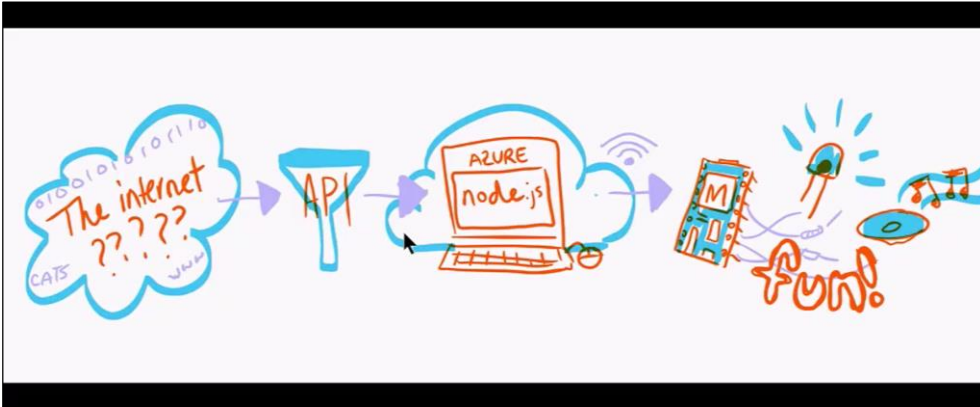
The Hierarchy of Debugging

11101110
10101010
10101010



Breaking it down

11101110
10101010
10101010

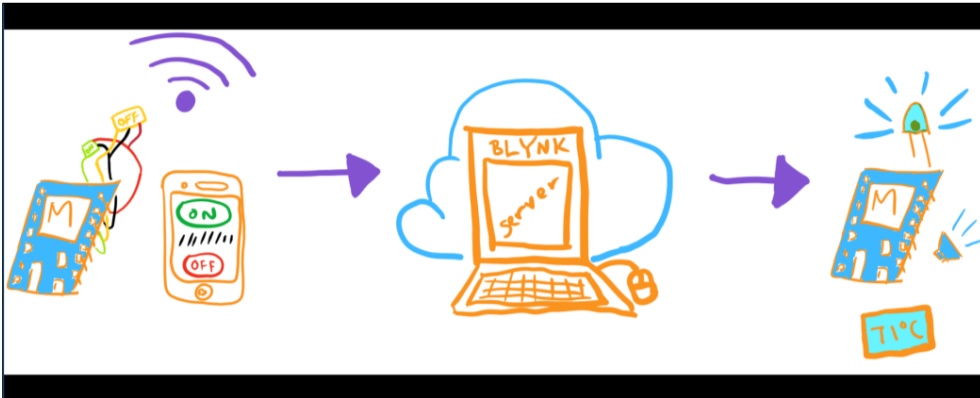


Hardware
(code, microcontrollers)

Cloud server
(data processing, comms)

API
free [big] data

Hardware
(breadboard, components)



What are we doing?

Using the Microsoft Azure IoT Starter kits to learn the basics of working with microcontrollers, inputs and outputs.



Tetris!!!

11101110
10101010
10101010

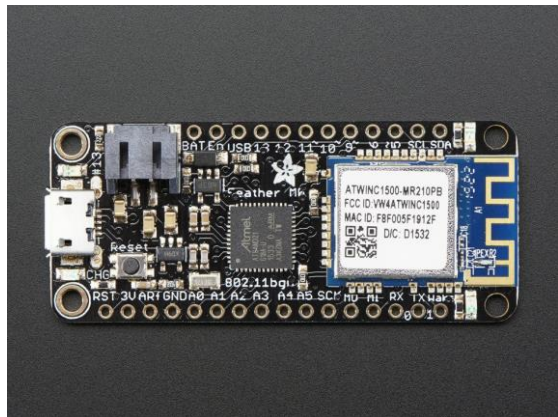
But actually?



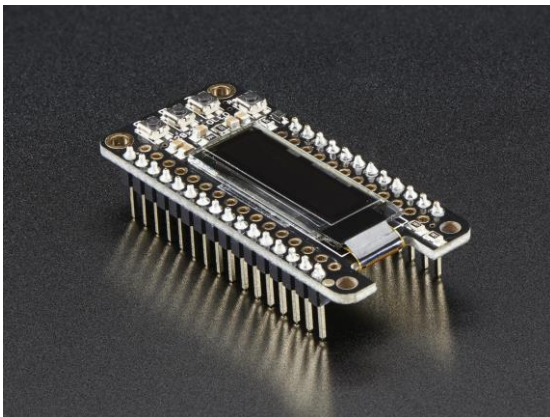
What do I get out of this?

- Working with a new type of microcontroller
- Getting familiar with installing board support and new libraries
- Experiencing GitHub and exploring the internet for fun projects
- **Play Tetris**

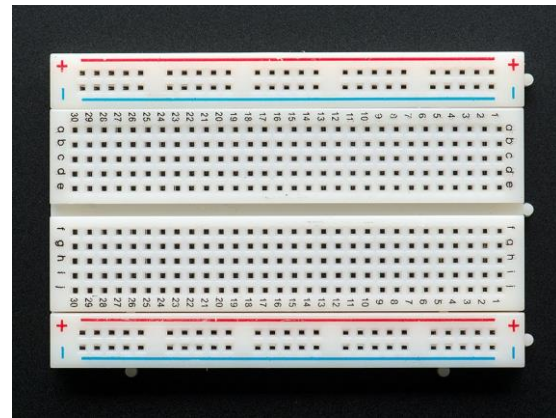
What we're using:



Adafruit Feather M0



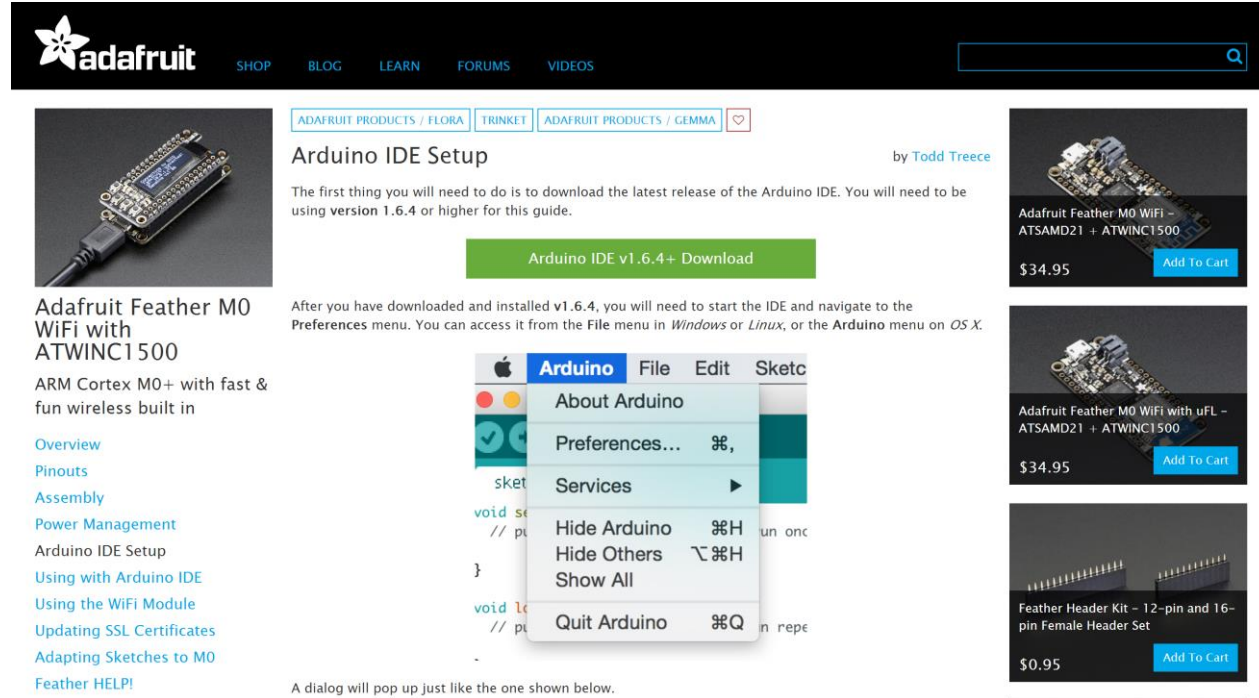
FeatherWing OLED



Breadboard

Getting started & set up

11101110
10101010
10101010



The screenshot shows the Adafruit website's navigation bar with links to SHOP, BLOG, LEARN, FORUMS, and VIDEOS. Below the navigation bar, there's a search bar and a breadcrumb trail: ADAFRUIT PRODUCTS / FLORA > TRINKET > ADAFRUIT PRODUCTS / GEMMA. The main content area features a large image of an Adafruit Feather M0 WiFi board. To the right of the image is the title "Arduino IDE Setup" by Todd Treece. Below the title is a green button that says "Arduino IDE v1.6.4+ Download". The text below the button explains that the first step is to download the latest release of the Arduino IDE, version 1.6.4 or higher. To the left of the text is a small image of the Feather M0 WiFi board. Below the text is a screenshot of the Arduino IDE interface, showing the "Arduino" menu with options like "About Arduino", "Preferences...", "Services", "Hide Arduino", "Hide Others", "Show All", and "Quit Arduino". Below the screenshot is a note: "A dialog will pop up just like the one shown below."

adafruit

SHOP BLOG LEARN FORUMS VIDEOS

ADAFRUIT PRODUCTS / FLORA TRINKET ADAFRUIT PRODUCTS / GEMMA

Arduino IDE Setup

by Todd Treece

The first thing you will need to do is to download the latest release of the Arduino IDE. You will need to be using version 1.6.4 or higher for this guide.

Arduino IDE v1.6.4+ Download

After you have downloaded and installed v1.6.4, you will need to start the IDE and navigate to the Preferences menu. You can access it from the File menu in *Windows* or *Linux*, or the *Arduino* menu on *OS X*.

Adafruit Feather M0 WiFi with ATWINC1500

ARM Cortex M0+ with fast & fun wireless built in

Overview
Pinouts
Assembly
Power Management
Arduino IDE Setup
Using with Arduino IDE
Using the WiFi Module
Updating SSL Certificates
Adapting Sketches to M0
Feather HELP!

void setup() {
 // pin
}

void loop() {
 // pin
}

sketch
void setup()
// pin
}

void loop()
// pin
}

Hide Arduino ⌘H
Hide Others ⌘⇧H
Show All
Quit Arduino ⌘Q

A dialog will pop up just like the one shown below.

Adafruit Feather M0 WiFi - ATSAM21 + ATWINC1500 \$34.95 Add To Cart

Adafruit Feather M0 WiFi with uFL - ATSAM21 + ATWINC1500 \$34.95 Add To Cart

Feather Header Kit - 12-pin and 16-pin Female Header Set \$0.95 Add To Cart



<https://learn.adafruit.com/adafruit-feather-m0-wifi-atwinc1500/setup>

Microsoft Student Partners



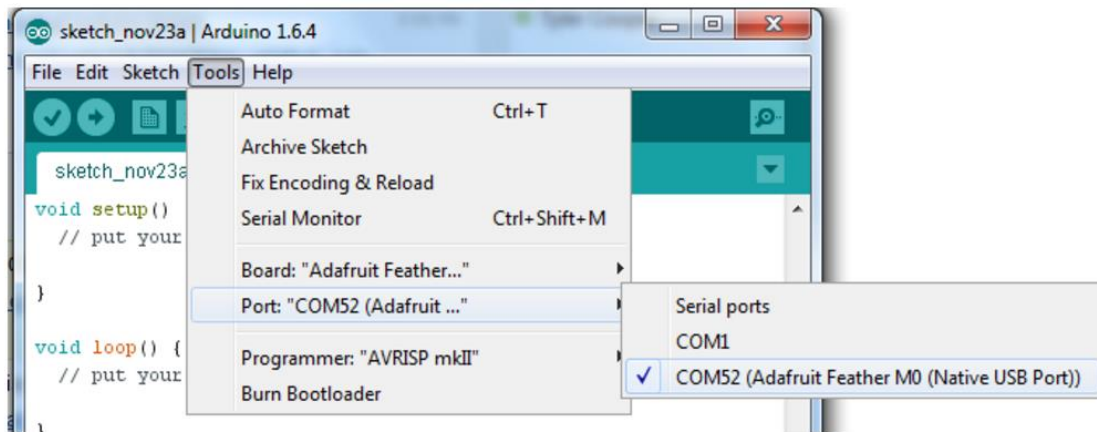
Blink test part 1

11101110
10101010
10101010

Blink

Now you can upload your first blink sketch!

Plug in the Feather M0 and wait for it to be recognized by the OS (just takes a few seconds). It will create a serial/COM port, you can now select it from the dropdown, it'll even be 'indicated' as Feather M0!



Blink Test- Checking your hardware

11101110
10101010
10101010

Copy Code

```
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin 13 as an output.
  pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(13, HIGH);    // turn the LED on (HIGH is the voltage level)
  delay(1000);               // wait for a second
  digitalWrite(13, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);               // wait for a second
}
```

And click upload! That's it, you will be able to see the LED blink rate change as you adapt the `delay()` calls.

GitHub: An open source playground

11101110
10101010
10101010

GitHub, Inc. [US] | <https://github.com/tomasdecamino/Micro-Tetris>

This repository Search Pull requests Issues Gist

tomasdecamino / Micro-Tetris

Watch 1 Star 4 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Wiki Pulse Graphs

No description, website, or topics provided.

16 commits 1 branch 0 releases 1 contributor GPL-3.0

Branch: master New pull request Create new file Upload files Find file Clone or download

tomasdecamino Update Tetris_v3.ino Latest commit 40bfd38 on Jun 1, 2016

Tetris_v3	Update Tetris_v3.ino	10 months ago
LICENSE.txt	Create LICENSE.txt	10 months ago
README.md	Update README.md	10 months ago
feather1.JPG	Add files via upload	10 months ago
feather2.JPG	Add files via upload	10 months ago
feather3.JPG	Add files via upload	10 months ago

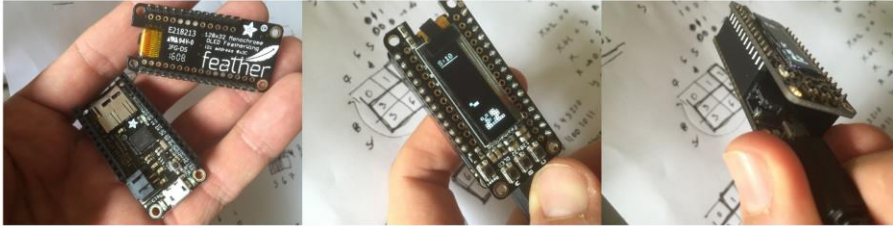
Downloading the required libraries

11101110
10101010
10101010

README.md

Micro-Tetris

Juego de Tetris para la placa [Adafruit Feather M0](#) y la pantalla [Adafruit FeatherWing OLED](#). No es estrictamente teris sino toma la idea de allí.



Hay mucho espacio para mejorar el código (work in progress). Fue creado con propósitos didácticos como parte de los materiales de la [Fundación Costa Rica para la Innovación](#)

En Costa Rica los componentes los puede encontrar en [CrCibernetica.com](#)

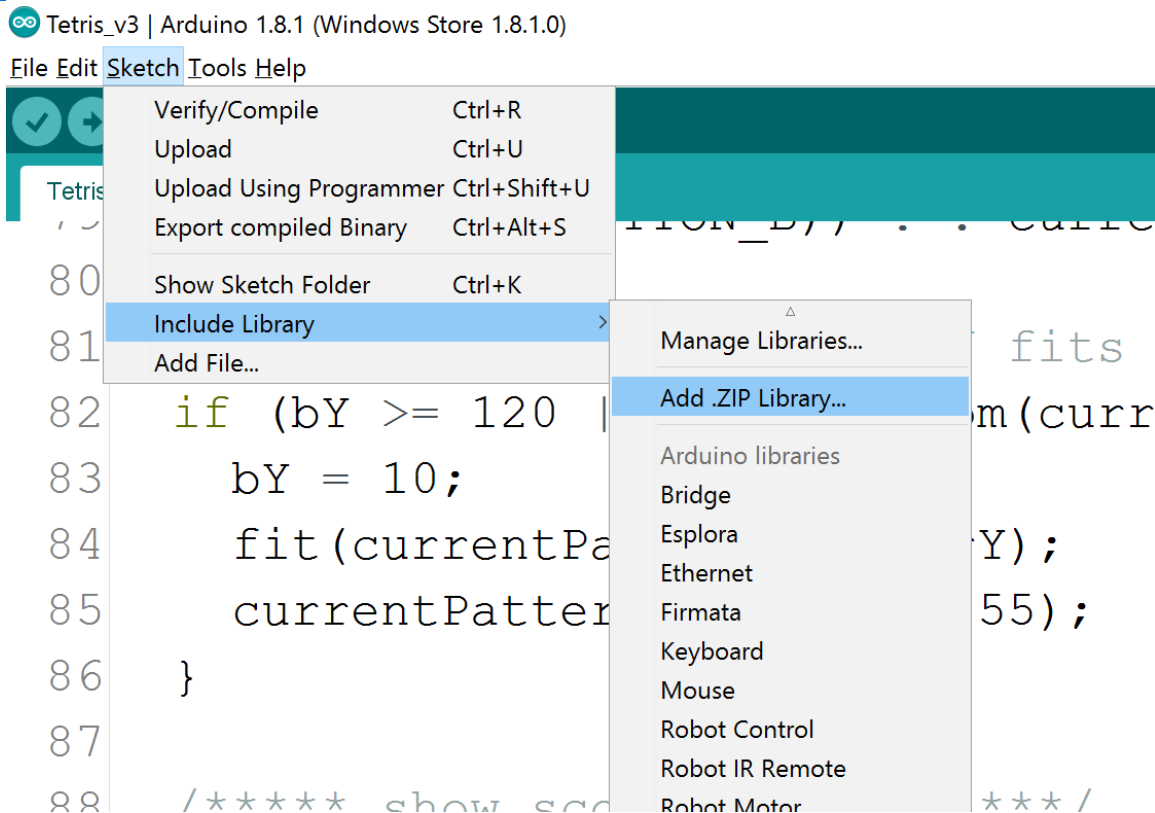
##Librerías adicionales

Requiere de las siguientes librerías de Adafruit:

- [Adafruit SSD1306](#)
- [Adafruit GFX](#)

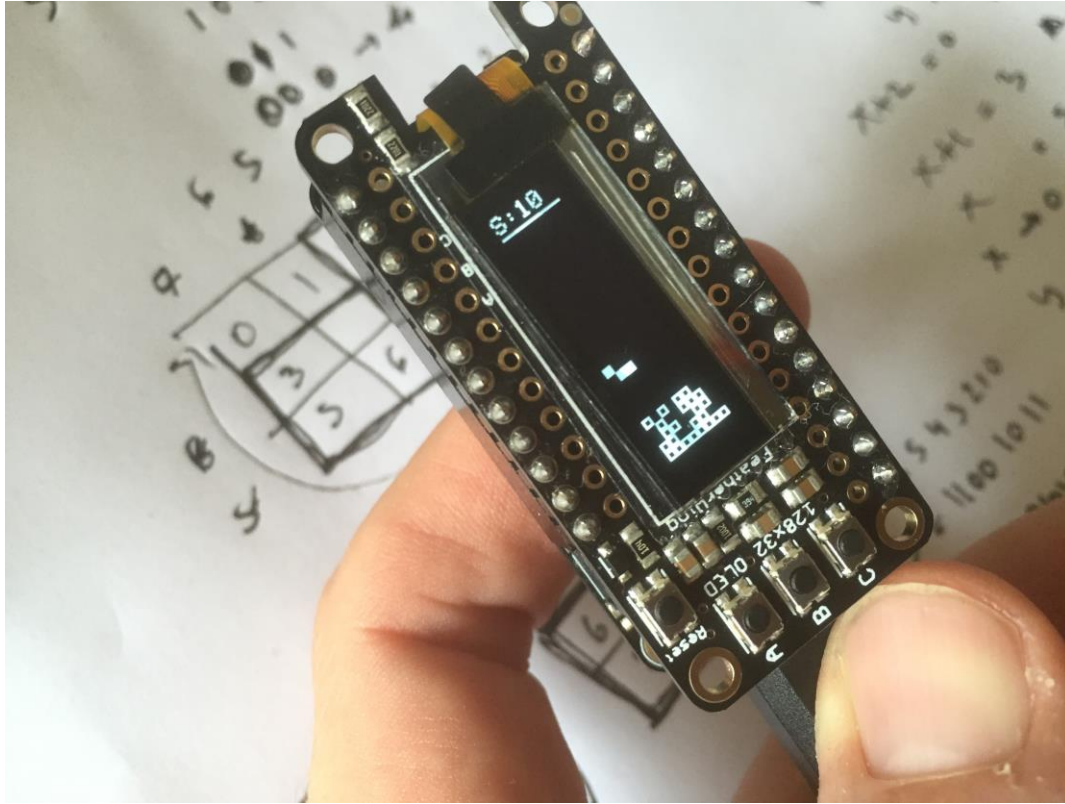
Including libraries in IDE

11101110
10101010
10101010

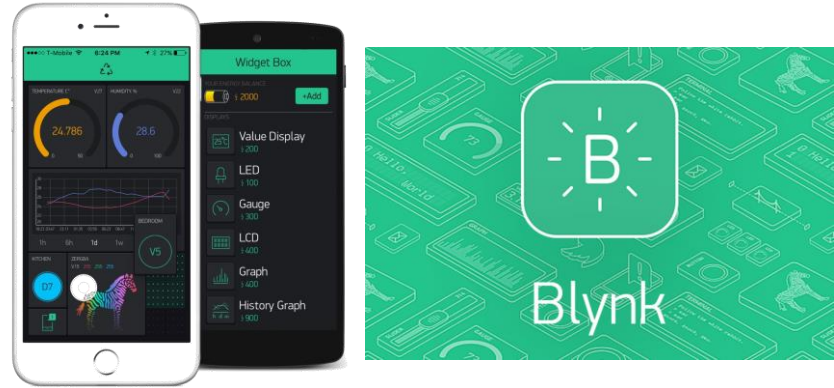


Implementing

11101110
10101010
10101010



11101110
10101010
10101010



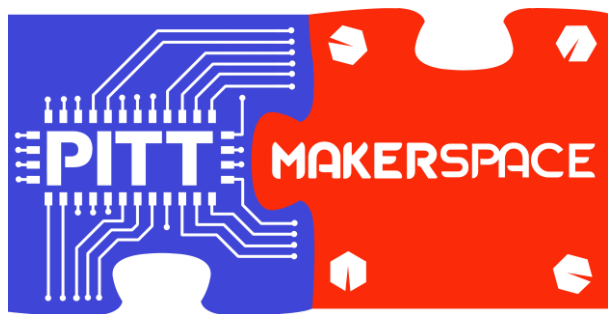
Shout outs and shameless plugs

11101110
10101010
10101010



DESIGNhub

Facebook
@pittdesignhub



Facebook
@pittmakerspace



Facebook
@groups/284974235229198/
Or search "Microsoft at Pitt"

Microsoft **Student Partners**

