Arduino vs STEAM

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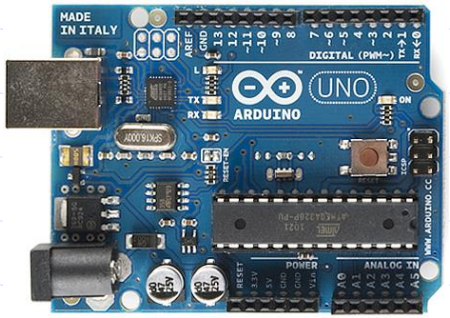
http://makethat.tistory.com

Contents

Arduino

- 아두이노 (Arduino)
  - Arduino 는 이탈리어이고 영어로는 Best Friend
  - 아두이노는 오픈소스를 기반으로한 마이크로 컴퓨터
  - AVR 계열의 칩셋을 사용 (atmege328)
  - USB로 간단히 컴파일하고 업로드 할 수있다.
  - 멀티 플랫폼 지원 (Windows, Mac, Linux 지원)
  - 프로그래밍 언어 (Java, C 언어와 유사)



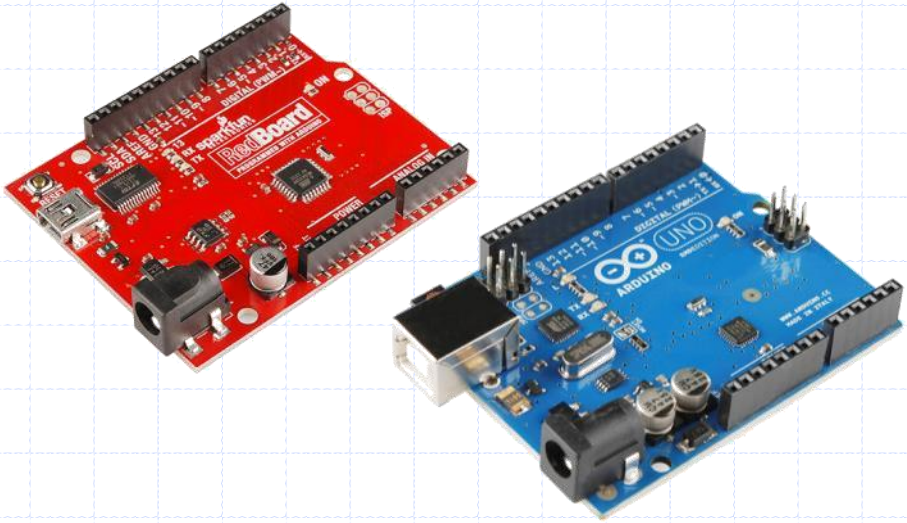
Arduino UNO board

Arduino Board

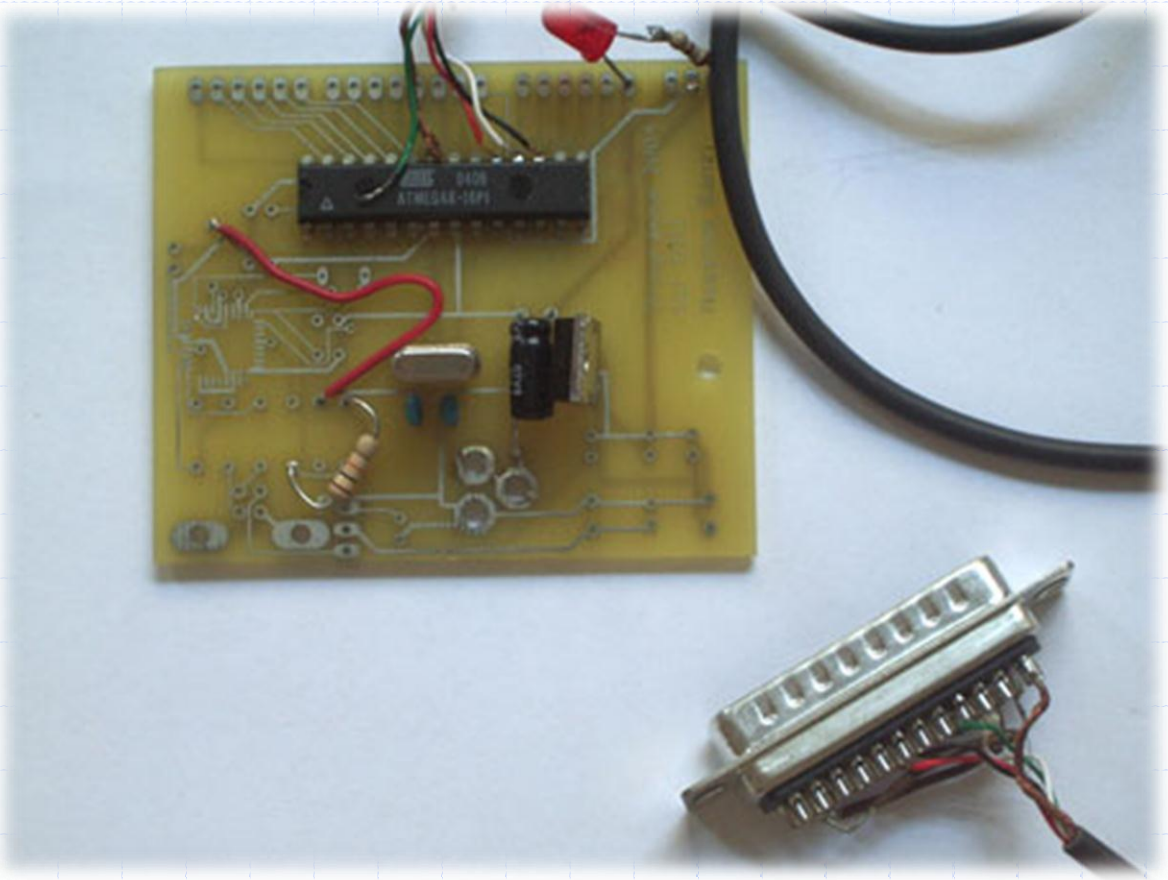
- "Strong Friend" Created in Ivrea, Italy
- in 2005 by Massimo Banzi & David Cuartielles
- Open Source Hardware

open source hardware

- Processor
- Coding is accessible & transferrable → (C++, Processing, java)

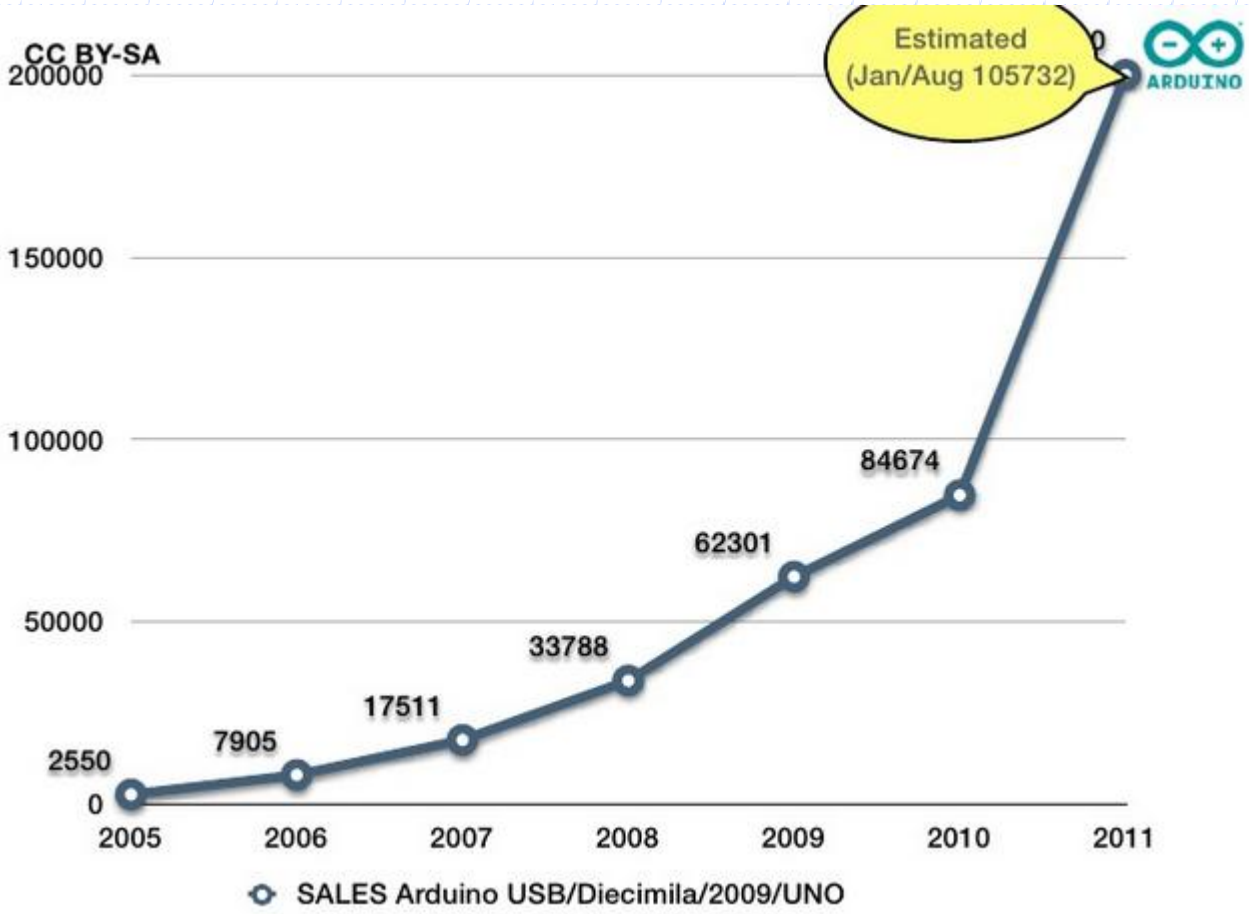


Arduino…



http://spectrum.ieee.org/geek-life/hands-on/the-making-of-arduino

Arduino


CC BY-SA
200000
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(Jan/Aug 105732)
ARDUINO
84674
62301
33788
17511
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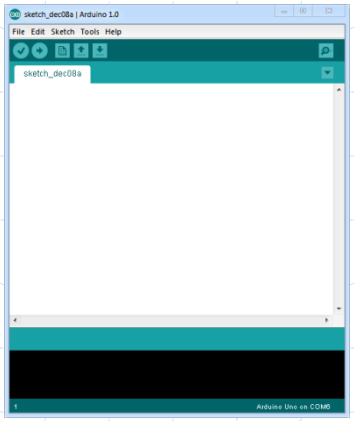
2550
2005
2006
2007
2008
2009
2010
2011
SALES Arduino USB/Diecimila/2009/UNO

Arduino



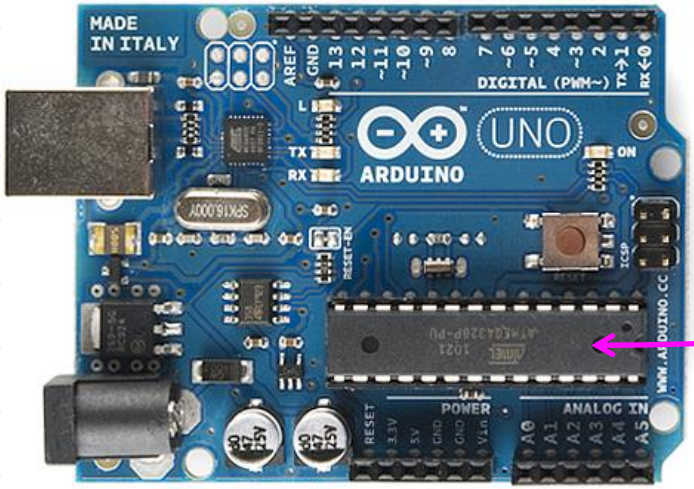
Arduino board

Arduino IDE

Open Source

Arduino UNO R2 board

- Arduino is a small computer!



Small computer with microcontroller
(ATmega328 microcontroller)

PWR IN

USB
(to Computer)

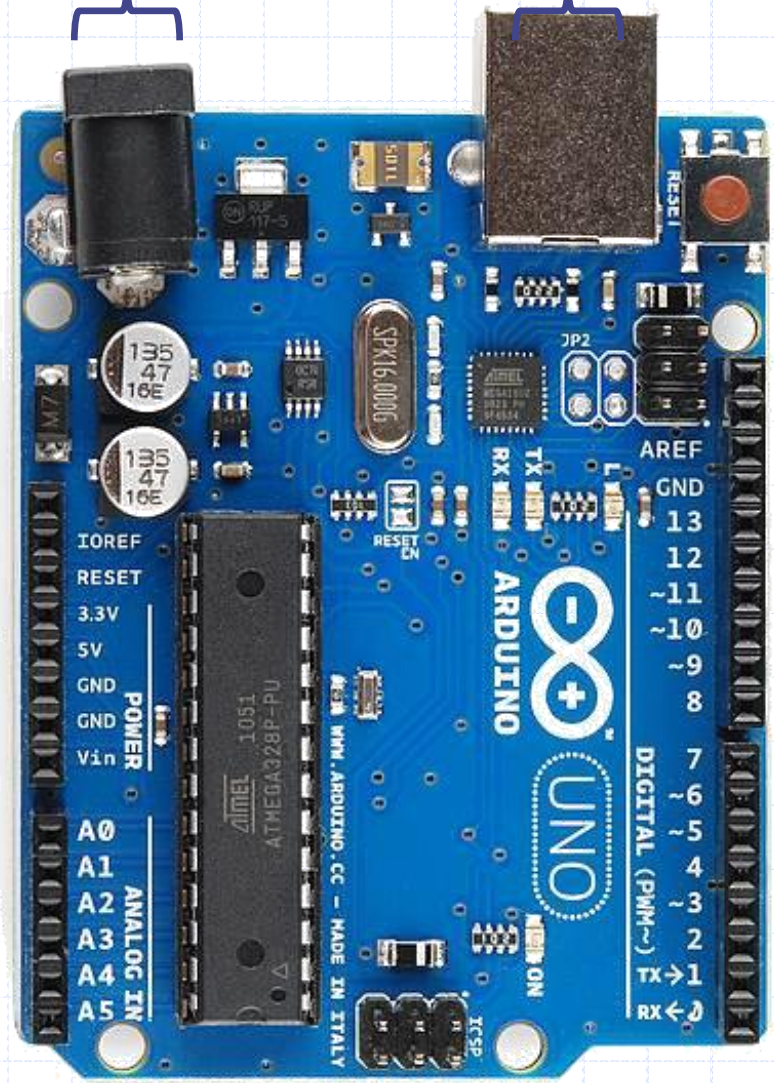
RESET

SCL□SDA
(I2C Bus)

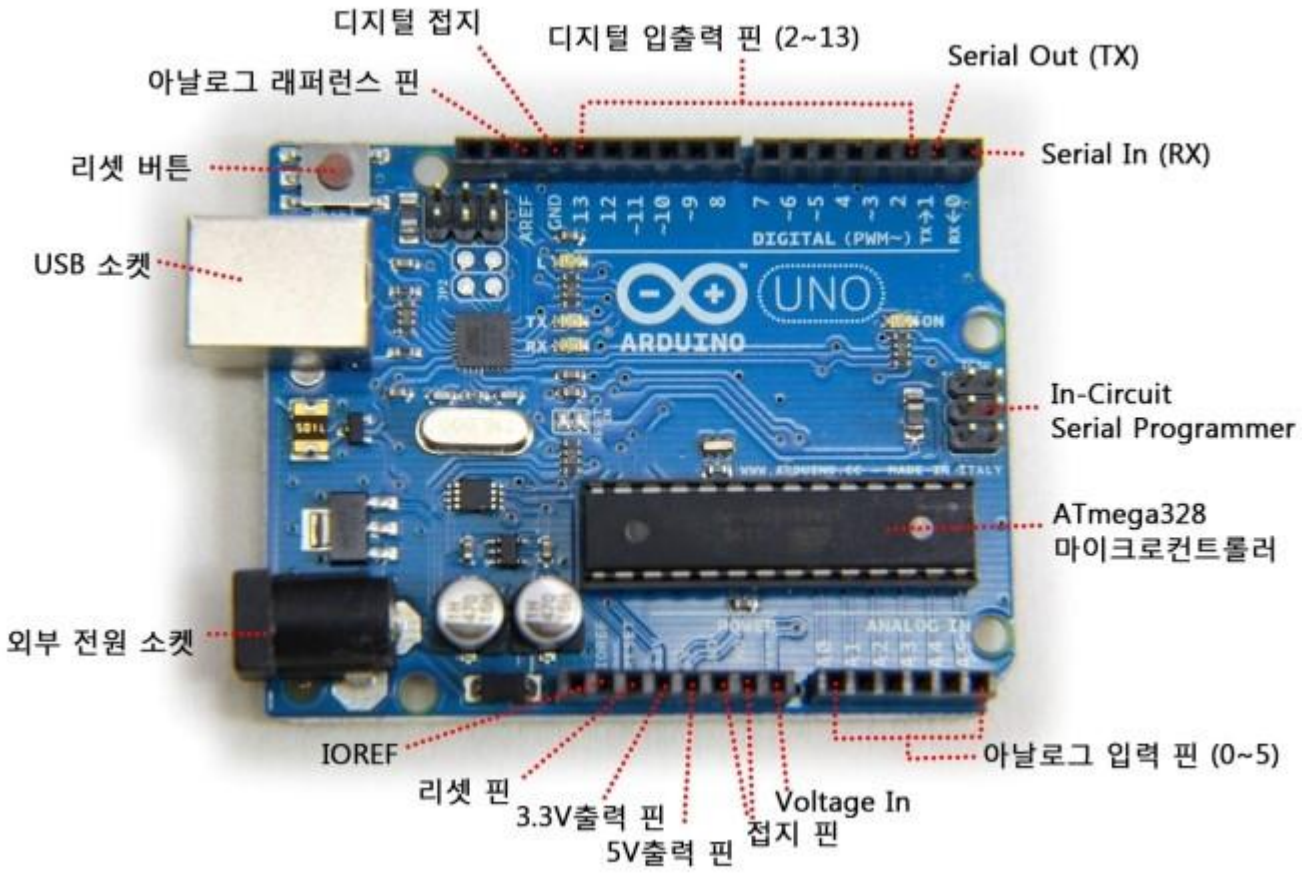
POWER
5V / 3.3V / GN
D

Analog I
NPUTS

Digital I□O
PWM(3, 5, 6, 9, 10, 1
1)



Arduino UNO R3



Features

- ATmega328 microcontroller
- Input voltage: 7-12V
- 14 Digital I/O Pins (6 PWM outputs)
- 6 Analog Inputs
- 32k Flash Memory
- 16Mhz Clock Speed

Arduino Mega 2560

- 아두이노 UNO 보드 의 고성능 버전
  - ATMega328 을 ATMega2560 으로 변경
  - 메모리 용량 8배 증가
  - 디지털 입출력 핀 54개로 증가
  - 아날로그입력 16개로 증가

기본사양:
54 Digital I/O Pins (14 PWM outputs)
16 Analog Inputs
4 UARTs(하드웨어 시리얼 포트)
256KB Flash MemorySRAM 8KB
EEPROM 4KB
16Mhz Clock Speed

Arduino Pro 328

- 아두이노 UNO에 기본 장착된 USB변환기 등을 제거하여 경제적으로 사용할 수 있는 버전(전문가용)
  - 프로그래밍을 위해 USB to Serial 변환기가 필요

기본사양:
14 Digital I/O Pins (6 PWM outputs)
6 Analog Inputs
32k Flash Memory
16Mhz Clock Speed

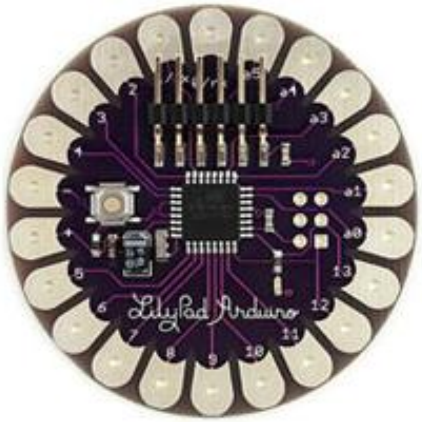
Arduino Pro Mini 328

- 아두이노 프로에서 크기를 축소한 보드
  - $18 \times 33mm$ 의 크기

기본사양:
14 Digital I/O Pins (6 PWM outputs)
6 Analog Inputs
32k Flash Memory
16Mhz Clock Speed

LilyPad Arduino 328

- 원형모양의 보드로 전도성 실을 이용하여 바느질을 하여 회로를 구성
  - 예술작품 및 미적 완성도를 위한 디자이너를 위한 보드



기본사양:
14 Digital I/O Pins (6 PWM outputs)
6 Analog Inputs
32KB Flash Memory
8Mhz Clock Speed

ARDUINO STEAM 사례

사례1

다양한 센서를 적용할 수 있는 스마트폰 기반의 MBL 환경 구축

(Establishment of MBL(Microcomputer-Based Labratory) Environment Enabling Various Sensors on Smartphones)

연 구 기 간 : 2012. 3. 1 ~ 2012. 12. 28

연구책임자 : 오동철(경기북과학고)

참 여 학 생 : 백동현(경기북과학고)

김중수(경기북과학고)

정도환(경기북과학고)

한성규(경기북과학고)

이 보고서는 2012년도 정부(과학기술진흥기금/복권기금)의 재원으로 한국과학창의재단의 지원을 받아 수행된 성과물입니다.

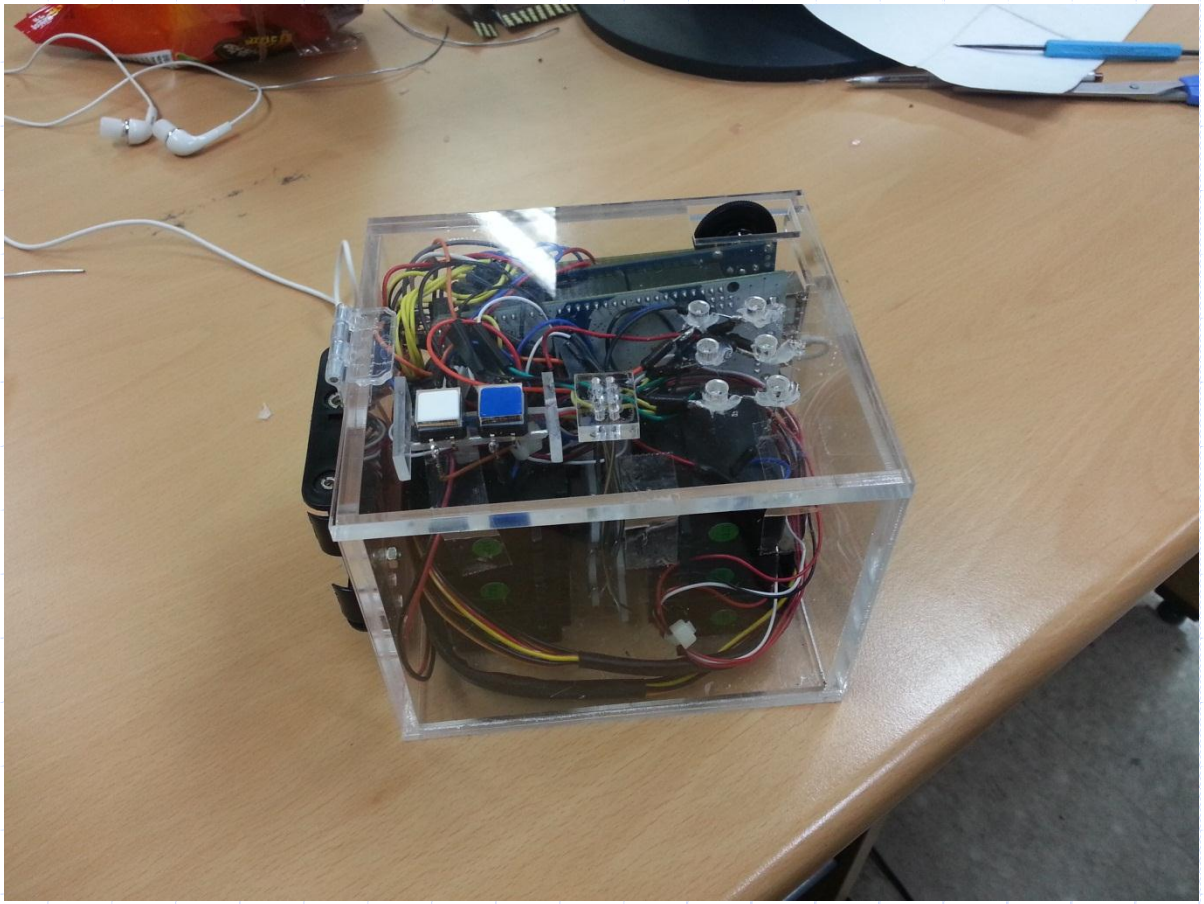
한국과학창의재단

Korea Foundation for the Advancement of Science & Creativity

경기북과학고등학교

GYEONGGIBUK SCIENCE HIGH SCHOOL

사례2



사례3

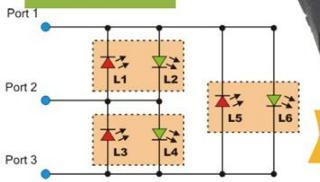
Gyeonggibuk Science High School

Make Christmas

Make your own Christmas Tree

ATtiny85 & Charlieplexing & Soldering & LED

Just 6 LED with 3 pins

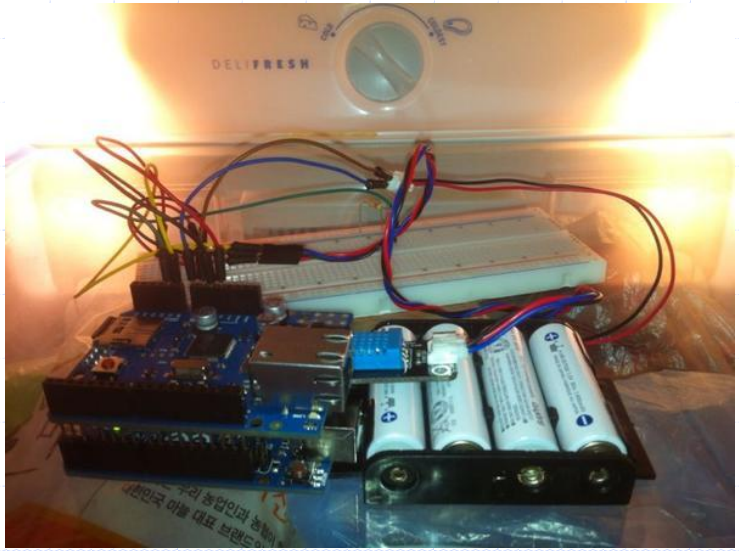


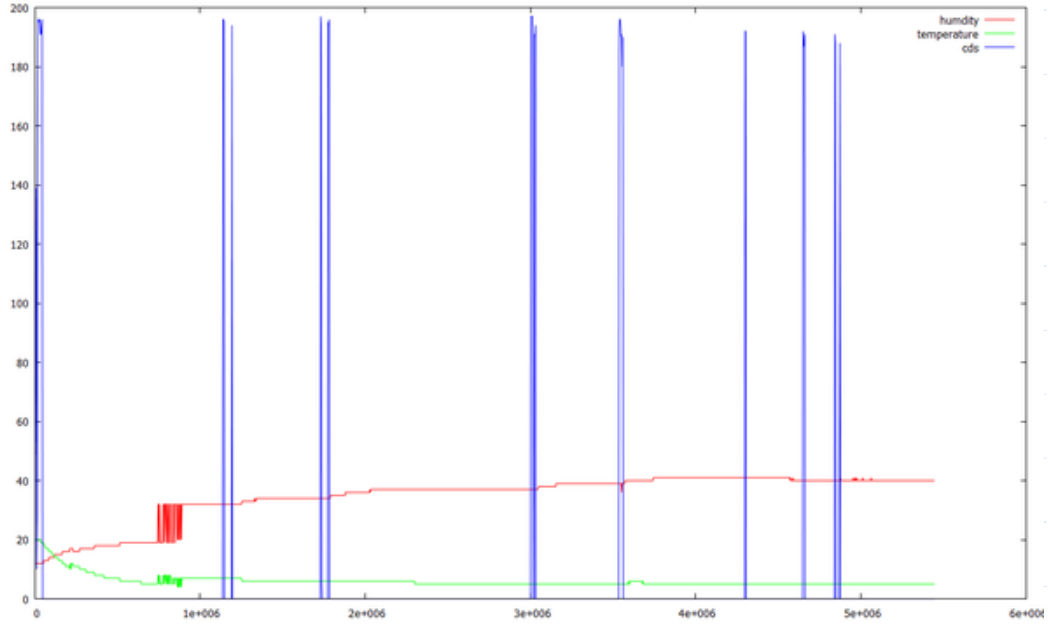
ATtiny85
8bit Microcontroller

Soldering

It's not difficult to make Tree.

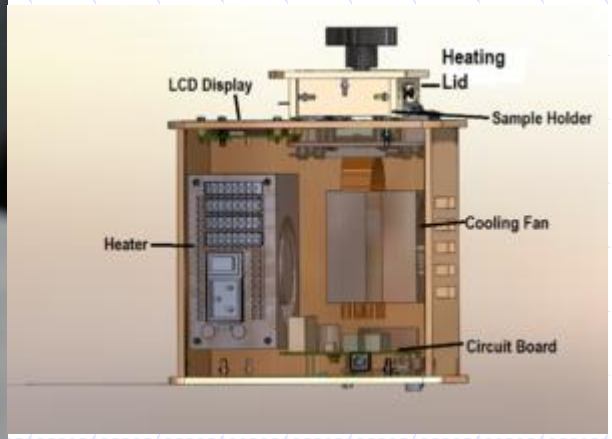
사례4


DELIFRESH

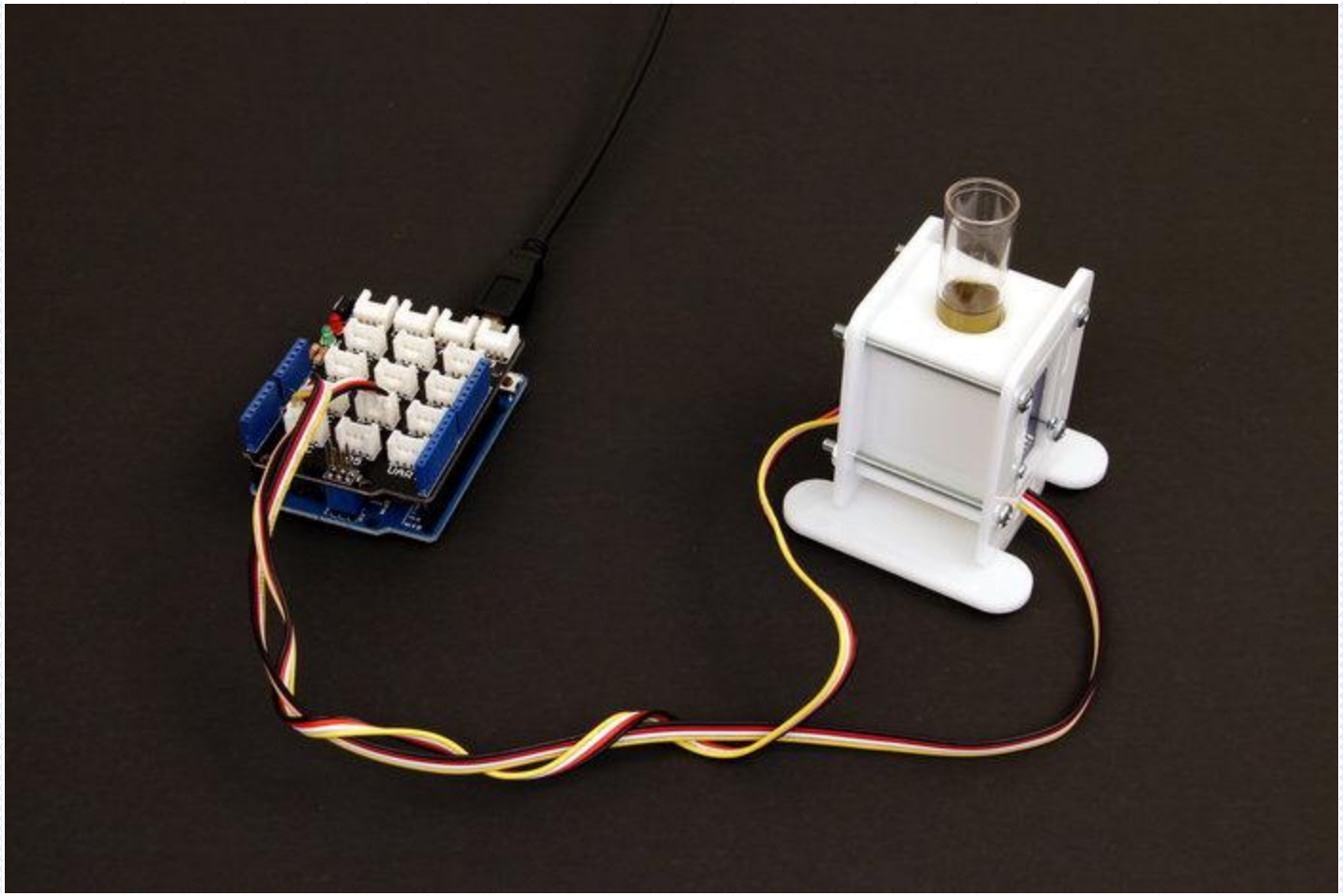

humdity
temperature
cds
200
180
160
140
120
100
80
60
40
20
0
0
1e+006
2e+006
3e+006
4e+006
5e+006
6e+006

사례5

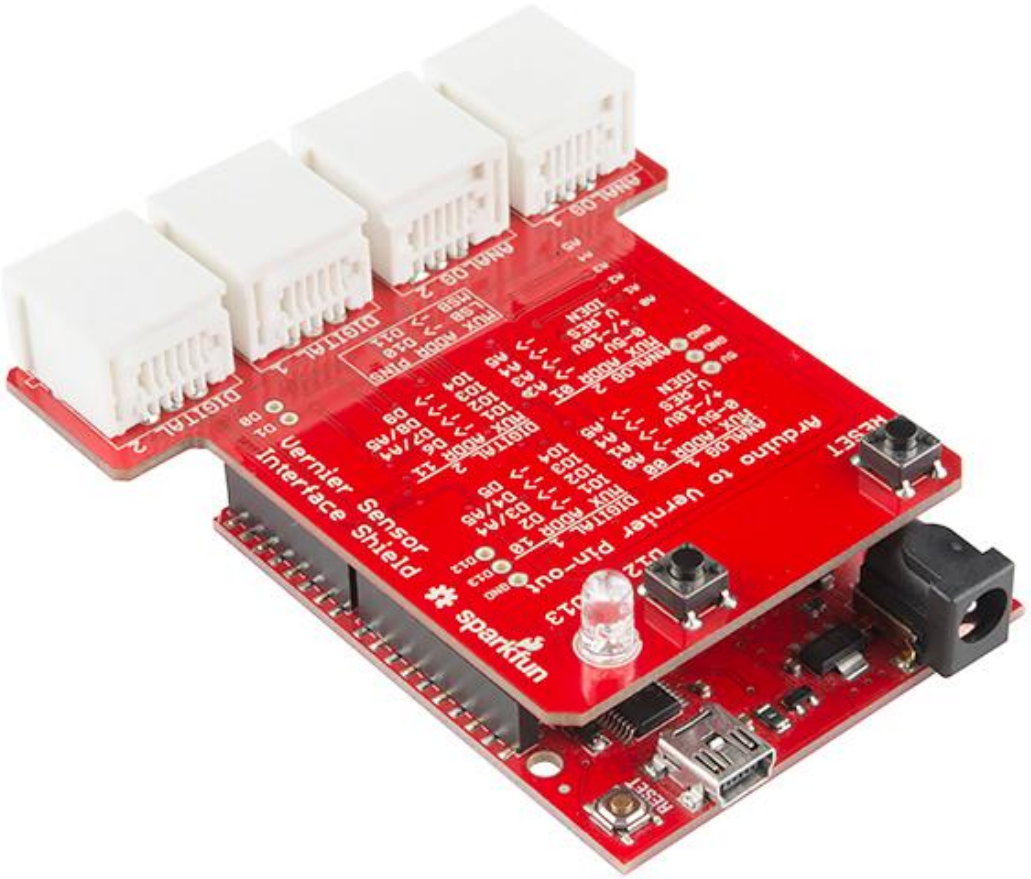

OpenPCR


Heating Lid
LCD Display
Sample Holder
Cooling Fan
Heater
Circuit Board

사례6



사례7


Vernier Sensor
Interface Shield
sparkfun
Arduino to Vernier
RESET

사례8

MathLibrary

```
double  cos (double __x)   // returns cosine of x
double   fabs (double __x)  // absolute value of a float
double   fmod (double __x, double __y) // floating point modulo
double   modf (double __value, double *__iptr) // breaks the argument value into
                                               // integral and fractional parts
double   sin (double __x)   // returns sine of x
double   sqrt (double __x)  // returns square root of x
double   tan (double __x)   // returns tangent of x
double   exp (double __x)   // function returns the exponential value of x.
double   atan (double __x)  // arc tangent of x
double   atan2 (double __y, double __x) // arc tangent of y/x
double   log (double __x)   // natural logarithm of x
double   log10 (double __x) // logarithm of x to base 10.
double   pow (double __x, double __y) // x to power of y
double  square (double __x) // square of x
```

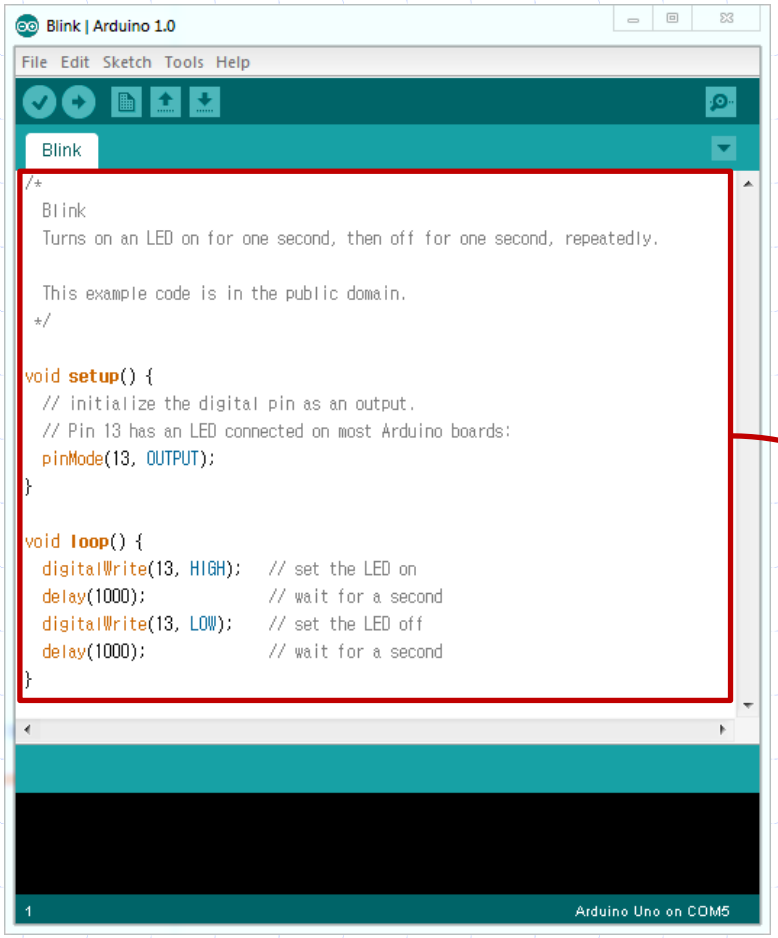
아두이노 센서를 활용한 스마트폰 무선 과학 실험

아두이노와 **RFID** 를 이용한 국어 문법 교육

개발환경 구축 및 IDE 사용법
드라이버 설치

ARDUINO 개발환경

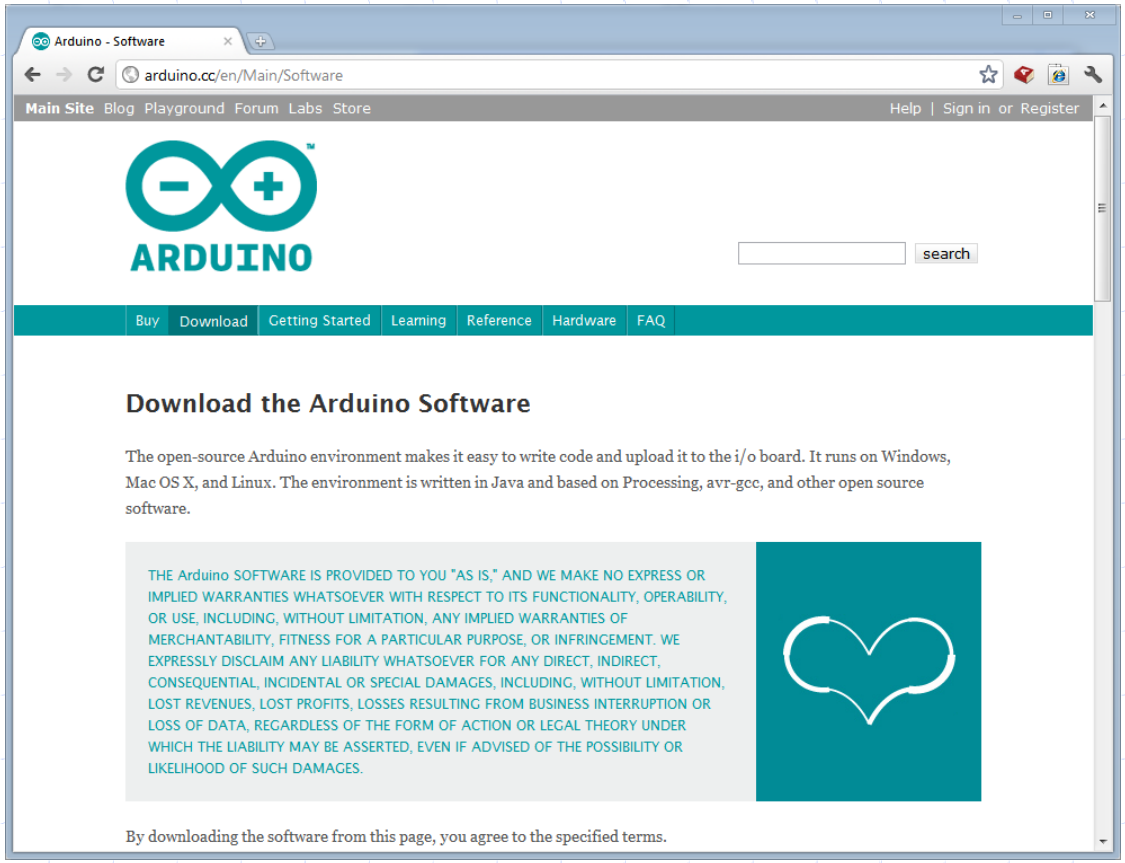
IDE



sketch

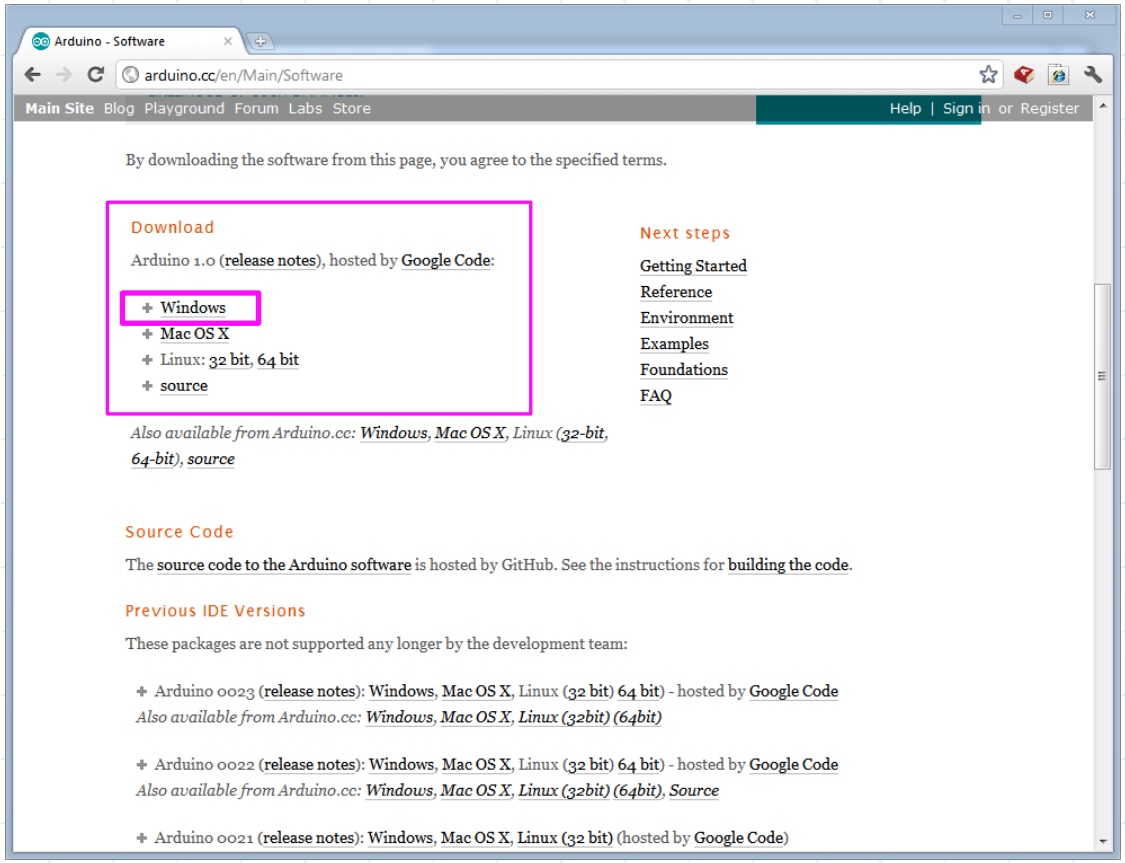
Processing 언어에 기반을 둔 프로그래밍 언어

Arduino development environment

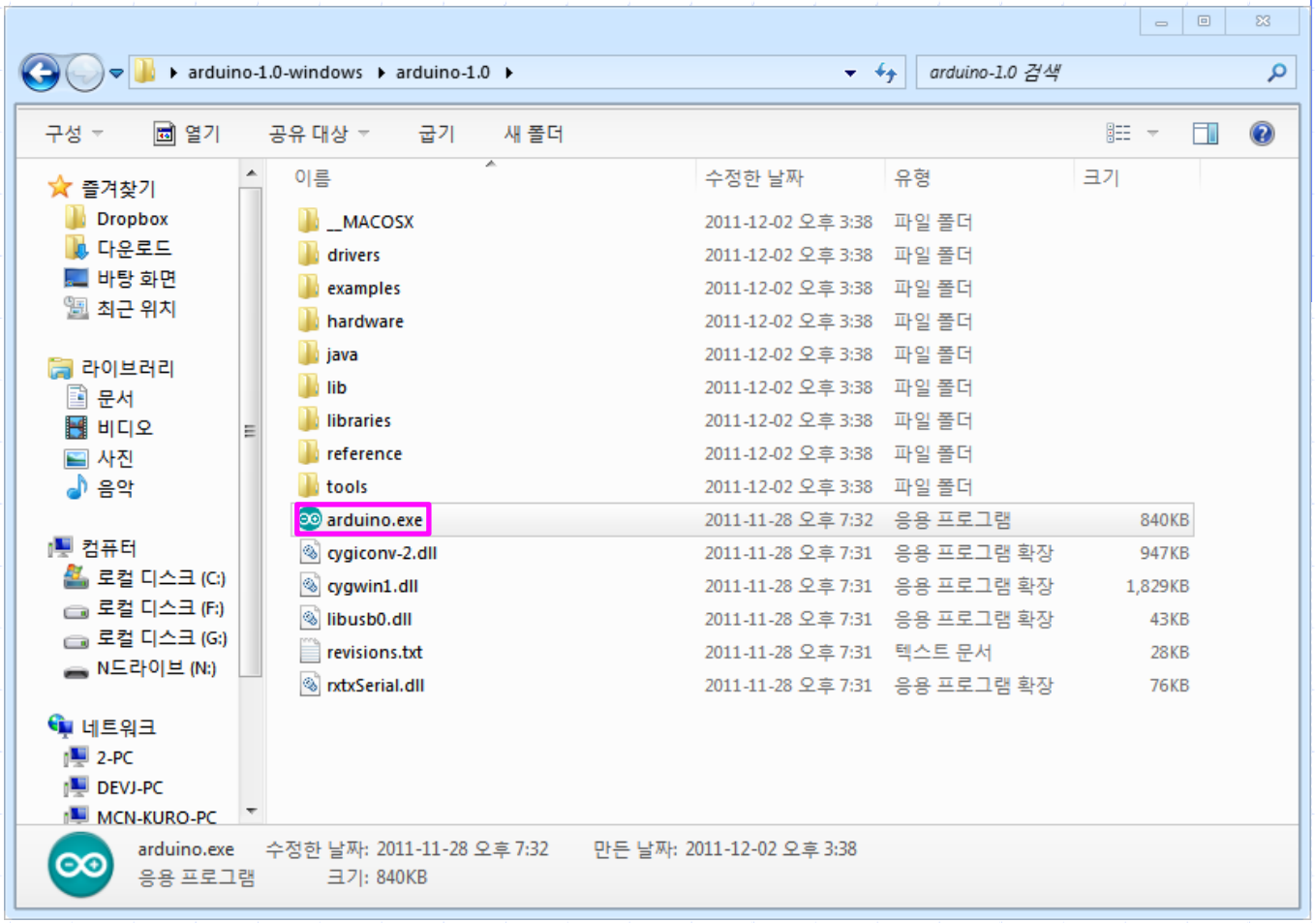


http://www.arduino.cc/

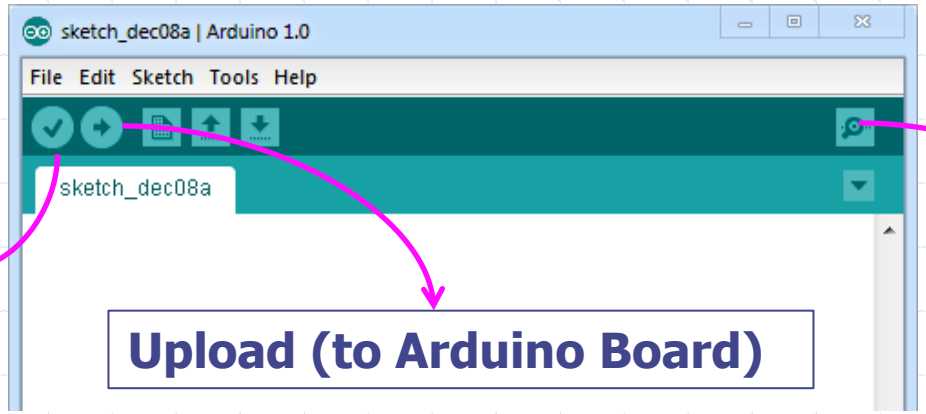
Arduino development environment

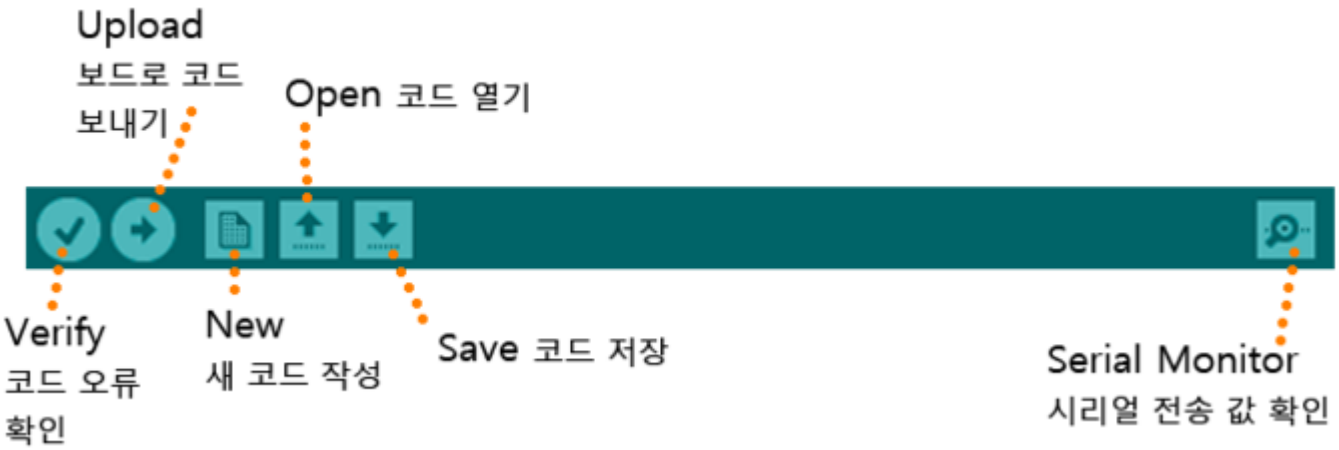


Arduino development environment



Arduino IDE


sketch_dec08a | Arduino 1.0
File Edit Sketch Tools Help
sketch_dec08a
Verify (Compile)
Upload (to Arduino Board)
Serial monitor


Upload
보드로 코드
보내기
Open 코드 열기
Verify
코드 오류
확인
New
새 코드 작성
Save 코드 저장
Serial Monitor
시리얼 전송 값 확인

Arduino IDE

- Verify / Compile
  - 작성한 프로그램 코드가 제대로 되었는지 확인해주고, 이상이 없으면 컴파일이라는 과정을 통해 기계가 이해할 수 있는 언어로 바꿔준다.
- Upload
  - Verify로 오류도 없고, 기계가 이해할 수 있는 언어로 바뀐 코드를 아두이노 보드로 보내주는 기능이다.
- New
  - 새로운 스케치 작업을 할 때 사용한다.
- Open
  - 기존에 작성된 스케치를 열 때 사용한다.
- Save
  - 지금 작성하고 있는 스케치 즉 프로그램 코드를 저장한다.
- Serial Monitor
  - 시리얼로 보내고 받는 값을 확인할 때 사용한다.

Arduino development envionment

USB B type

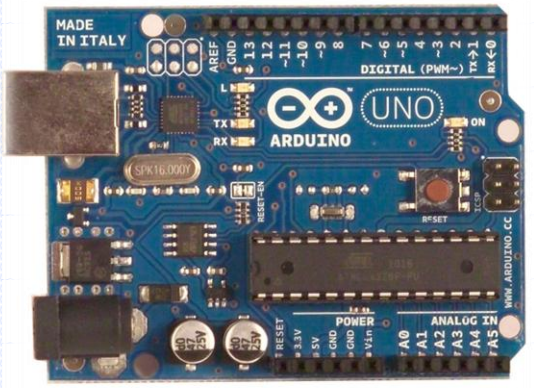
USB A type

USB2.0 A-B Cable

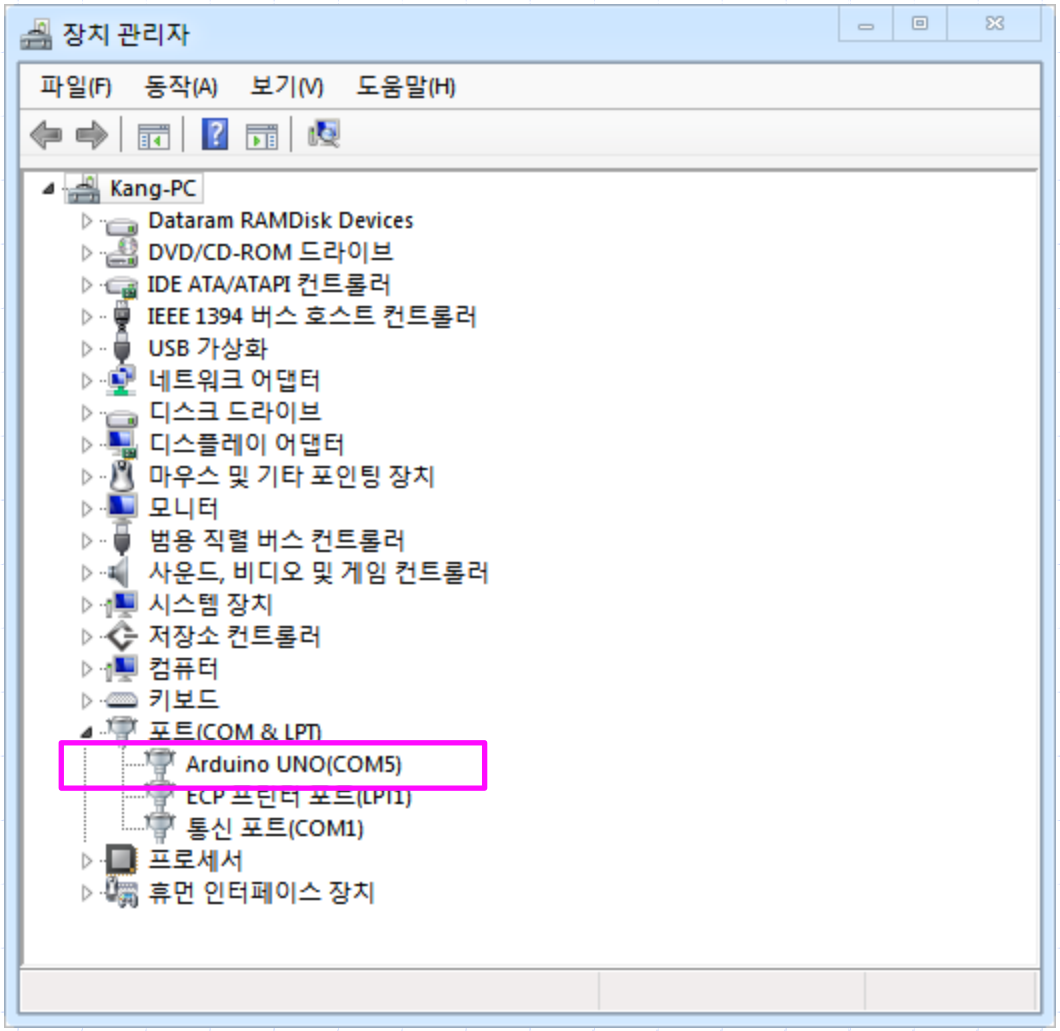
Arduino development envionment

USB A type

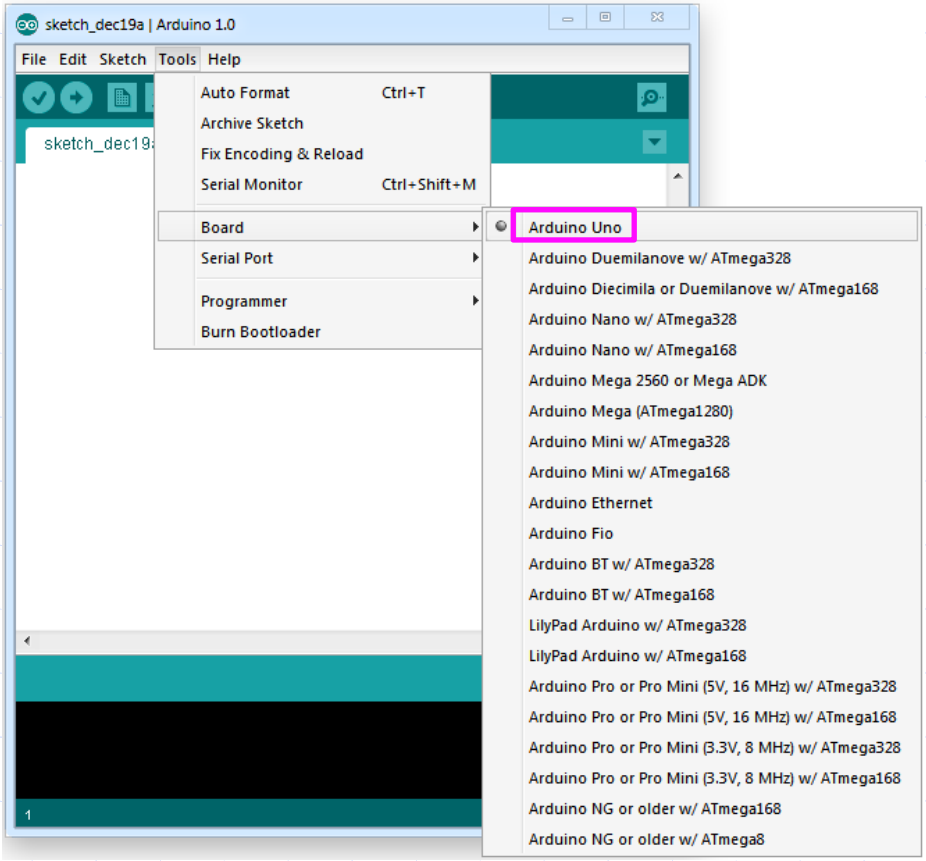
USB B type

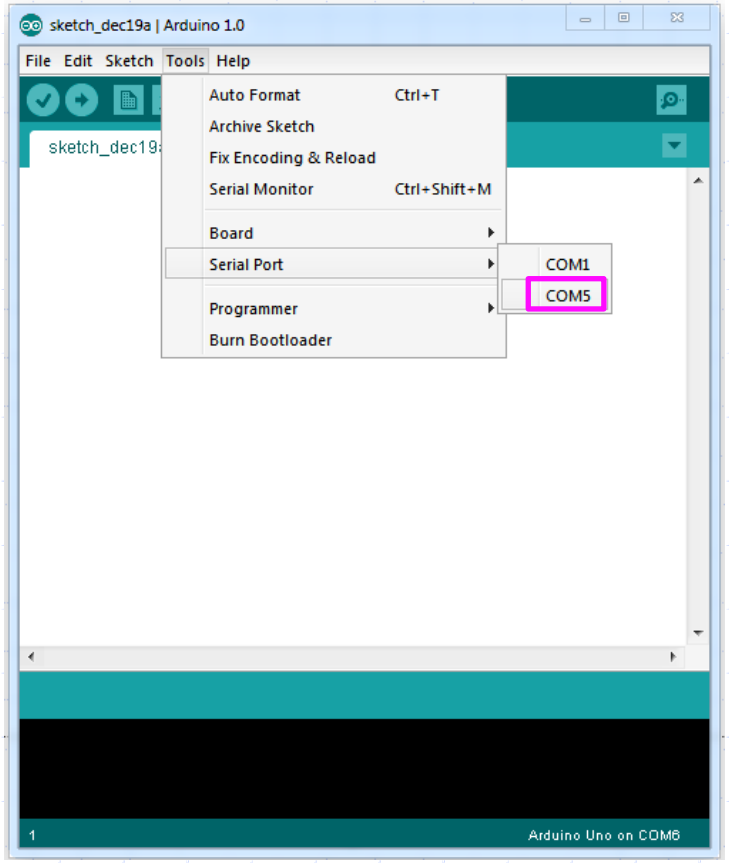


Arduino development envionment



Arduino development environment





ARDUINO LANGUAGE

Arduino

http://www.arduino.cc/

Arduino Basic Structure

```
void setup() {
        // Do initialization : Executed only
once
}

void loop() {
        // Loop : Continuously executed
}
```

Example - Blink Sketch

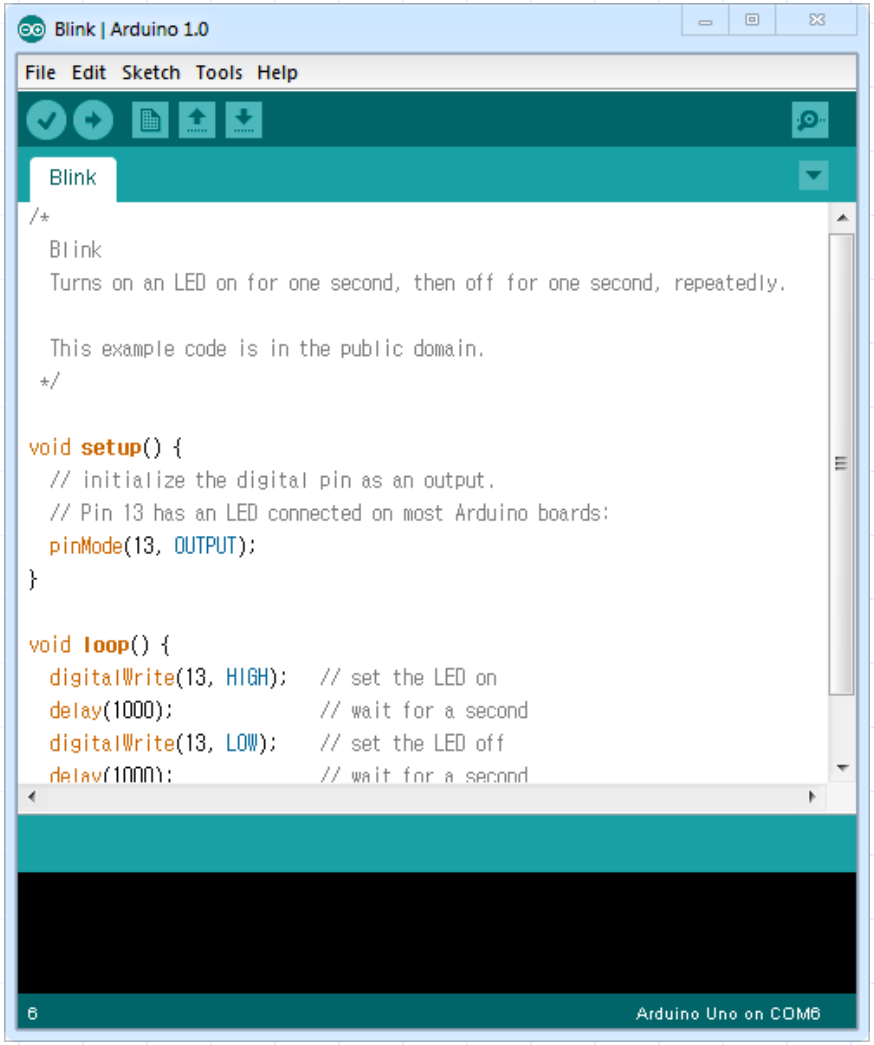
```
void setup() {
        // initialize the digital pin as an output.
        // Pin 13 has an LED connected on most Arduino boards:
        pinMode(13, OUTPUT);
}

void loop() {
        digitalWrite(13, HIGH); // set the LED on
        delay(1000); // wait for a second
        digitalWrite(13, LOW); // set the LED off
        delay(1000); // wait for a second
}
```

Reference

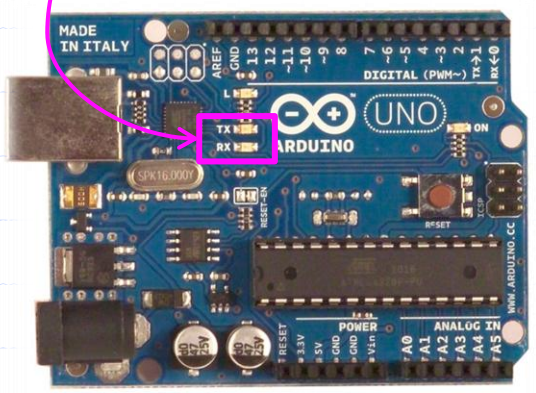
- Structure
  - setup()
  - loop()
- Functions
  - pinMode (pin, mode) – 사용 할 디지털 pin 번호, 사용 모드
  - digitalWrite (pin, value) – pin 번호에 value 값 출력
  - delay(ms) – millisecond 사용 ex) delay(1000) 1sec delay
- Variables
  - HIGH, LOW, INPUT, OUTPUT

Example - Blink



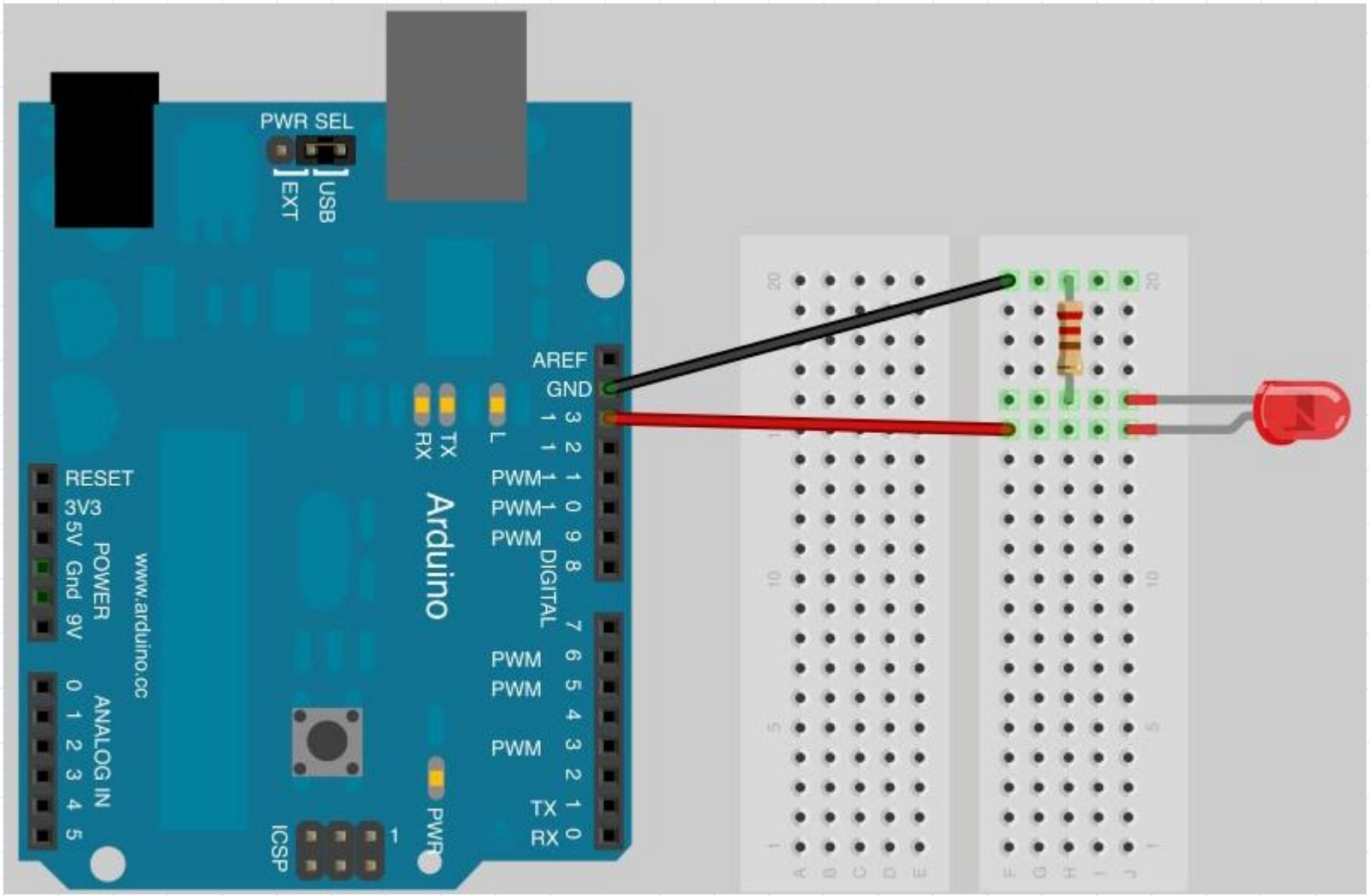
1. Click Verify(compile) and check error
2. Check if Arduino is connected
3. Click Upload

While uploading code to Arduino, you will see fast blinking lights on TX and RX LEDs



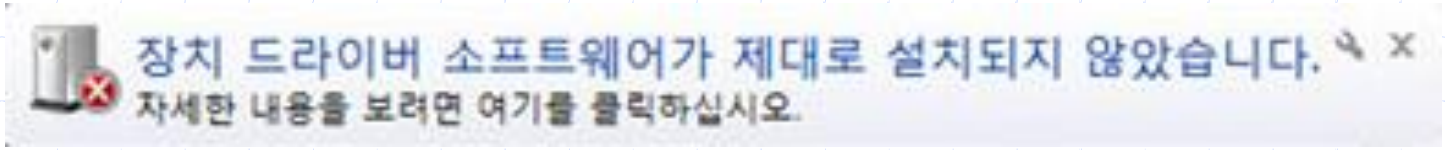
4. Code will start running soon

Example - Blink



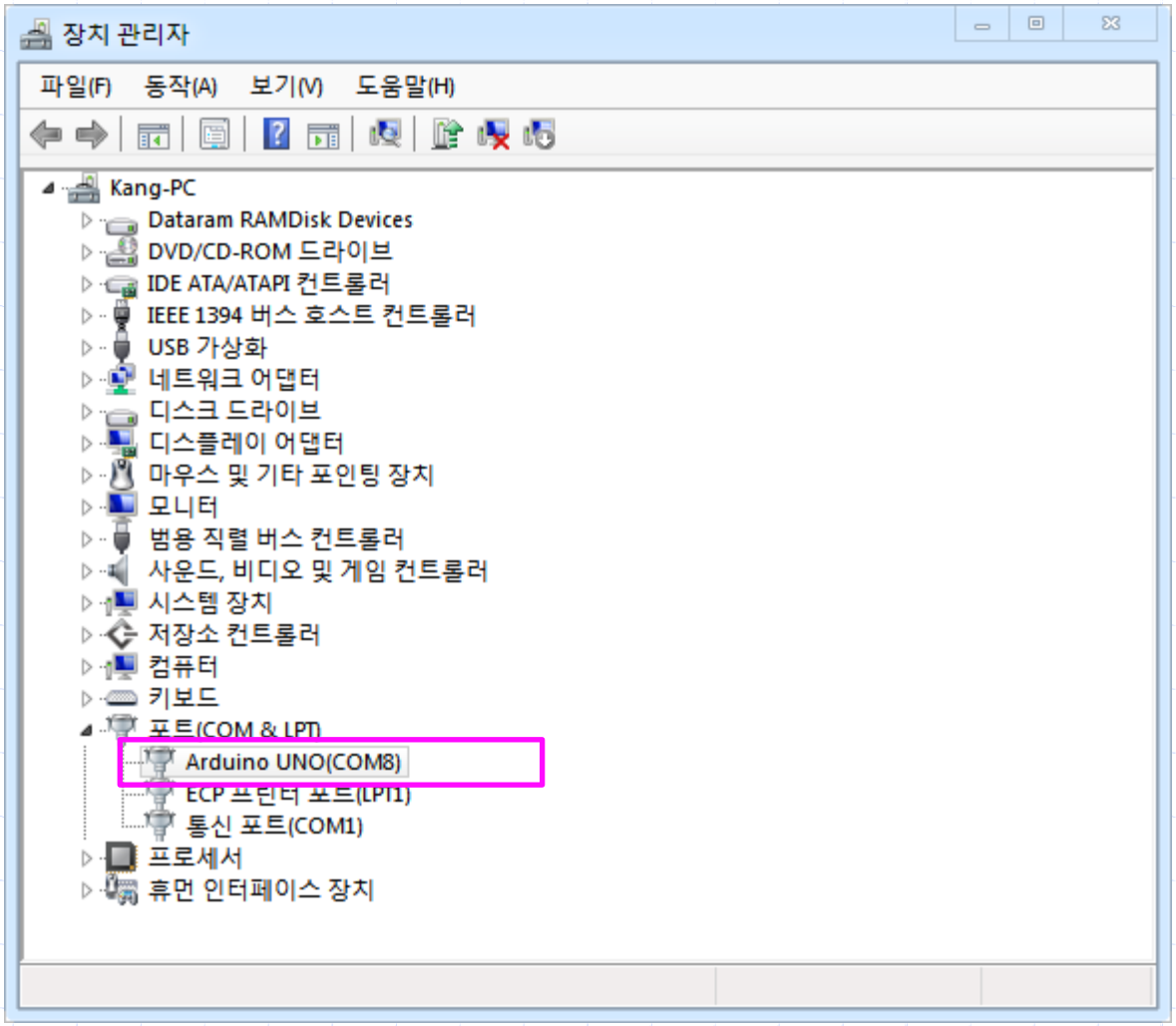
APPENDIX. 드라이버 설치

Driver install

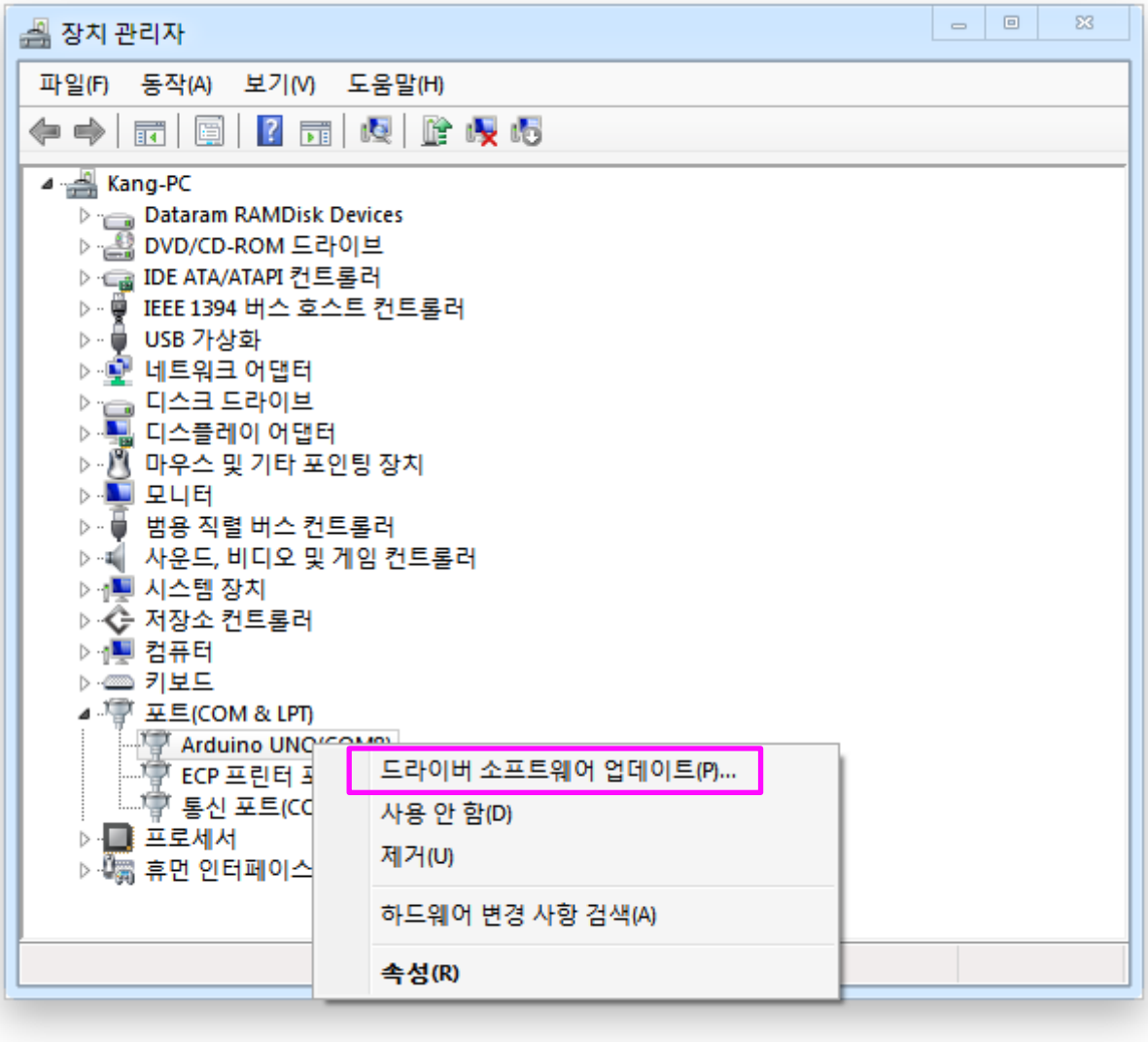


1. 윈도우 시작 > 제어판 > 장치관리자
2. 장치리스트에서 Arduino UNO 장치 선택 후 우 클릭
3. 드라이버 업데이트 선택

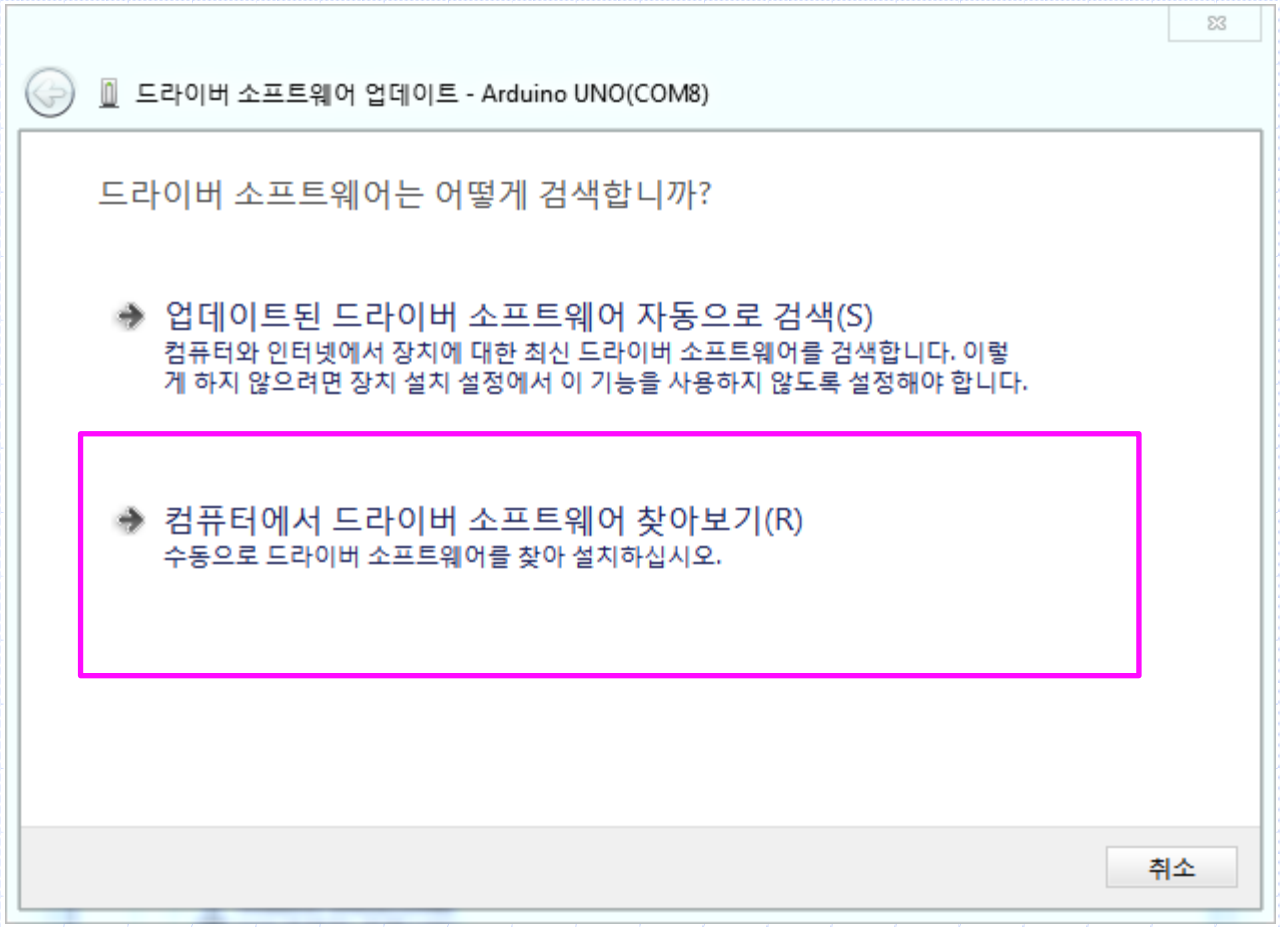
Driver install



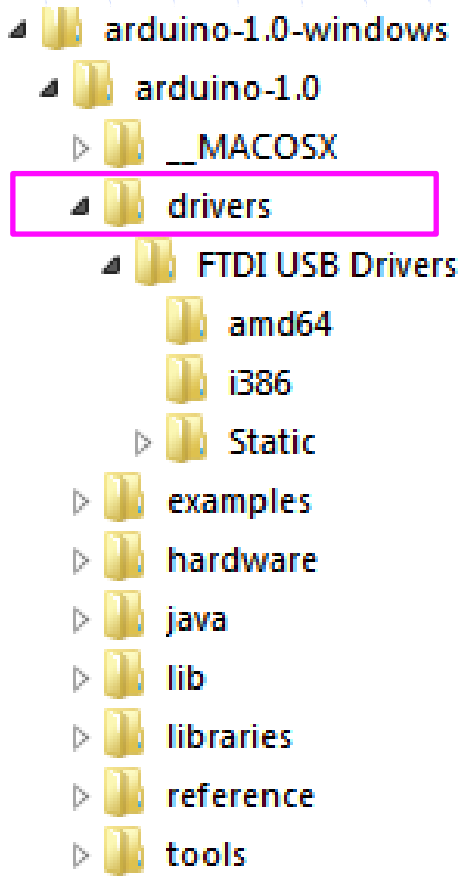
Driver install



Driver install



Driver install



Driver install