Tony Swanwick
STEM Ambassador
BSc MEng CEng MIET

What Are Arduinos

?

A Family Of Microcontrollers:

UNO

£5.99 - £22.19

YUN

£53.80 - £56.94

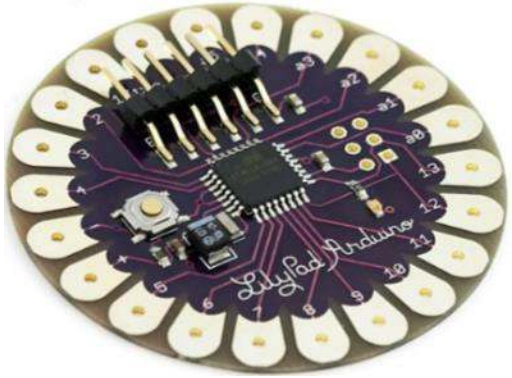
FIO

£19.61

NANO

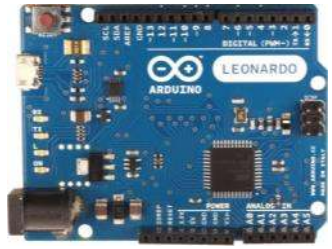
£1.99 - £13.00

LilyPad



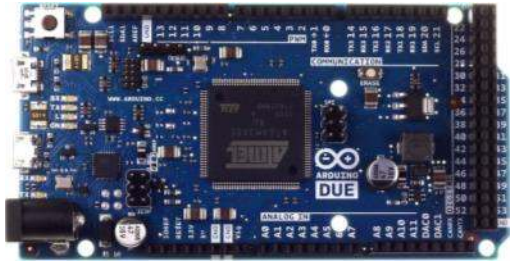
£13.00 - £24.30

LEONARDO



£9.62 - £24.99

DUE

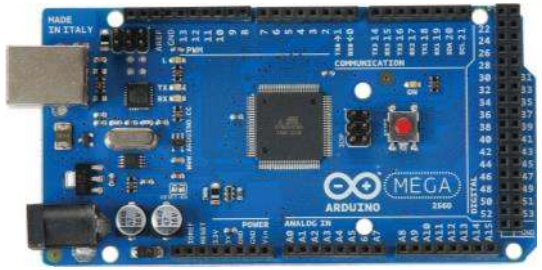


£38.50 - £54.00

GAMEBUINO

£25.99 - £53.99

MEGA



£8.94 - £34.07

Amazon.UK Prices – March'15

ARDUINO OPEN-SOURCE COMMUNITY *Where Buy...*

A Family Of Microcontrollers:

UNO

£5.99 - £2

YUN

£53.80 - £56.94

FIO

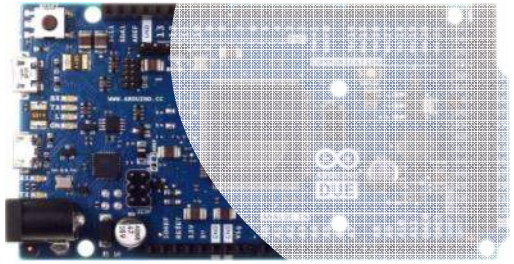
£19.61

NANO

£1.99 - £13.00

amazon.com

DUE



£38.50 - £54.00

ebay

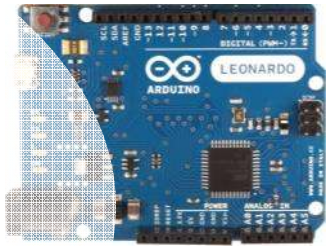
The electronics specialist

maplin

£12.00 - £24.30

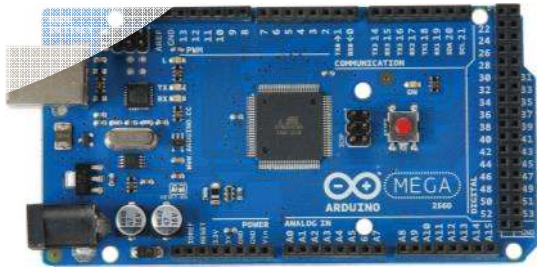
£25.99 - £53.99

LEONARDO



£9.62 - £24.99

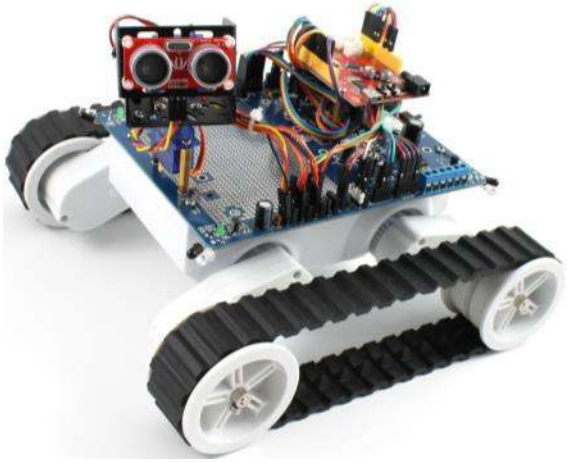
MEGA

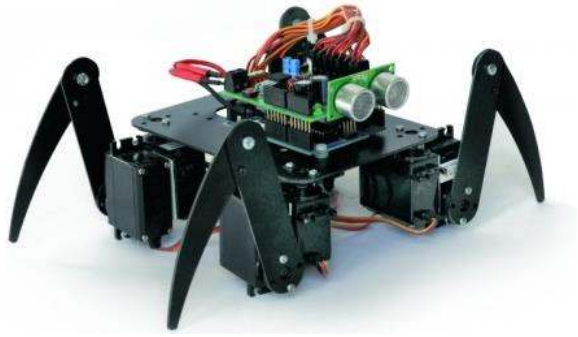


£8.94 - £34.07

Amazon.UK Prices – March'15

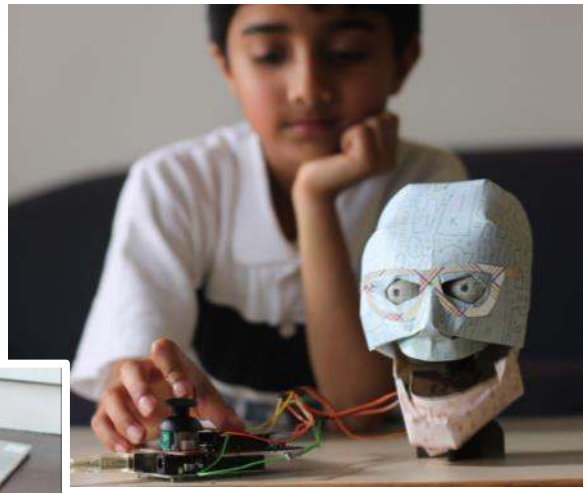
Fun Projects:

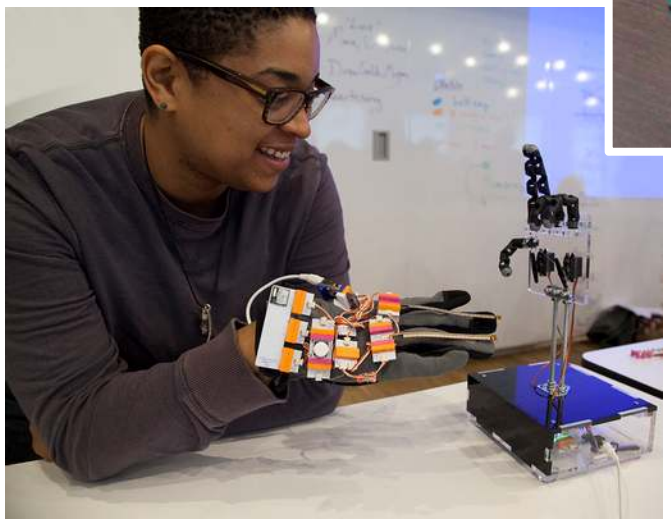




Hundreds Of Examples On Line!

More…

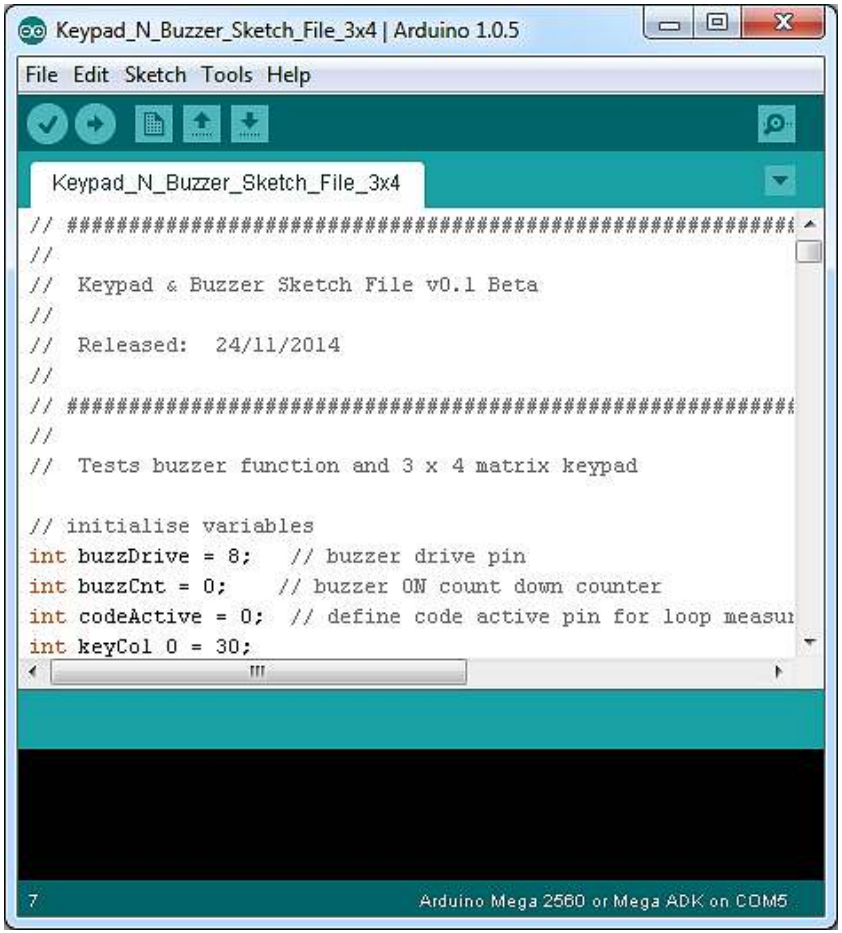




Where Do I Start

?

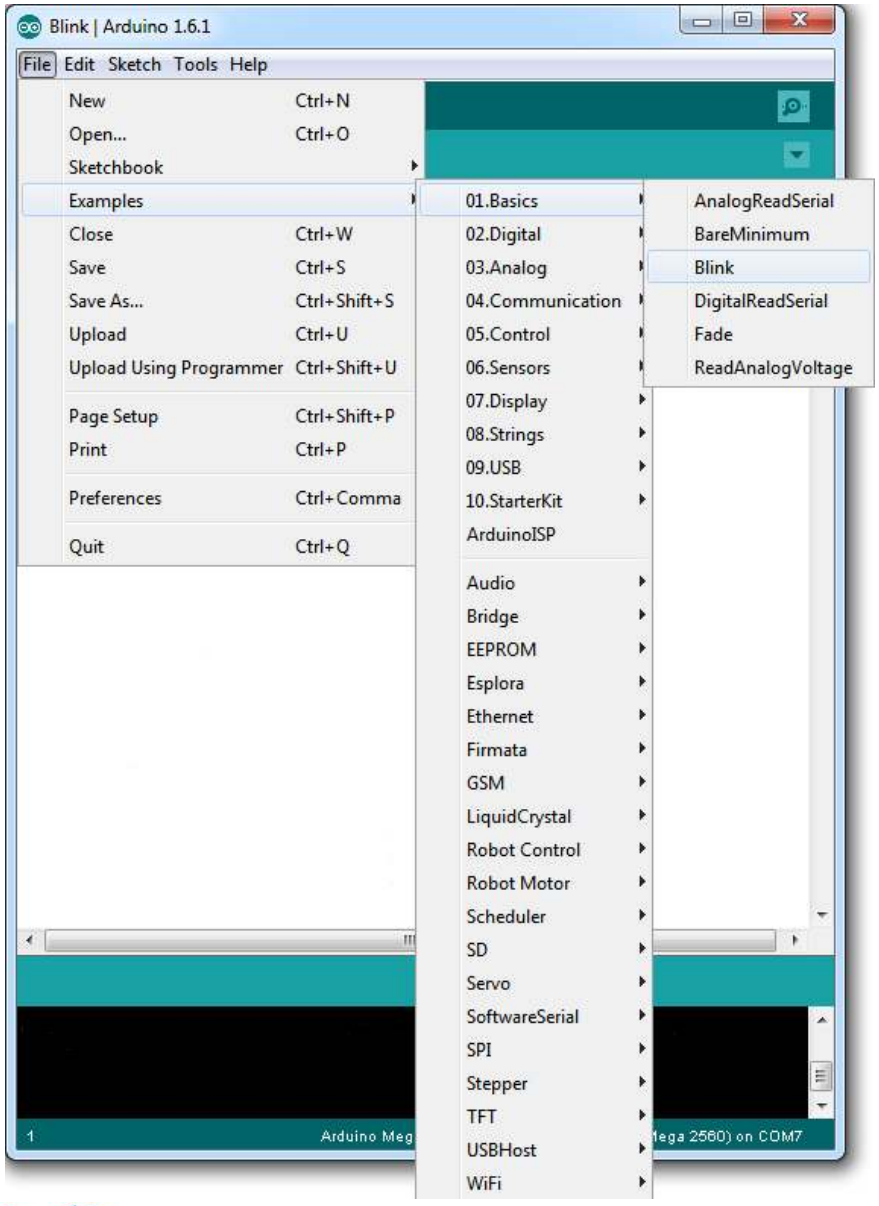
Install The IDE… IT's FREE!



- Buy an Arduino board (£5 - £15)
- Go to the Arduino web site
  http://www.arduino.cc/
- Download and install the Arduino IDE
- Runs on Windows, Mac iOS, Linux
- Install USB port drivers

- Open a sample Sketch program
- Send it to your Arduino via USB
- Test the code

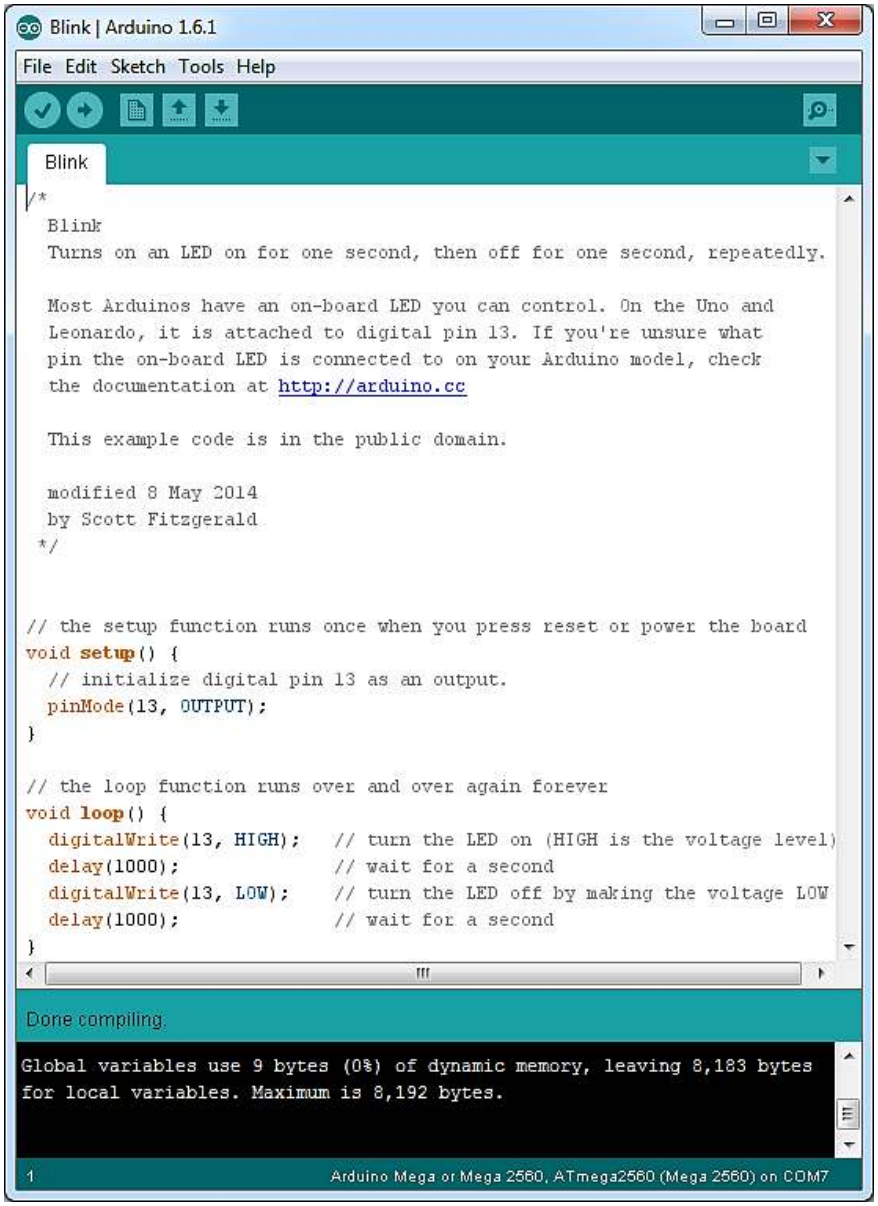
Lots Of FREE code!



- Over 260 examples to try:
  - Flashing LED's
  - Play tunes
  - Reading Joysticks
  - Driving Displays
  - GSM comms
  - Etc…

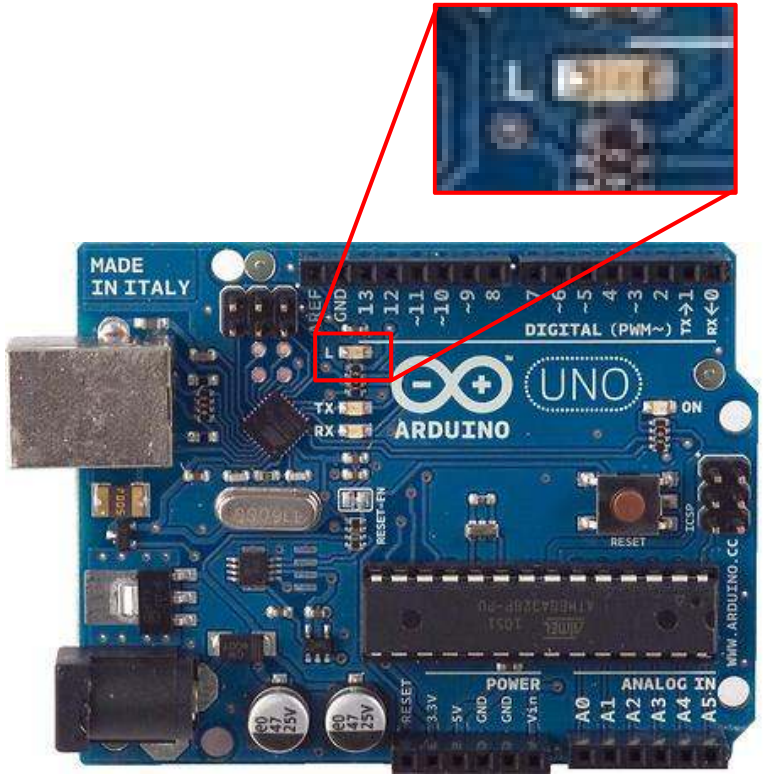
- Try the code
- Study the code
- Learn from the experts

Just Blink!



- Built in test LED
- Make code adjustments
  - Frequency
  - Cadence (ON/OFF)

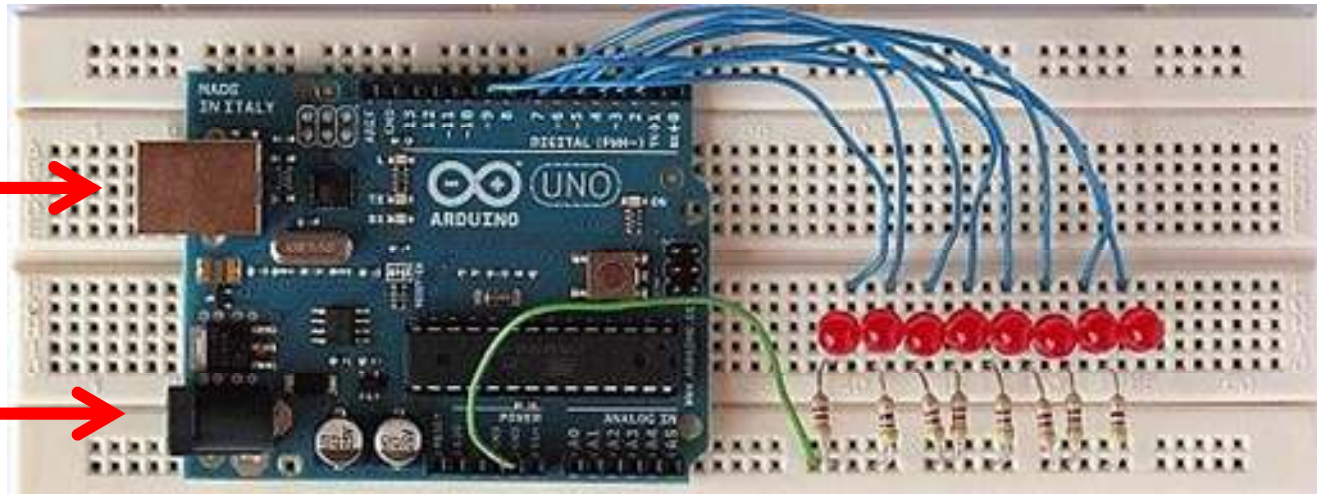
Other IDE's available!



Breadboard Circuits

Code + Power
via USB

DC Power
9V

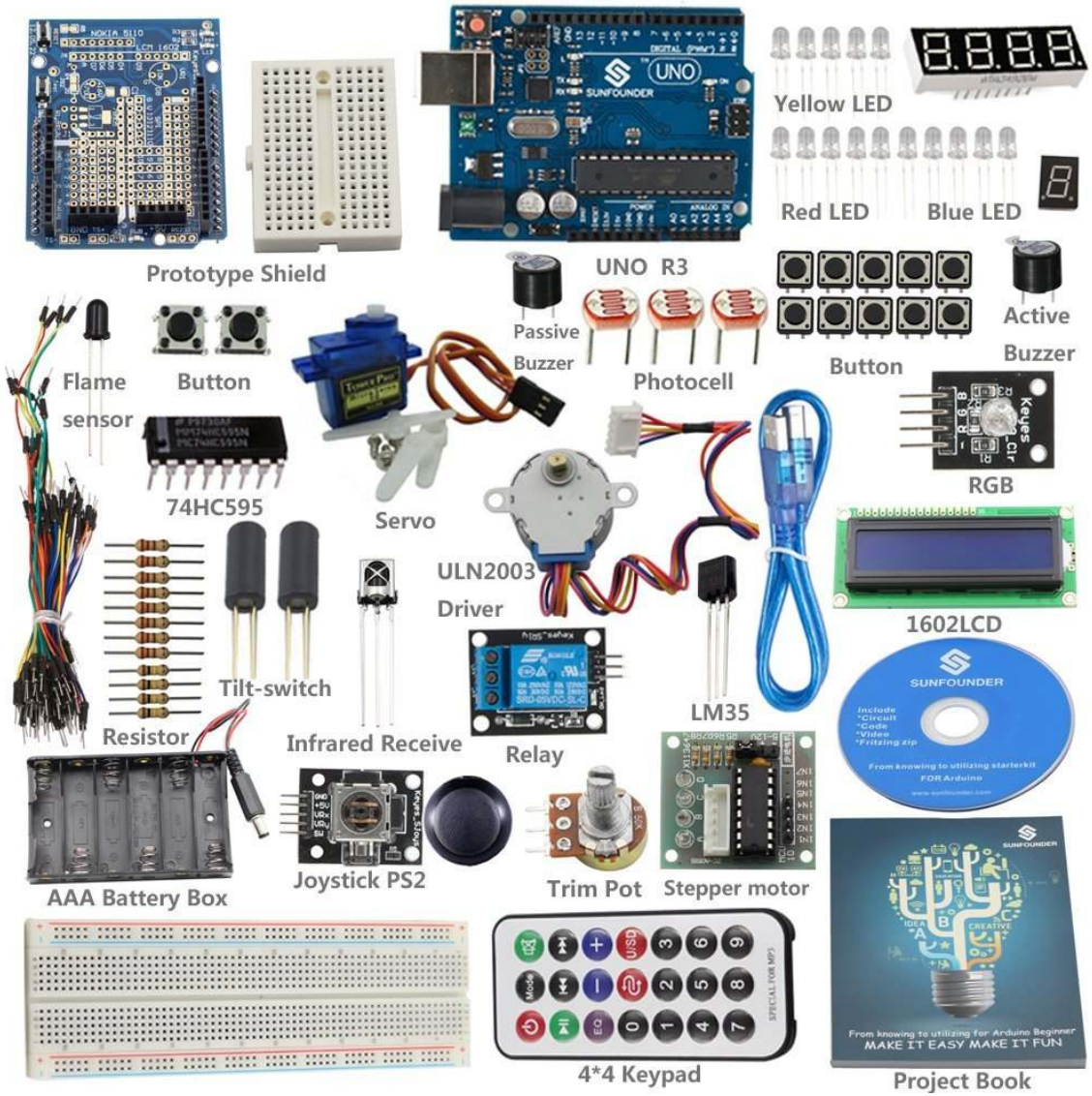


£1.99

- **Circuit diagrams on the internet**
- **YouTube Videos too**
- **Helpful descriptions - How Things Work**

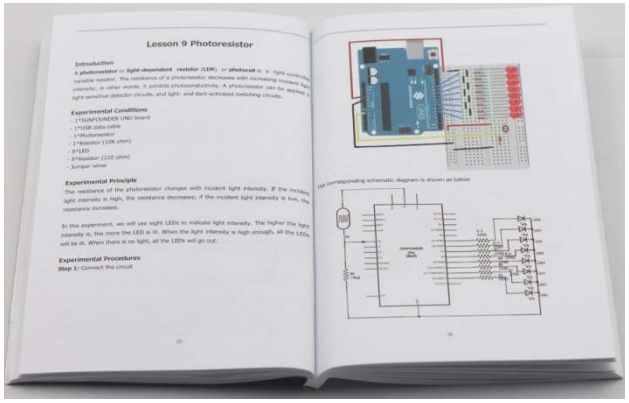
All for <u>FREE</u> – open source

Arduino Kits: £17.93 - £83.75

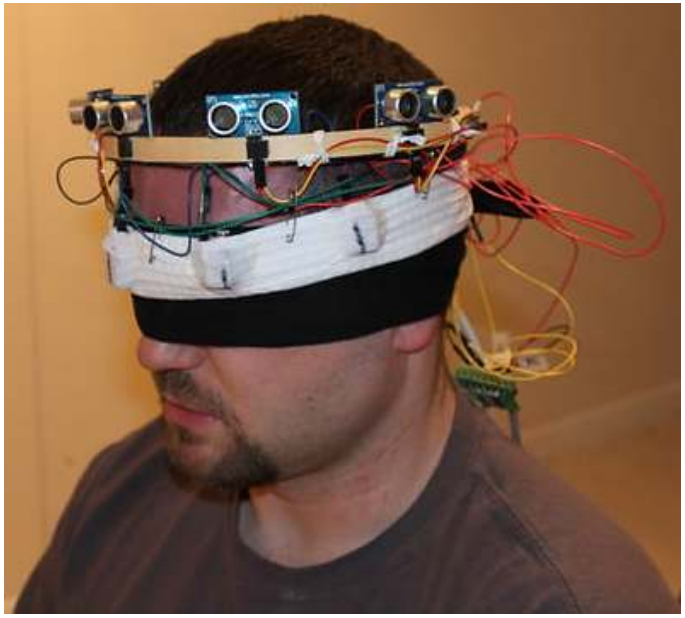


Contents:

- Arduino UNO
- Prototype Shield
- LCD display
- LEDs & 7-Segment
- LDR's & Buzzers
- Switches & Relays
- Servo
- Keypad
- Project Book
- CD - Sketches

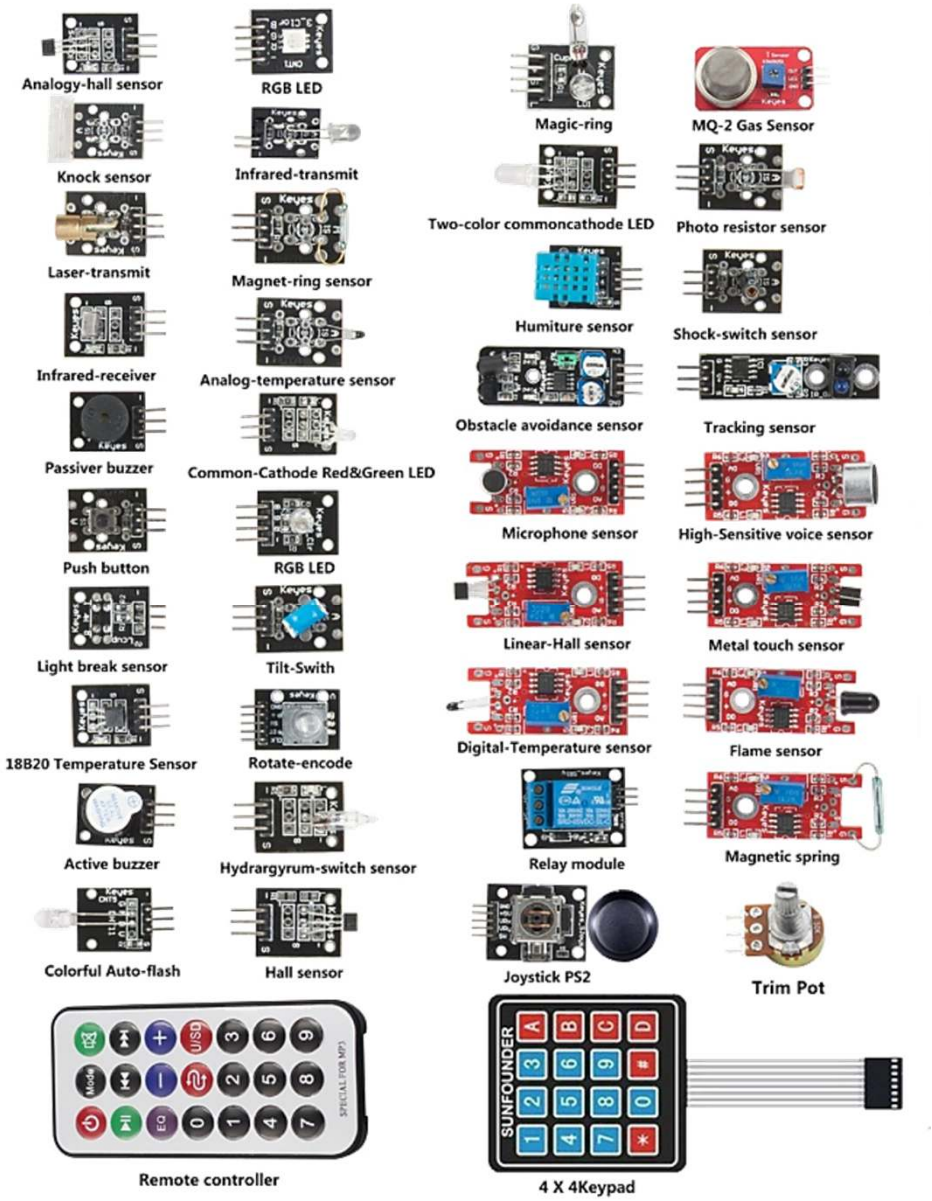


What About Complex Projects



?

Use Arduino Sensors:

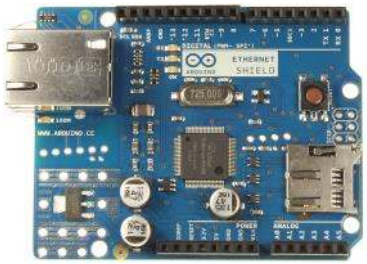


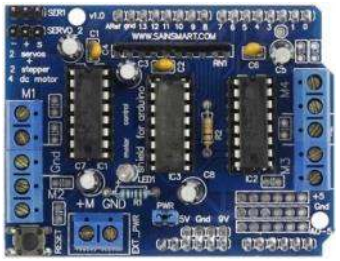
Examples:

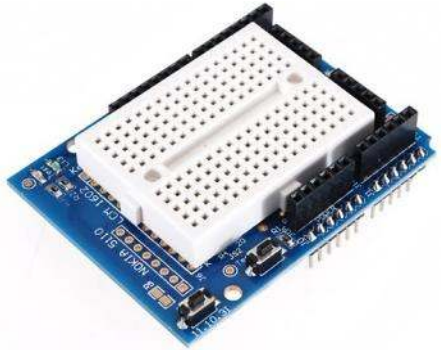
- Distance (Ultrasonic)
- Acceleration
- Temperature
- Humidity
- Shock & Tilt
- Light
- Current (Hall)
- Obstacle
- Tracking
- Infrared Tx & Rx
- Keypad
- Touch
- Joysticks
- Rotary Encoders
- Rain Detector

And…

Use Arduino Shields:

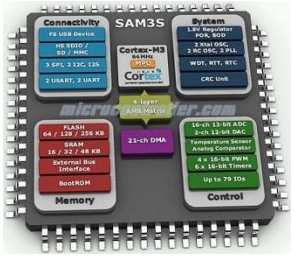






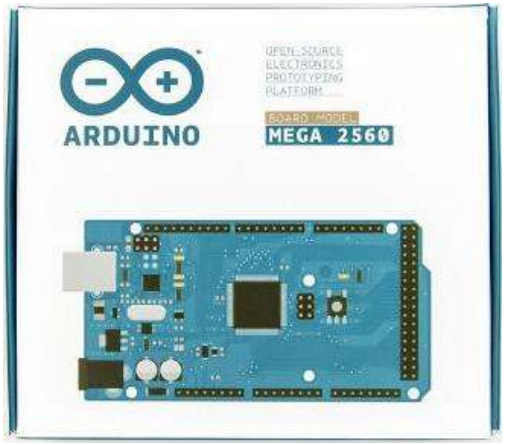
Examples:

- Prototyping
- Relay modules
- Keypads
- Motor Drive
- LCD Displays
- Ethernet
- Multi-function
- MP3 Players
- GPS
- 2.4 GHz WiFi
- GSM
- Etc…

What Products Use  Tech

?

Products:


ARDUINO
OPEN-SOURCE
ELECTRONICS
PROTOTYPING
PLATFORM
BOARD MODEL
MEGA 2560


HOT WATER
HEATING
Honeywell

Products:


easy
radio


80


ELECTRONIC DIGITAL SAFE


MERIDIAN
WE 15:12
23:58.24
SCUBAPRO

Products:

Are ARDUINO Related To VEX IQ

?

Brain

Motor

Gyro

Distance

Color

Touch LED

Bumper Switch

ARDUINO

Brain

Motor

Gyro

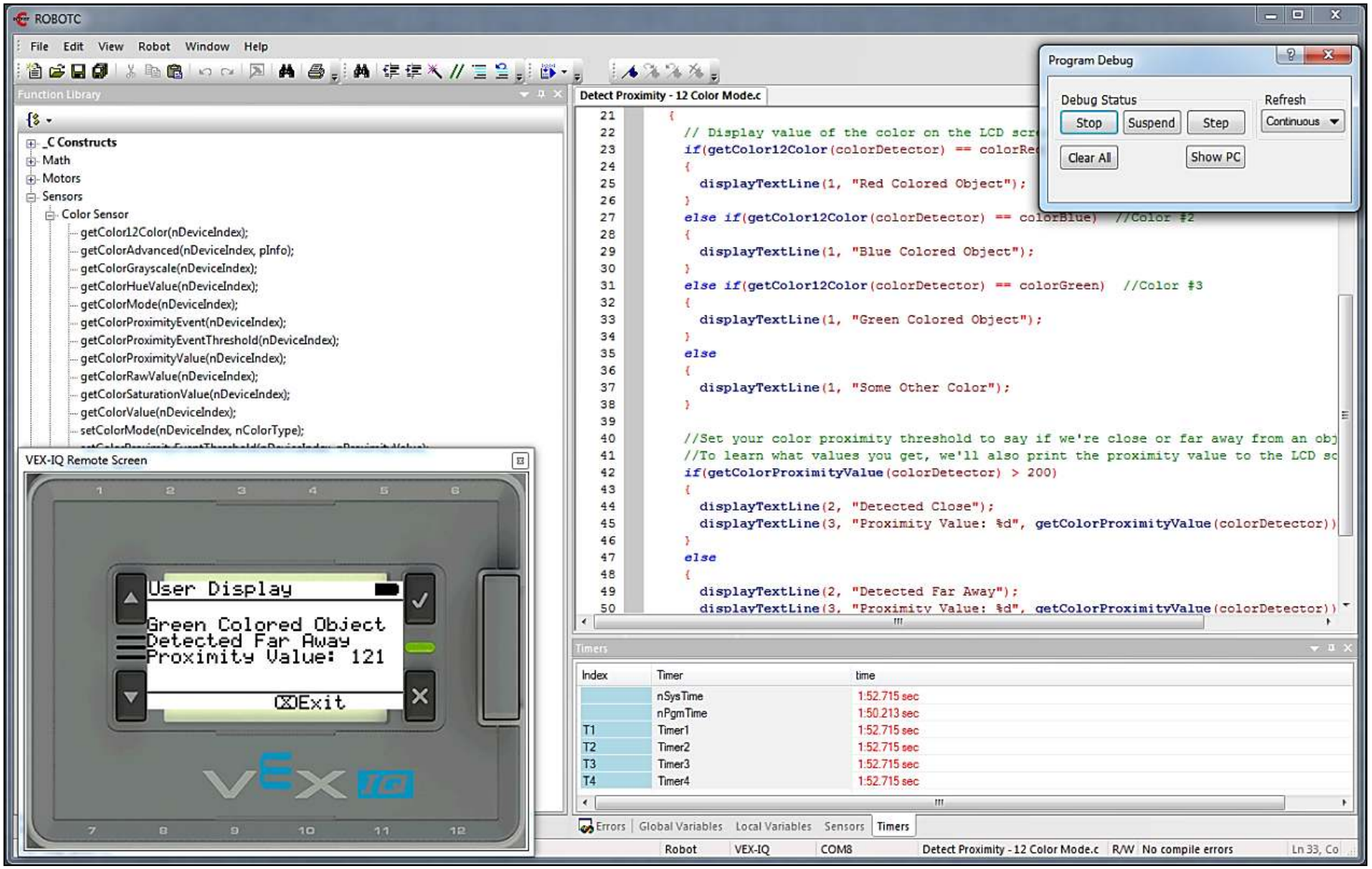
Distance

Color

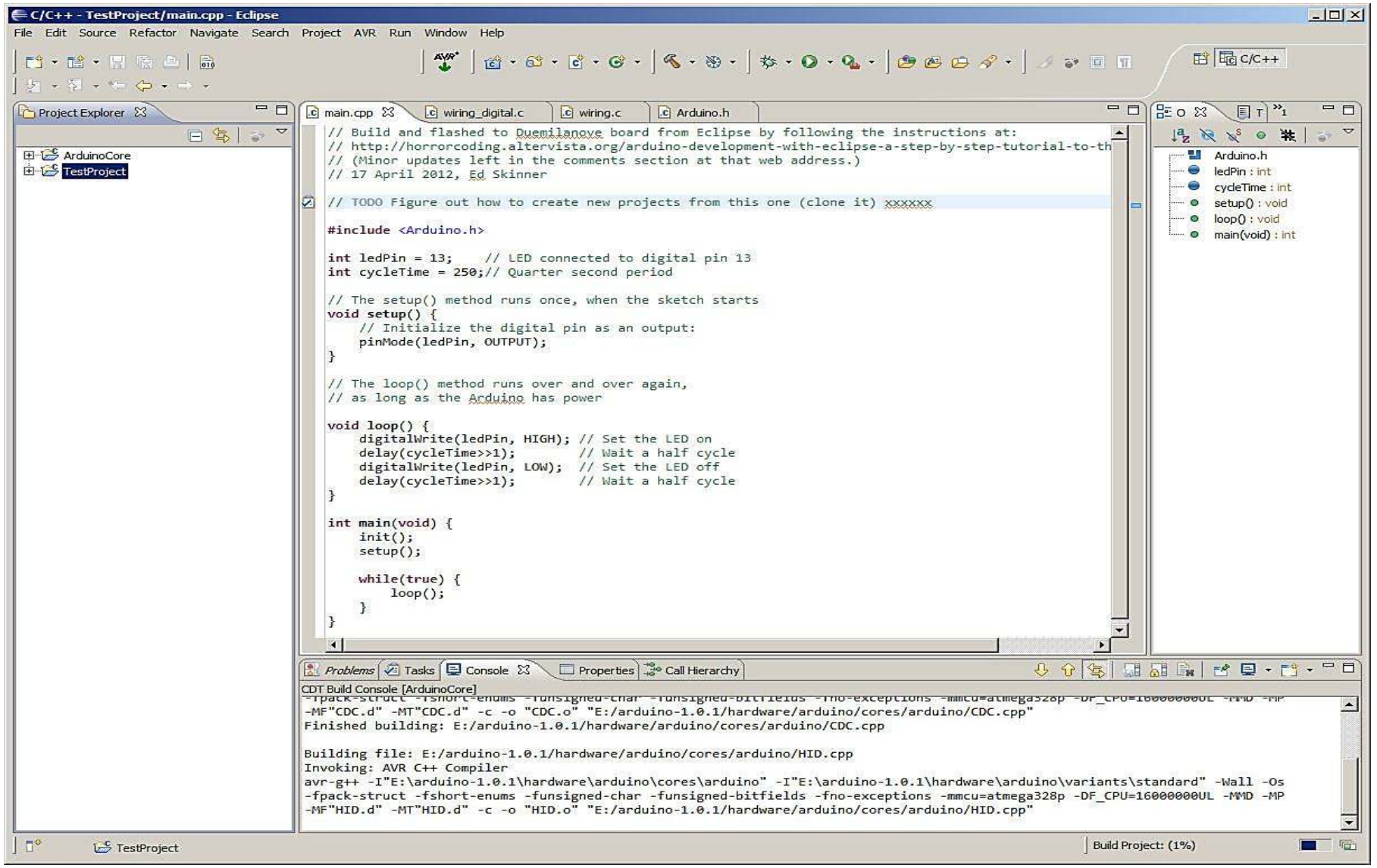
Touch LED

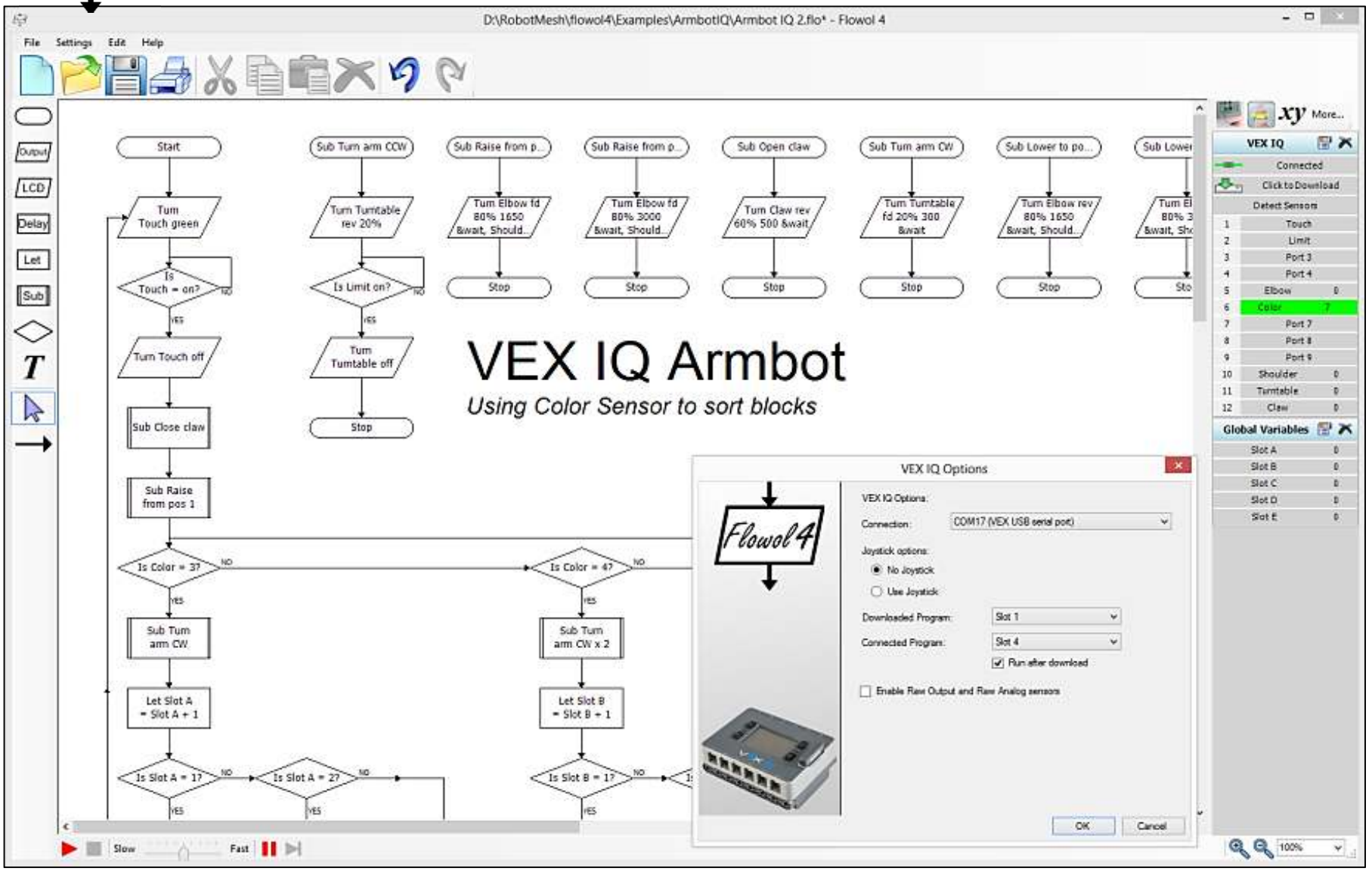
Bumper Switch

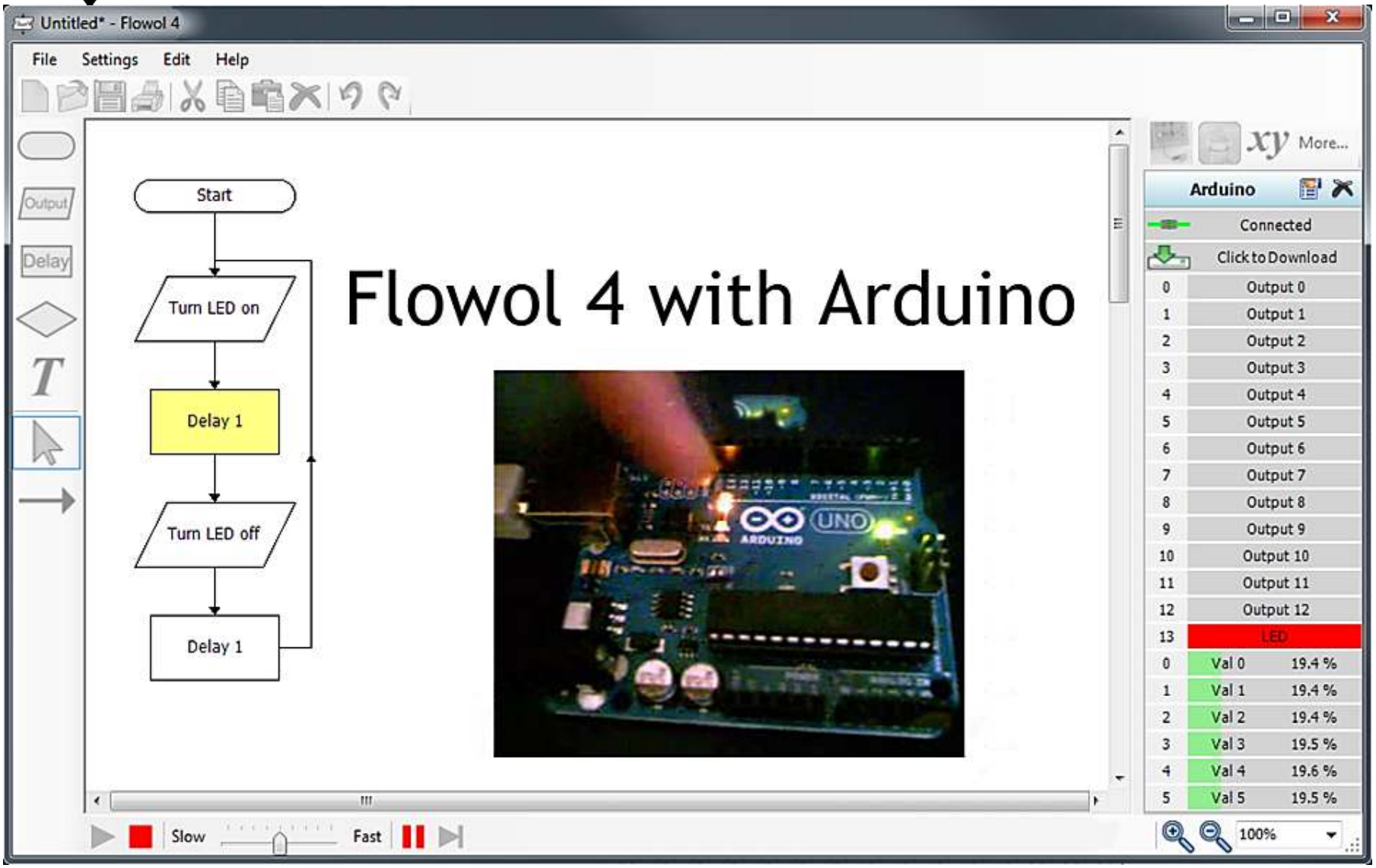
ROBOTC


ROBOTC
File Edit View Robot Window Help
Function Library
_C Constructs
Math
Motors
Sensors
Color Sensor
getColor12Color(nDeviceIndex);
getColorAdvanced(nDeviceIndex, pInfo);
getColorGrayscale(nDeviceIndex);
getColorHueValue(nDeviceIndex);
getColorMode(nDeviceIndex);
getColorProximityEvent(nDeviceIndex);
getColorProximityEventThreshold(nDeviceIndex);
getColorProximityValue(nDeviceIndex);
getColorRawValue(nDeviceIndex);
getColorSaturationValue(nDeviceIndex);
getColorValue(nDeviceIndex);
setColorMode(nDeviceIndex, nColorType);
VEX-IQ Remote Screen
User Display
Green Colored Object
Detected Far Away
Proximity Value: 121
Exit
Program Debug
Debug Status
Stop
Suspend
Step
Refresh
Continuous
Clear All
Show PC
Detect Proximity - 12 Color Mode.c
21 {
22 // Display value of the color on the LCD scr
23 if(getColor12Color(colorDetector) == colorRe
24 {
25 displayTextLine(1, "Red Colored Object");
26 }
27 else if(getColor12Color(colorDetector) == colorBlue) //Color #2
28 {
29 displayTextLine(1, "Blue Colored Object");
30 }
31 else if(getColor12Color(colorDetector) == colorGreen) //Color #3
32 {
33 displayTextLine(1, "Green Colored Object");
34 }
35 else
36 {
37 displayTextLine(1, "Some Other Color");
38 }
39
40 //Set your color proximity threshold to say if we're close or far away from an obj
41 //To learn what values you get, we'll also print the proximity value to the LCD sc
42 if(getColorProximityValue(colorDetector) > 200)
43 {
44 displayTextLine(2, "Detected Close");
45 displayTextLine(3, "Proximity Value: %d", getColorProximityValue(colorDetector))
46 }
47 else
48 {
49 displayTextLine(2, "Detected Far Away");
50 displayTextLine(3, "Proximity Value: %d", getColorProximityValue(colorDetector))
Timers
Index Timer time
nSysTime 1:52.715 sec
nPgmTime 1:50.213 sec
T1 Timer1 1:52.715 sec
T2 Timer2 1:52.715 sec
T3 Timer3 1:52.715 sec
T4 Timer4 1:52.715 sec
Errors Global Variables Local Variables Sensors Timers
Robot VEX-IQ COM8 Detect Proximity - 12 Color Mode.c R/W No compile errors Ln 33, Co

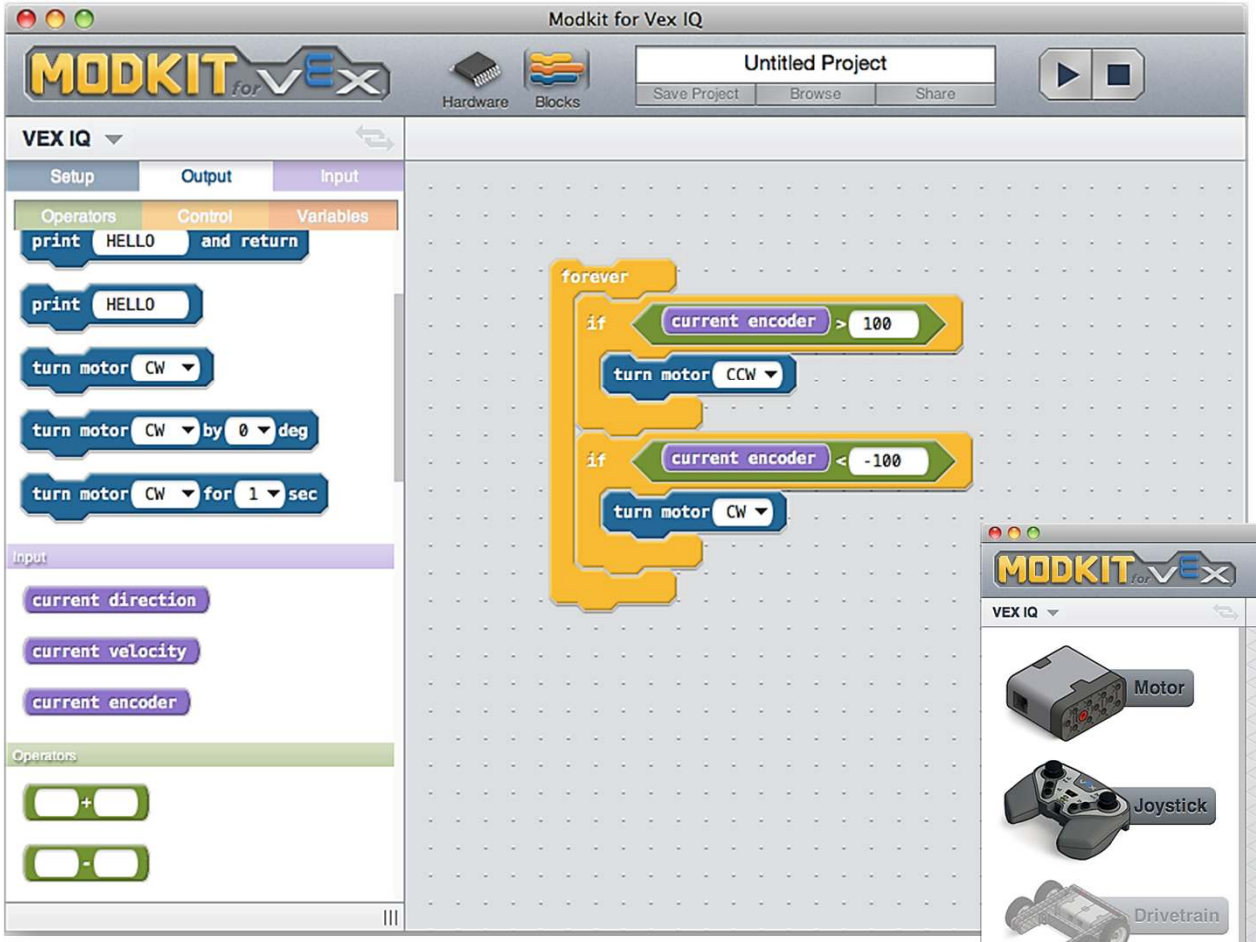
C++

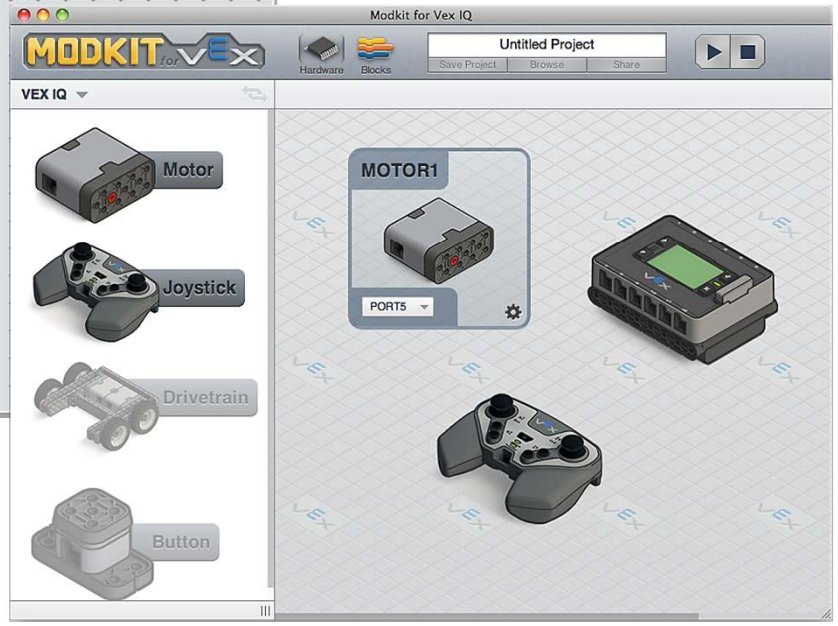

C/C++ - TestProject/main.cpp - Eclipse
File Edit Source Refactor Navigate Search Project AVR Run Window Help
Project Explorer
ArduinoCore
TestProject
main.cpp
wiring_digital.c
wiring.c
Arduino.h
// Build and flashed to Duemilanove board from Eclipse by following the instructions at:
// http://horrorcoding.altervista.org/arduino-development-with-eclipse-a-step-by-step-tutorial-to-th
// (Minor updates left in the comments section at that web address.)
// 17 April 2012, Ed Skinner
// TODO Figure out how to create new projects from this one (clone it) xxxxxx
#include <Arduino.h>
int ledPin = 13; // LED connected to digital pin 13
int cycleTime = 250;// Quarter second period
// The setup() method runs once, when the sketch starts
void setup() {
// Initialize the digital pin as an output:
pinMode(ledPin, OUTPUT);
}
// The loop() method runs over and over again,
// as long as the Arduino has power
void loop() {
digitalWrite(ledPin, HIGH); // Set the LED on
delay(cycleTime>>1); // Wait a half cycle
digitalWrite(ledPin, LOW); // Set the LED off
delay(cycleTime>>1); // Wait a half cycle
}
int main(void) {
init();
setup();
while(true) {
loop();
}
}
Arduino.h
ledPin : int
cycleTime : int
setup() : void
loop() : void
main(void) : int
Problems Tasks Console Properties Call Hierarchy
CDT Build Console [ArduinoCore]
-MF"CDC.d" -MT"CDC.d" -c -o "CDC.o" "E:/arduino-1.0.1/hardware/arduino/cores/arduino/CDC.cpp"
Finished building: E:/arduino-1.0.1/hardware/arduino/cores/arduino/CDC.cpp
Building file: E:/arduino-1.0.1/hardware/arduino/cores/arduino/HID.cpp
Invoking: AVR C++ Compiler
avr-g++ -I"E:\arduino-1.0.1\hardware\arduino\cores\arduino" -I"E:\arduino-1.0.1\hardware\arduino\variants\standard" -Wall -Os
-fpack-struct -fshort-enums -funsigned-char -funsigned-bitfields -fno-exceptions -mmcu=atmega328p -DF_CPU=16000000UL -MMD -MP
-MF"HID.d" -MT"HID.d" -c -o "HID.o" "E:/arduino-1.0.1/hardware/arduino/cores/arduino/HID.cpp"
TestProject
Build Project: (1%)


D:\RobotMesh\flowol4\Examples\ArmbotIQ\Armbot IQ 2.flo* - Flowol 4
File Settings Edit Help
VEX IQ Armbot
Using Color Sensor to sort blocks
Start
Turn Touch green
Is Touch = on?
Turn Touch off
Sub Close claw
Sub Raise from pos 1
Is Color = 3?
Sub Turn arm CW
Let Slot A = Slot A + 1
Is Slot A = 1?
Is Slot A = 2?
Is Color = 4?
Sub Turn arm CW x 2
Let Slot B = Slot B + 1
Is Slot B = 1?
Sub Turn arm CCW
Turn Turntable rev 20%
Is Limit on?
Turn Turntable off
Stop
Sub Raise from p...
Turn Elbow fd 80% 1650 &wait, Should...
Sub Raise from p...
Turn Elbow fd 80% 3000 &wait, Should...
Sub Open claw
Turn Claw rev 60% 500 &wait
Sub Turn arm CW
Turn Turntable fd 20% 300 &wait
Sub Lower to po...
Turn Elbow rev 80% 1650 &wait, Should...
Output
LCD
Delay
Let
Sub
Slow
Fast
VEX IQ
Connected
Click to Download
Detect Sensors
Touch
Limit
Port 3
Port 4
Elbow
Color
Port 7
Port 8
Port 9
Shoulder
Turntable
Claw
Global Variables
Slot A
Slot B
Slot C
Slot D
Slot E
VEX IQ Options
VEX IQ Options:
Connection:
COM17 (VEX USB serial port)
Joystick options:
No Joystick
Use Joystick
Downloaded Program:
Slot 1
Connected Program:
Slot 4
Run after download
Enable Raw Output and Raw Analog sensors
OK
Cancel
100%

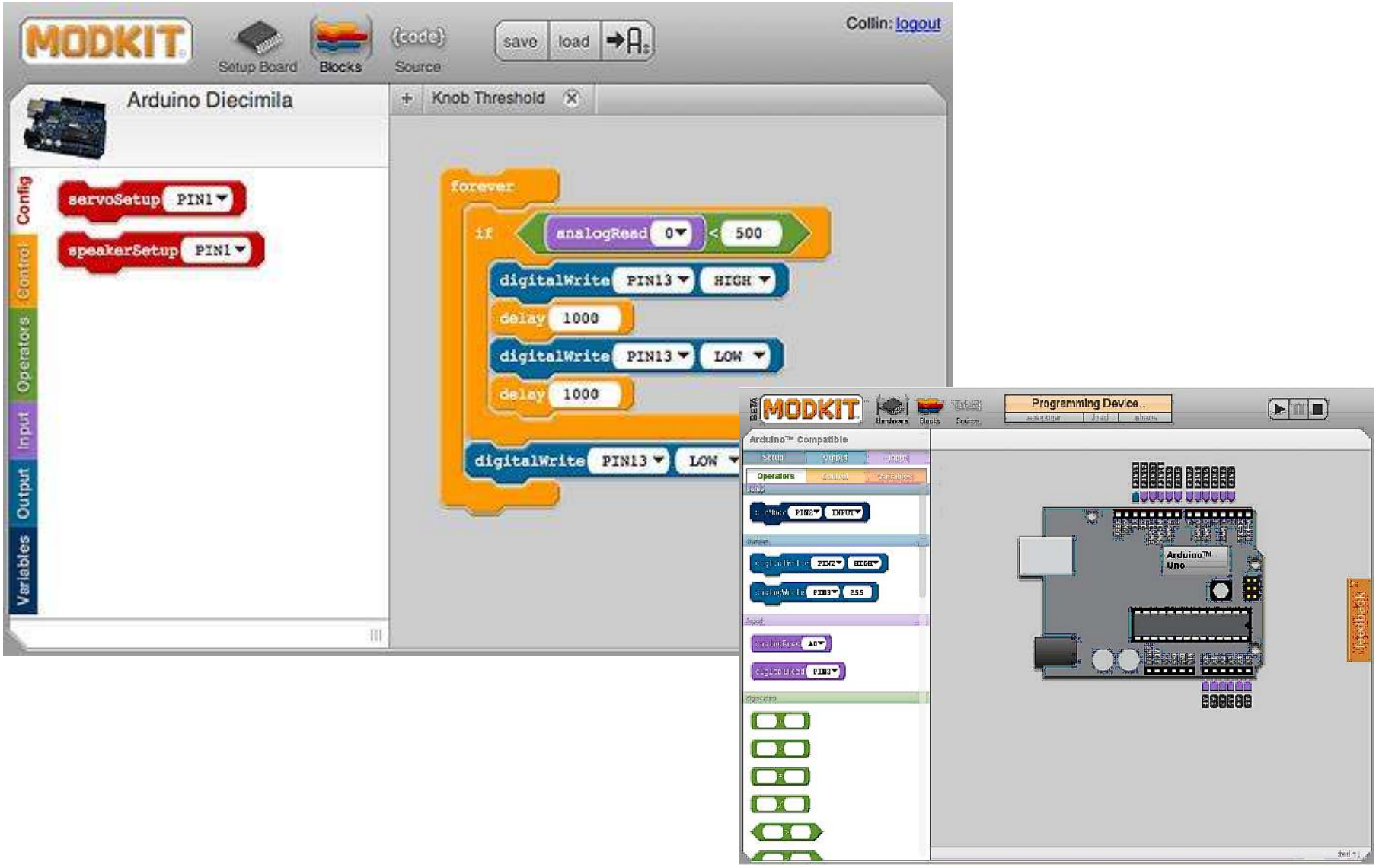

Untitled* - Flowol 4
File
Settings
Edit
Help
Output
Delay
Start
Turn LED on
Delay 1
Turn LED off
Delay 1
Flowol 4 with Arduino
UNO
ARDUINO
More...
Arduino
Connected
Click to Download
0 Output 0
1 Output 1
2 Output 2
3 Output 3
4 Output 4
5 Output 5
6 Output 6
7 Output 7
8 Output 8
9 Output 9
10 Output 10
11 Output 11
12 Output 12
13 LED
0 Val 0 19.4 %
1 Val 1 19.4 %
2 Val 2 19.4 %
3 Val 3 19.5 %
4 Val 4 19.6 %
5 Val 5 19.5 %
Slow
Fast
100%

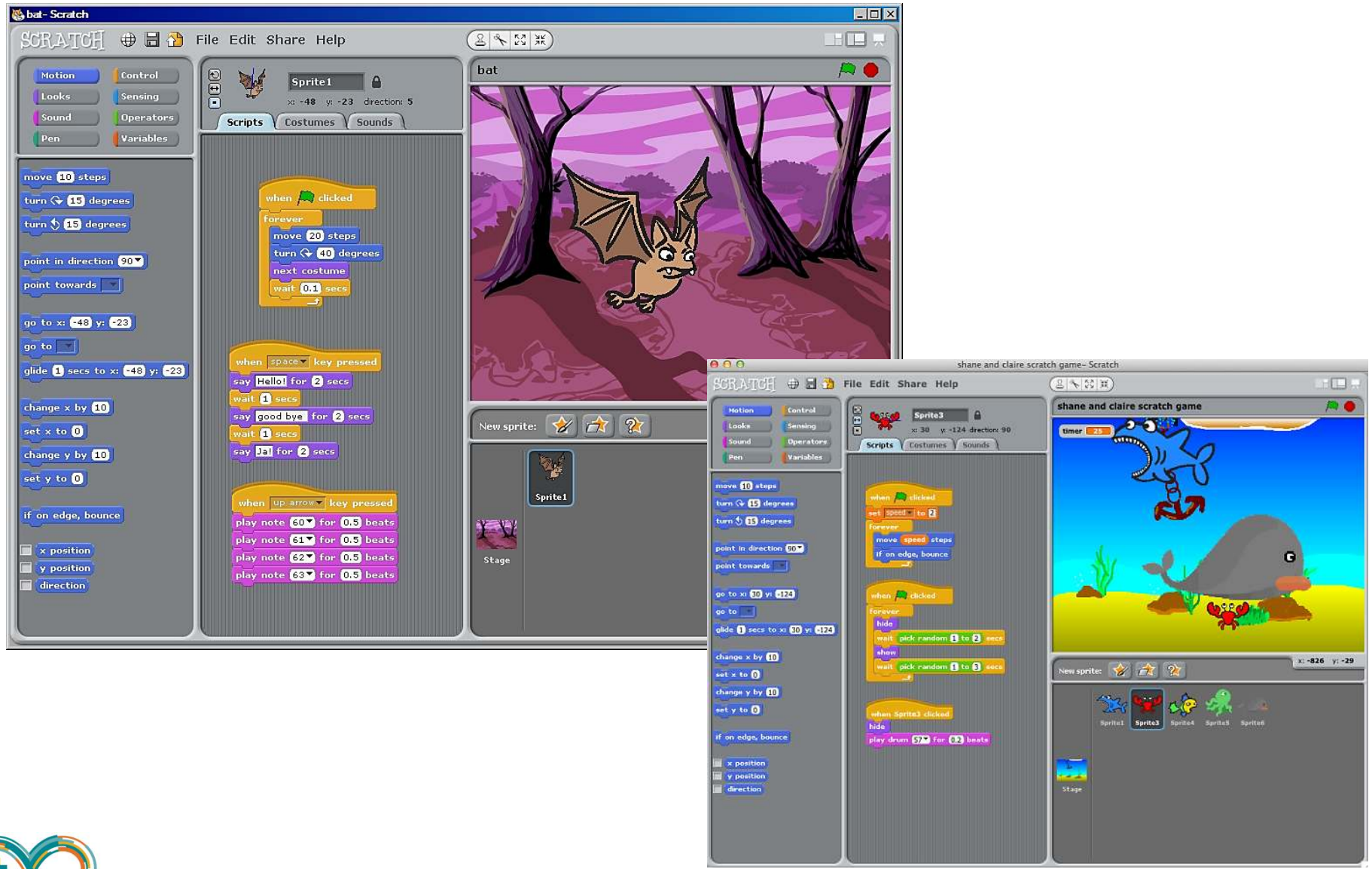
MODKIT for VEX





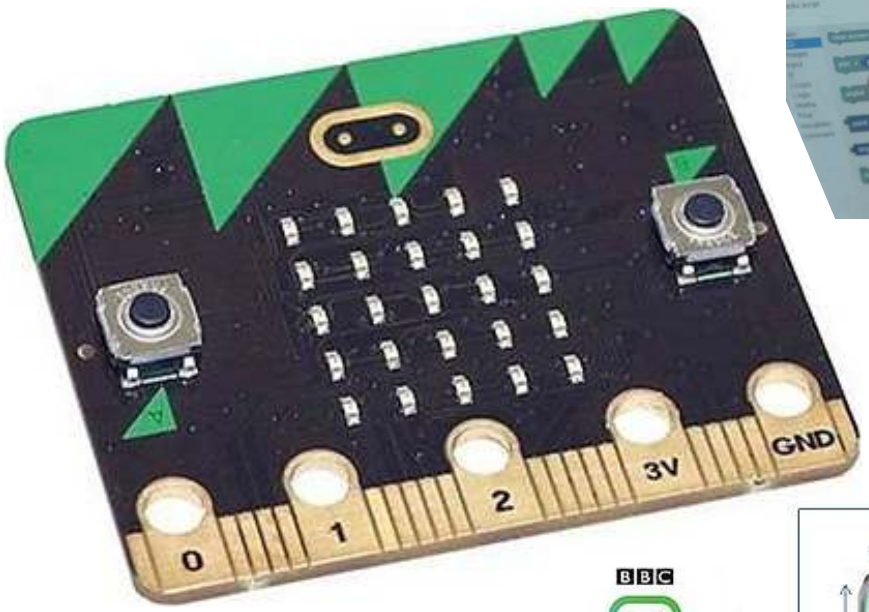
MODKIT For ARDUINO




bat- Scratch
File Edit Share Help
Motion
Control
Looks
Sensing
Sound
Operators
Pen
Variables
Sprite1
Scripts
Costumes
Sounds
move 10 steps
turn 15 degrees
turn 15 degrees
point in direction 90
point towards
go to x: -48 y: -23
go to
glide 1 secs to x: -48 y: -23
change x by 10
set x to 0
change y by 10
set y to 0
if on edge, bounce
x position
y position
direction
when clicked
forever
move 20 steps
turn 40 degrees
next costume
wait 0.1 secs
when space key pressed
say Hello! for 2 secs
wait 1 secs
say good bye for 2 secs
wait 1 secs
say Ja! for 2 secs
when up arrow key pressed
play note 60 for 0.5 beats
play note 61 for 0.5 beats
play note 62 for 0.5 beats
play note 63 for 0.5 beats
bat
New sprite:
Sprite1
Stage
shane and claire scratch game- Scratch
File Edit Share Help
Sprite3
shane and claire scratch game
timer 25
when clicked
set speed to 2
forever
move speed steps
if on edge, bounce
when clicked
forever
hide
wait pick random 1 to 2 secs
show
wait pick random 1 to 3 secs
when Sprite3 clicked
hide
play drum 57 for 0.2 beats
New sprite:
Sprite1
Sprite3
Sprite4
Sprite5
Sprite6
Stage

Make it Digital

BBC launches flagship UK-wide initiative to inspire a new generation with digital technology



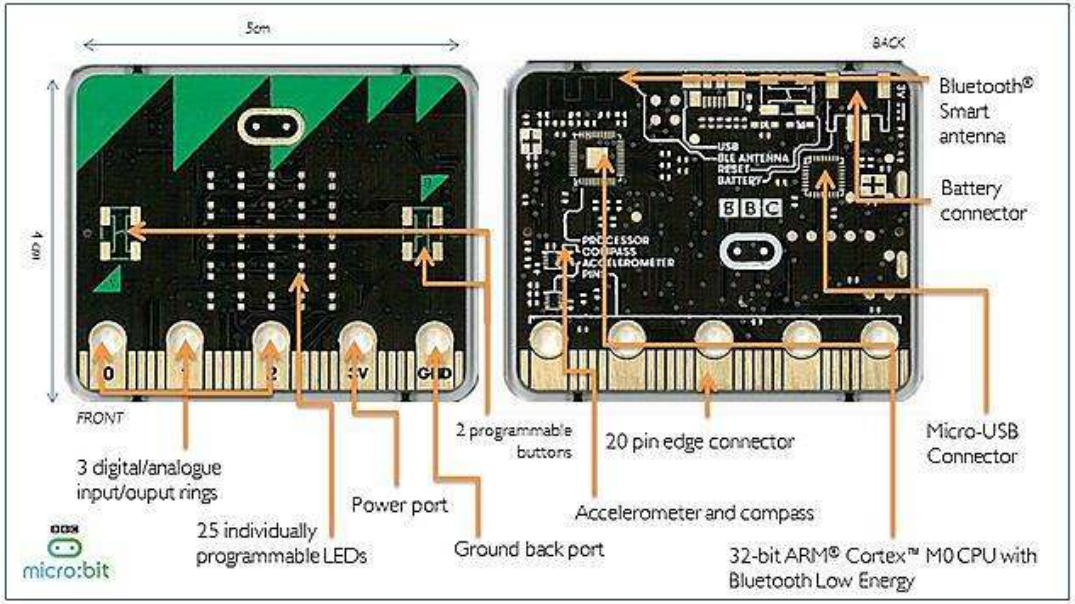
BBC will give a personal coding device free to every child in year 7 across the country - 1 million devices in total – in autumn 2015.

BBC three will be launching a talent show called '*Girls Can Code*'.

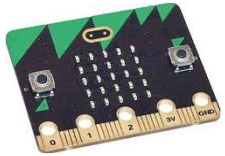
BBC micro:bit

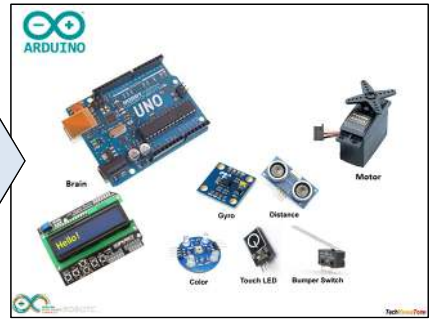
A wearable device that is easy to code.

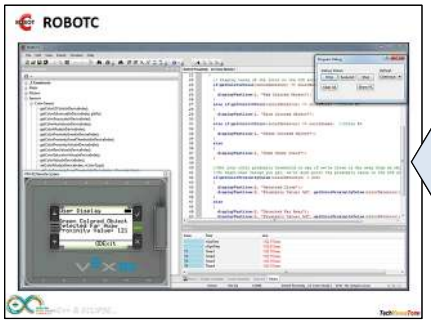
Complimentary to the Arduino and Raspberry Pi.

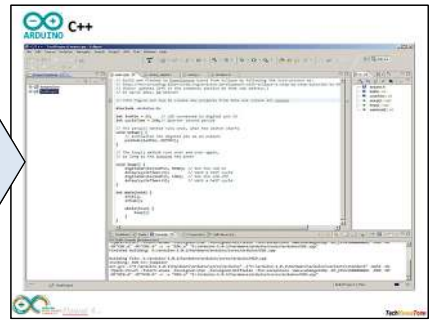


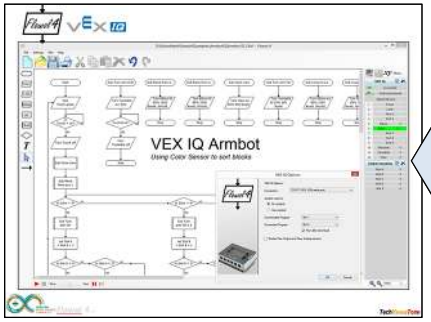
Fully Transferrable STEM Skills!

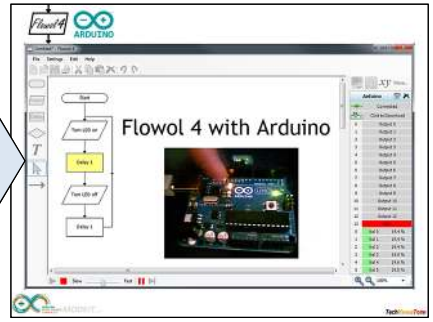


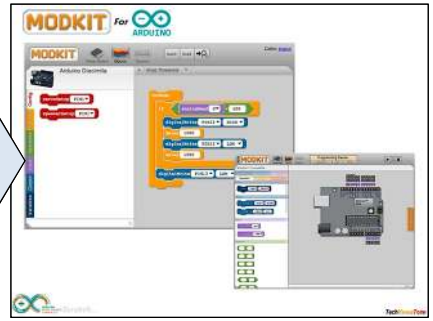












ARDUINO OPEN-SOURCE COMMUNITY *Benefits...*

Arduino Benefits:

- Very Low Cost & easy to acquire
- Reusable, over and over
- Use at School and at Home
- You Learn:
  - How To Apply STEM Skills
  - About Microcontrollers
  - How To Code In C++
  - About Electronic Circuits
  - How To Specify & Test ideas
  - About Constraints & Budgets
- Create Unique Solutions
- Develop Engineering Skill
- Skills that are very transferrable

You Have Fun!

ARDUINO