COSC 1000: Getting Started with Arduino

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Goals

- Familiarize yourself with:
 - Electronics
 - Installing tools on your labtop
 - Basics of programming in C
- Evaluation:
 - Based on two projects, the latter being completely up to you
 - But you will get proposals

Prerequisites

- Functioning Arduino:
 - Uno or Mega
 - Selection of Boards, wires, LEDS, ...
 - e.g. from Elegoo, a set of cheap clones from China
 - e.g. from Arduino.cc itself

- Step 1: Installing the Arduino software on your computer
 - This depends heavily on your computer
 - Go to the Arduino web-page
 - Allow pop-ups
 - Select your platform: Windows, Mac, Linux
 - Follow the instructions
 - You do not have to donate

- Find the Arduino Uno board in your kit
 - Connect via the USB cable
 - If you have a Mac, you will need a USB to USB-C converter





- The Arduino is powered
 - either by the USB cable from your computer
 - The power source

- You can go to the Elegoo website and download the documentation
- Go to the page for your kit (under Robotics and Arduino)

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- Elegoo manual download
 - This will lead you to a google doc page
 - Use the download arrow on the top right
 - And forego virus checking on Google Drive



• You will find the downloaded pdf in your download folder

- Open up the Arduino IDE
 - This is how you program the Arduino
 - You then need to upload the program to the Arduino
- Default program:
 - The Arduino comes with a default program that blinks a yellow LED.



- First, we need to select the right type of Arduino
 - Go to Tools, then to Board and select the right one:
 - Arduino Uno or Arduino Mega
 - Otherwise you will get errors

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		Arduino Pro or Pro Mini
		Arduino Robot Control
10		Arduino Robot Motor
F		Arduino Gemma
		Adafruit Circuit Playground
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at java.awt.Even	tDispatchThread.run(EventDispatchThread.java:82)	Arduino Uno WiFi

- Also need to ensure that the right connection is selected
 - Open Tools —> Serial Port and select the option with Arduino in it

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12 Getting Started Arduino • We new regregers to trivinal started }	main code here, to run repeatedly:		ow LED

- Open source project by Massimo Banzi and David Cuartielles since 2005
- Used by hobbyist and fast prototypers to build digitally controlled gadgets
 - With numerous examples on the web
 - And a support networks for parts

- Arduinos are built to interact with the environment
 - Can use a humidity sensor to warn that it is raining
 - Can detect light and change state because of it

- Arduinos come with
 - USB (left) and Power Connector (right)



- Micro-controller
 - This is a "computer on a chip"



And now for something completely different



St. Xavier's Ahmedabad, Gujarat

- On the long edges, we have pins
 - Lower pins:
 - Left:
 - Power connections
 - Input for external reset button
 - Right:
 - Analog inputs



- Upper left above USB connector:
 - A brownish reset button



- Three Light Emiting Diodes (LED)
 - TX, RX light up when data is transmitted
 - L LED is controlled by programmer
- There are some components to the left to control the USB port
- To the right, there is a green ON LED that blinks if the Arduino has power



- Upper row contains pins
 - Sockets (pins) 0-13 are digital input/ output (I/O) pins
 - Can detect whether an electrical signal is present or can generate a signal
 - Pins with a tilde ~ can generate varying electrical signals



- Shields:
 - You can buy shields that connect to all pins
 - A shield comes with copper pins that need to be inserted completely into the Arduino
 - The Elegoo kit has a "prototype shield", but you can get ethernet shields, ... to connect to the internet, ...
 - A shield has the same type of outputs on its top



Partially inserted shield showing the copper pins.

- We can use the power supply to set up our first circuit
 - We let a LED shine
 - CAUTION: We need to limit current between power and ground
 - We do this by using a resistor.
 - Take out the breadboard, a LED and a 330 $\!\Omega$ resistor
 - Bread-board has horizontal wiring on the inside and vertical wiring on the outside
 - Connect to ground, + to Power





- Arduino comes with an Integrated Development Environment
 - A program used to write the software for your Arduino

Command Area

Menu Items (in a Mac on top of screen)

Title Bar,

Icons



- To create a program
 - Write the program in the sketch area
 - Need to provide a set-up function
 - Runs only once, at the beginning
 - Should provide a loop function
 - Executed over and over again

- Programming language is C
 - Statements are separated by semicolons;
 - Usually consists of function calls
 - delay, digitalWrite
 - Which have parameters:
 - delay: an integer indicating the number of milliseconds
 - digitalWrite: pin number and type of output:
 - HIGH / LOW

- After writing the program:
 - Verify using the checkmark button
 - If something goes wrong:
 - Study the error message carefully



- The offending line of code is high-lighted
- The status-window below shows the error
 - I should have used HIGH instead of High

	sketch_nov15a Arduino	1.8.13
		₽ ₽
sketch nov15a		•
<pre>void setup() {</pre>		—
<pre>pinMode(13, OUTPUT);</pre>		
}		
<pre>void loop() {</pre>		
<pre>digitalWrite(13, High); del ru(100);</pre>		
digitalWrite(13, Low);		
delay(500);		
digitalwrite(13, High); delay(100)		
<pre>digitalWrite(13, Low); delew(500)</pre>		
<pre>detdy(500) }</pre>		
	0	
'High' was not declared in this scope	2	Copy error messages
exit status 1 'High' was not declared in this	SCOPA	
intent was not declared in this	scope	

- Let's try it out
- First line is a comment
 - Indicated by /* ... */
- setup:
 - We declare to Arduino how to treat PIN 13
 - (The built-in LED)
 - loop:

...

- We put voltage on 13, then wait for 1/10 of a second
- We remove voltage on 13, then wait for 1/2 of a second.

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		ø
sketch_nov15a		
/* This is the firs	st blinker program */	
<pre>void setup() { pinMode(13, OUTPL</pre>	л);	
}		
<pre>void loop() { digitalWrite(13, delay(100); digitalWrite(13, delay(500); digitalWrite(13, delay(1000); digitalWrite(13, delay(500); }</pre>	HIGH); LOW); HIGH); LOW);	
Done compiling.		
Sketch uses 968 byte Global variables use	es (3%) of program storage space e 9 bytes (0%) of dynamic memory	. Maximum i , leaving 2
15	Arduino Uno on /dev/cu.us	omodem14101

- After checking, we upload to the Arduino
 - We do so using the —> button next to the verification button
 - If your setup is correct, the transfer diodes are going to blink
 - In addition to the green power LED



- We have reprogrammed the internal yellow LED
 - And the Arduino starts executing your program
 - You will find it blinking