Arduino Guide

Connect to a DiCE Computer and upload a sketch

From a terminal window on your DiCE machine type the command
$ ls /dev
This will display all the devices that are currently connected to the DiCE PC

Connect Arduino to USB port on DiCE PC

Wait a few seconds then type the same command again.
$ ls /dev
Note the new port number that has just appeared, typically TTYACM0 or TTYACM1
(Port numbers are allocated on a first come first served basis and can take a few seconds to be allocated - hence why unplugging and plugging your Arduino to a DiCE PC too quickly may see your Arduino switch port numbers or the arduino IDE fail to see any available serial ports).

From the command line type:-
$ arduino &

Check that you have selected the correct board, port and programmer by looking at the following three settings:-

Tools - Board: "Arduino/Genuino Uno"
Tools - Port - TTYACM0 (or TTYACM1 - to match what you see in your /dev folder)
Tools - Programmer: "AVRISP mkII"

You are now ready to run your first sketch:-
Select File - Examples - 01.Basics - Blink
The blink sketch should open in a new window
Click the right facing arrow on the top toolbar (second left button) to compile and load the sketch to your arduino.
In the lower pane you should see the Uploading followed by the Done uploading messages and the LED on the Arduino should be blinking. Note that this is where you will see any warning or error messages for both the compilation of your sketch and the upload. The tick button on the top toolbar allows you to compile your sketch without uploading it to the arduino.

Drive a motor

Connect the small grey RCX LEGO motor to pins 10 and 11 on the Arduino.

Select File - New to create a new sketch and enter the following code:-

```
int motor1 = 10;
int motor2 = 11;
void setup() {
  pinMode(motor1,OUTPUT);
  pinMode(motor2,OUTPUT);
}

void loop() {
  digitalWrite(motor1,200);
  digitalWrite(motor2,0);
  delay(1000);
  digitalWrite(motor1,0);
  digitalWrite(motor2,400);
  delay(1000);

}
```

Read a sensor

Connect the Sharp GP2D12 Infrared Sensor to the arduino with the black wire going to GND, the red wire going to 5V and the white wire going to pin A0. See figure below for the sensors pin out.

PIN	SIGNAL NAME
①	V_O
②	GND
③	V_{CC}
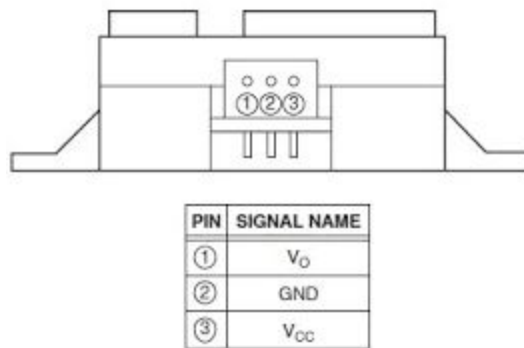
Select File - New to create a new sketch and enter the following code:-

```
int IR_SENSOR = 0; // Sensor is connected to the analog A0
int intSensorInput = 0; //Sensor result
```

```
float fltSensorCalculation = 0; //Calculated value

void setup()
{
Serial.begin(9600); // Start serial port communication
}

void loop()
{
// read the ir sensor

intSensorInput = analogRead(IR_SENSOR); //read the sensor input
fltSensorCalculation = (6787.0 / (intSensorInput - 3.0)) - 4.0; //Calculate distance in cm

Serial.print(fltSensorCalculation); //Print the calculated distance to screen
Serial.println(" cm"); //print cm to screen
delay(200); //Wait
}
```

Select Tools - Serial Monitor
In the serial monitor window change the baud rate to 9600.
You should now see distance measurements from the Sharp sensor. Note that this sensor has a working range of 10-80cm and that readings outwith this range are likely to be spurious.

Install a new library

Libraries can be found under the Sketch - Include Library menu where you can also search all the installed libraries using the manage libraries window.

New libraries can be added using the add .Zip library option

Our SDP library and rotary encoder library can be downloaded from the following links and should be added to your local version of the arduino ide before using either our Interface shield, motor board and/or rotary encoder board.

http://homepages.inf.ed.ac.uk/gde/work/sdp/SDPArduino.zip
http://www.inf.ed.ac.uk/teaching/courses/sdp/Rotarylib.zip

Add a new board

You can search the supported range of programmable boards by using the
Boards Manager which can be found here:-
Tools - Board: "Arduino/Genuino Uno" - Boards Manager

To add a new board to the range of supported devices in the arduino ide go to
File - Preferences in the top menu of the IDE. When the Preferences window appears, copy and paste the board manufacturers link to the Additional Boards Manager URLs textbox. (This step may take about 20 min.)

Then go back to the Boards Manager window to search for your new board and click to install it. Once completed your new board should be available under the Tools-Board menu to select as your working board.

Motor test sketch

Download the motor test sketch from the link below:-
http://homepages.inf.ed.ac.uk/gde/work/sdp/SDPMotorTest.zip
Create a working folder and unzip the test file. If you haven't already done so, add the SDPArduino library to your version of the arduino ide.
Upload the sketch to your arduino and then unplug the USB connection.
Connect the battery pack, interface shield, motor board and motors as shown in the diagram linked below:-
http://www.inf.ed.ac.uk/teaching/courses/sdp/SDP2019/arduino_connection_diagram.pdf
The Power/Interface shield and motor boards are the ones in the images linked below.
http://www.inf.ed.ac.uk/teaching/courses/sdp/SDP2019/powerBoard.pdf
http://www.inf.ed.ac.uk/teaching/courses/sdp/SDP2019/motorBoard.pdf
The battery pack should be plugged in last.

The motor test code should engage all motors clockwise, then anti-clockwise, before cycling through them all individually, both at 50% and 100%

Rotary encoder test sketch

Download the rotary master file from the link below:-
http://www.inf.ed.ac.uk/teaching/courses/sdp/RotarySlave.zip
Create a working folder and unzip the test file. If you haven't already done so, add the Rotarylib library to your version of the arduino ide.
Upload the sketch to your arduino.
With the Interface shield attached to the arduino, connect the encoder board via the I2C cable and plug an encoder in. (The encoder board is board in the image linked below:-
http://www.inf.ed.ac.uk/teaching/courses/sdp/SDP2019/encoderBoard.pdf)
In the arduino ide select Tools - Serial Monitor and change the baud rate to 115200
You should now see 6 sets of encoder values scrolling on your screen with the values increasing and decreasing as you rotate the encoder clockwise and anti-clockwise.

Please note that both the NXT and EV3 motors can be connected via a breakout board and splitter cable to allow you to control them from our motor board and read back their enocer information via our encoder board.

Wireless Communication (RF - Radio Frequency)

The arduinos have a built in SRF module and compatible SRF USB sticks are available. Both devices need pairing with each other and the requirements for doing so can be found in the guide linked below.
http://www.inf.ed.ac.uk/teaching/courses/sdp/srf_setup.txt