Preface

About SunFounder

SunFounder is a technology company focused on Raspberry Pi and Arduino open source community development. Committed to the promotion of open source culture, we strive to bring the fun of electronics making to people all around the world and enable everyone to be a maker. Our products include learning kits, development boards, robots, sensor modules and development tools. In addition to high quality products, SunFounder also offers video tutorials to help you build your own project. If you have interest in open source or making something cool, welcome to join us! Visit www.sunfounder.com for more!

About This Kit

This learning kit focuses on the popular open source platform Arduino. You can learn the knowledge of the Arduino servo by applying this kit.

In this book, we will show you how to build the bionic robot via description, illustrations of physical components, in both hardware and software respects. You may visit our website www.sunfounder.com to download the related code and view the user manual on LEARN -> Get Tutorials and watch related videos under VIDEO.

Free Support

If you have any **TECHNICAL questions**, add a topic under FORUM section on our website and we'll reply as soon as possible.

For **NON-TECH questions** like order and shipment issues, please send an email to service@sunfounder.com. You're also welcomed to share your projects on FORUM.

Contents

Get Started with Mixly

This is an extension document of the user manual *DIY 4-DOF Robot Kit User Manual,* which shows how to apply **Mixly** to reach the same functions of the Arduino IDE.

Install program and wire of the Sloth please refer to: *DIY 4-DOF Robot Kit User Manual*

Overview

Mixly is a graphical programming software with some blocks embedded in. You can program by dragging and dropping blocks to combine together like building blocks, thus enabling a complete process of the same sketch in IDE. This simple programming software is aimed to help those who don't want to learn or don't know programming.

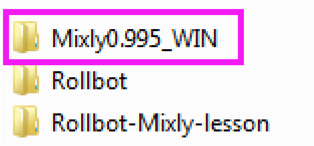
Download the Mixly Software

Download the latest Mixly software at:

http://wiki.sunfounder.cc/index.php?title=Get_started_with_Mixly

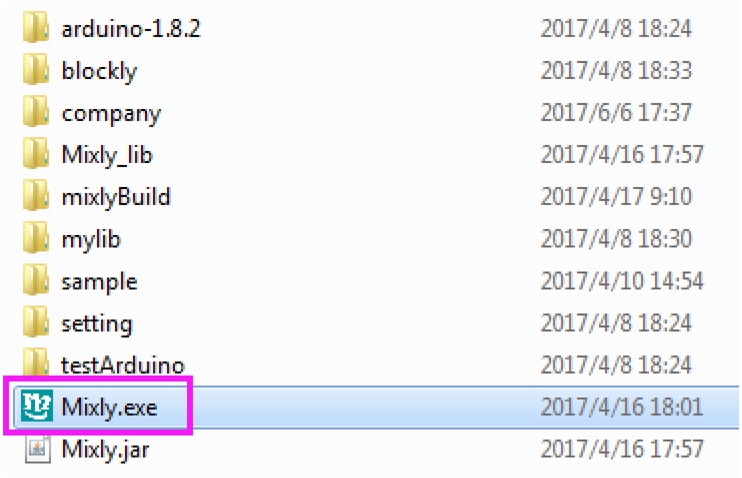
Open the Software

Get into folder *Mixly0.995_WIN:*



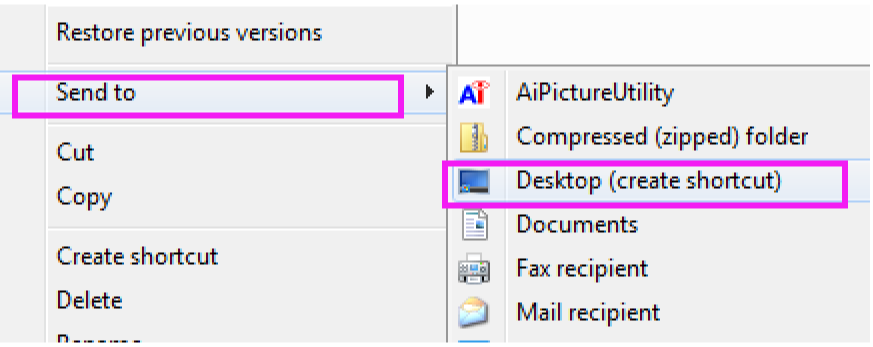
Mixly0.995_WIN
Rollbot
Rollbot-Mixly-lesson

Double click the **Mixly** icon:



arduino-1.8.2	2017/4/8 18:24
blockly	2017/4/8 18:33
company	2017/6/6 17:37
Mixly_lib	2017/4/16 17:57
mixlyBuild	2017/4/17 9:10
mylib	2017/4/8 18:30
sample	2017/4/10 14:54
setting	2017/4/8 18:24
testArduino	2017/4/8 18:24
Mixly.exe	2017/4/16 18:01
Mixly.jar	2017/4/16 17:57

For convenience, we can right-click and select **Send to** -> **Desktop (create shortcut)** to create a desktop shortcut.

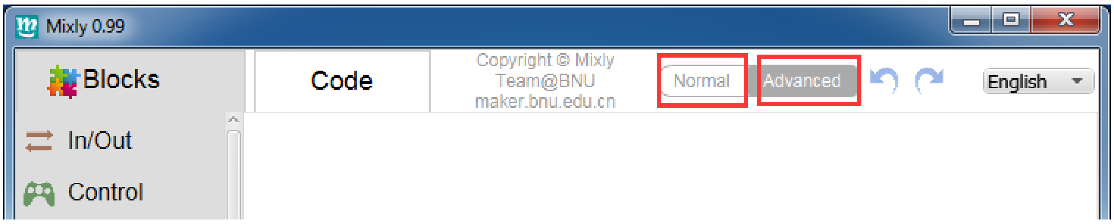


Brief Introduction

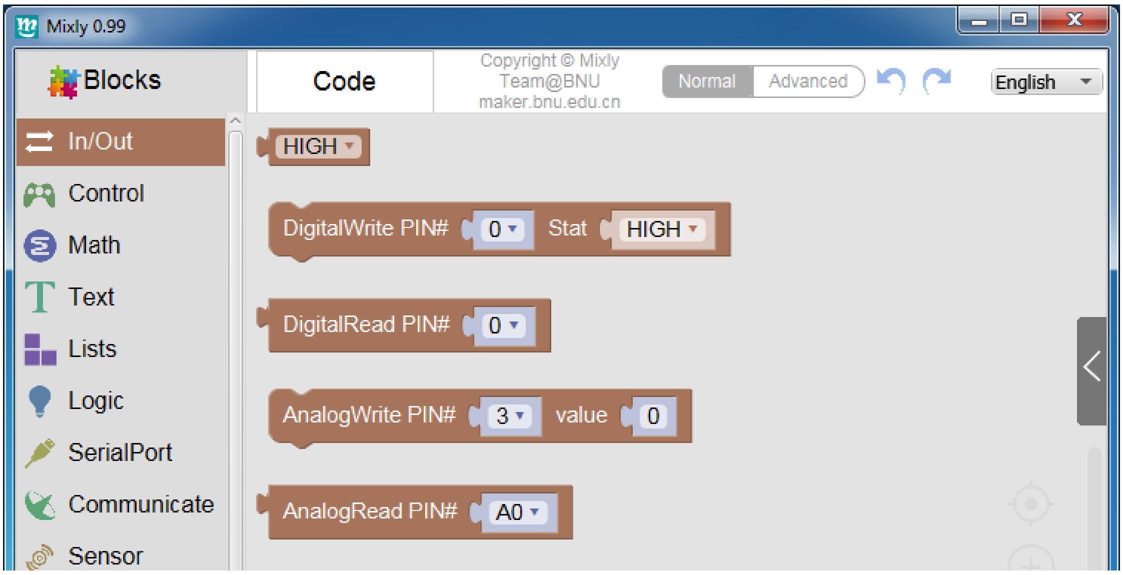
Blocks

The **Mixly0.995_win** version includes In/Out, Control, SerialPort, and some other block categories. Next, let's get through what these categories cover.

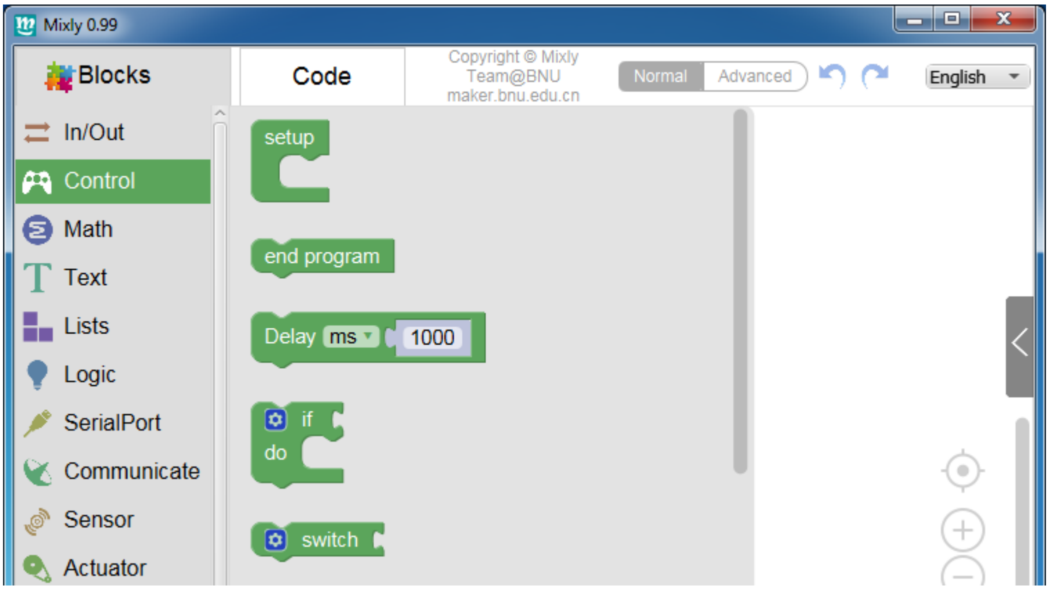
Note: Block categories supports Normal and Advanced views. For more functions, just click **Advanced** to use after you've mastered much.



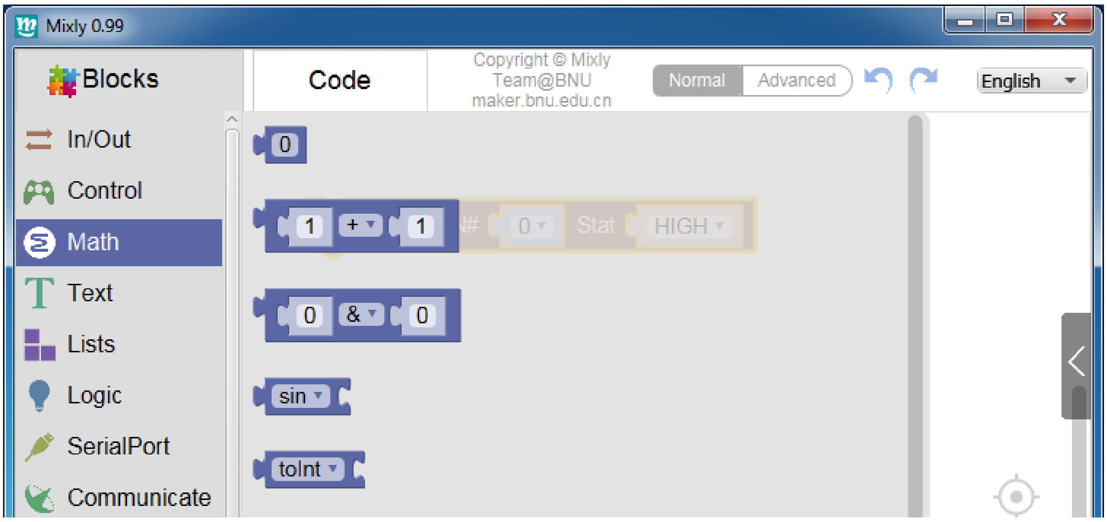
In/Out: DigitalRead, DigitalWrite, AnalogRead, AnalogWrite, attachInterrupt, detachInterrupt, ShiftOut, etc.



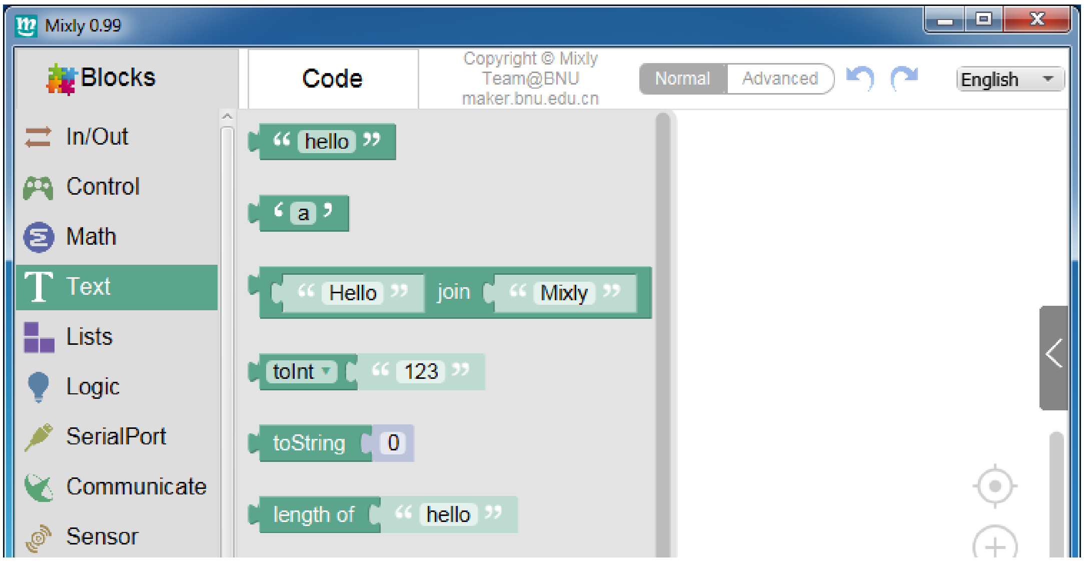
- Control: Delay, if…do…, repeat…do…, System running time, setup, etc.



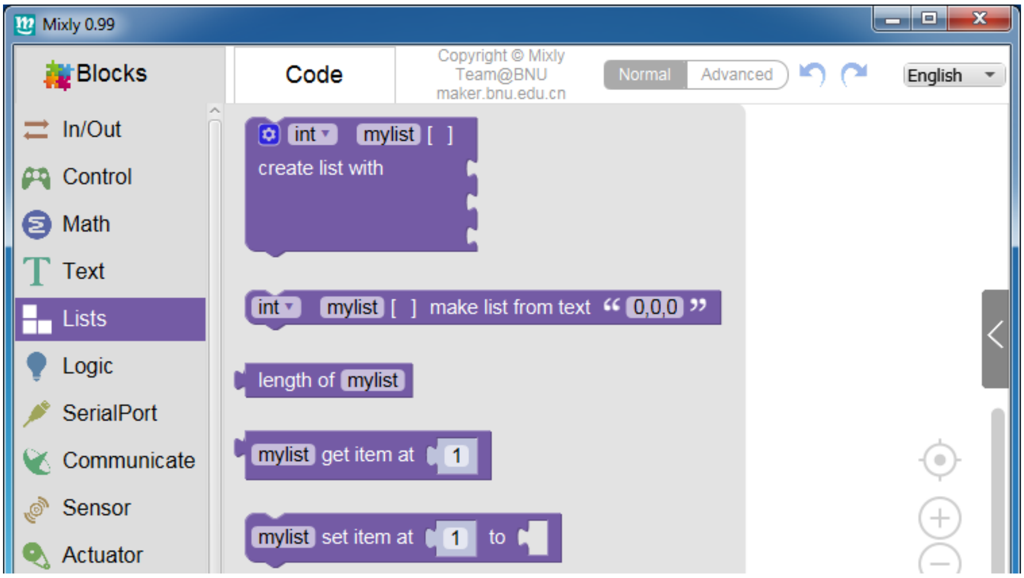
- Math: Map, Constrain, operations like +/-, sin/cos, random integer from…to…, etc.



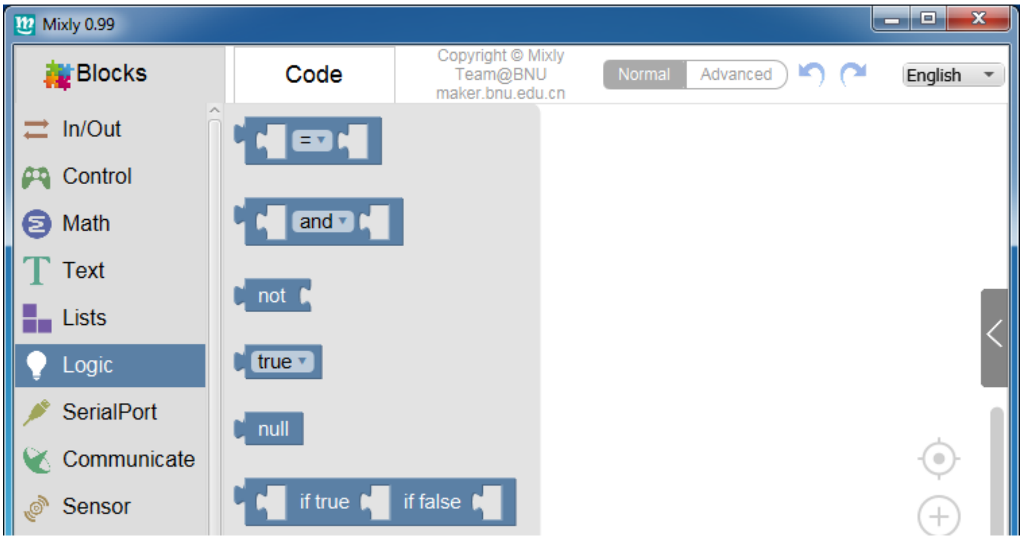
- Text: text join, number to string, length of string, compareTo, etc.



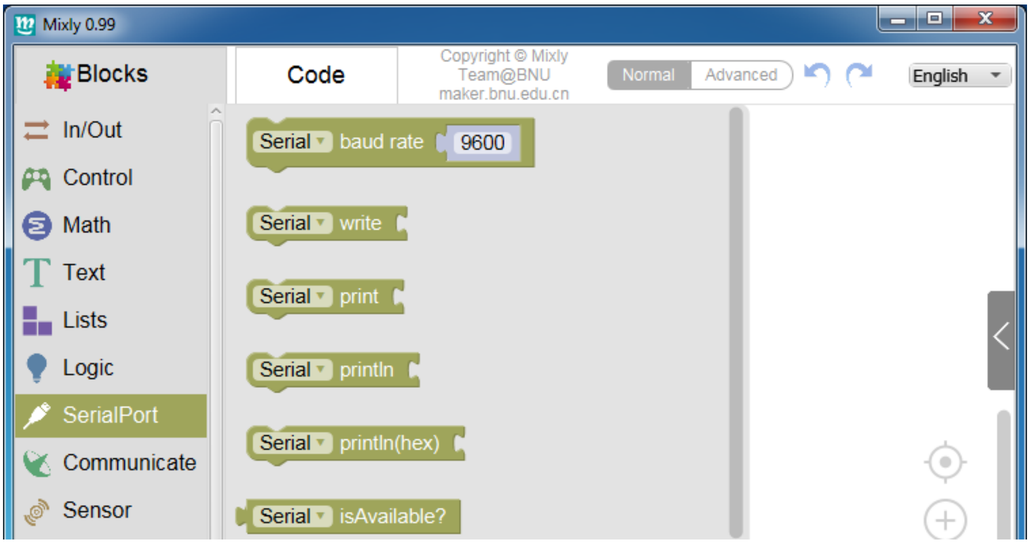
- Lists: create list, get item at list, set item at list, etc.



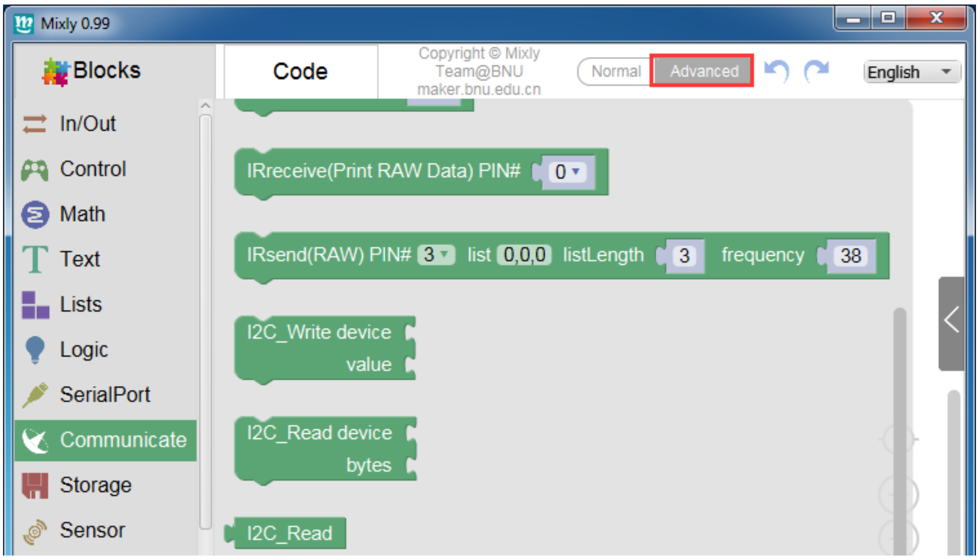
- Logic: if conditional statement, logical operations.



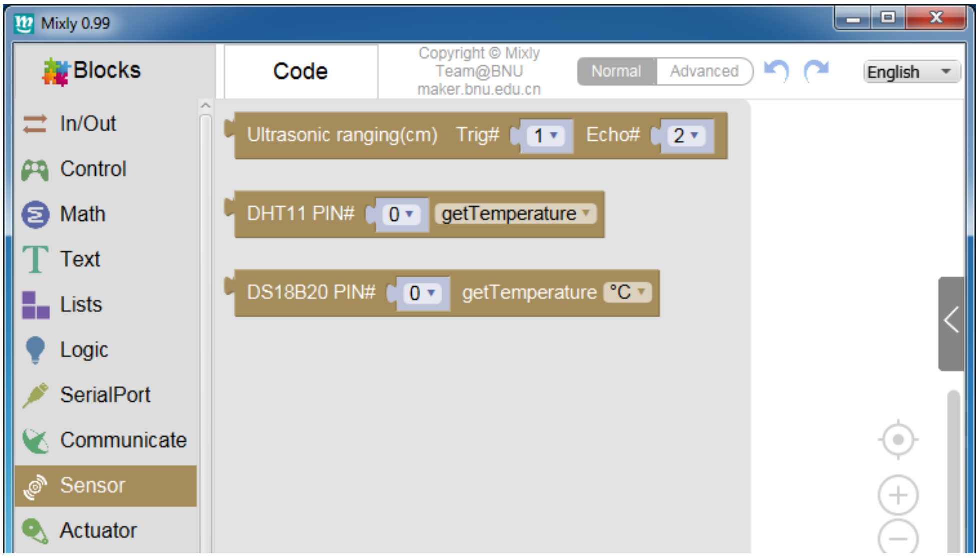
- SerialPort: set baud rate, print data, read data.



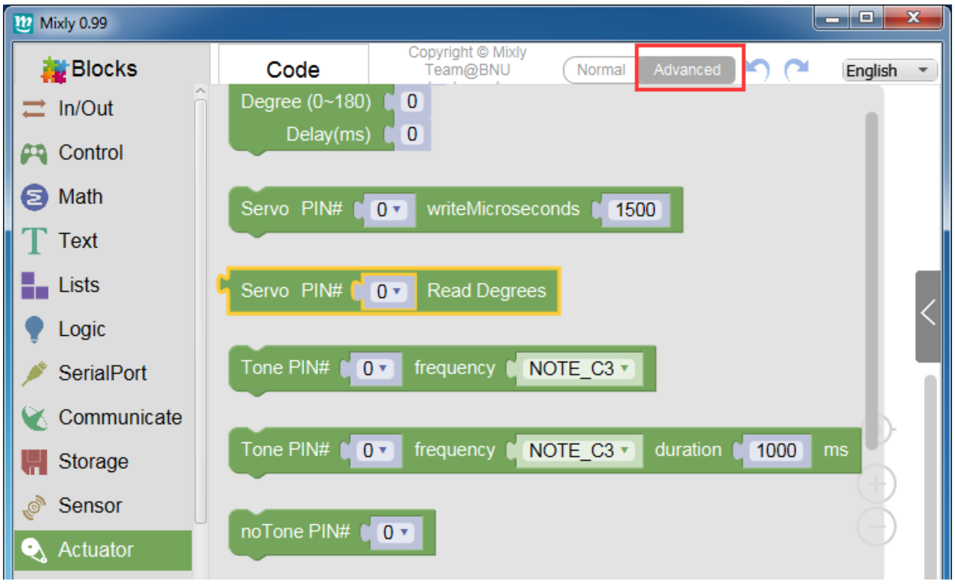
- Communicate: IR receive, IR send, I2C read/write device, to SPI, etc.



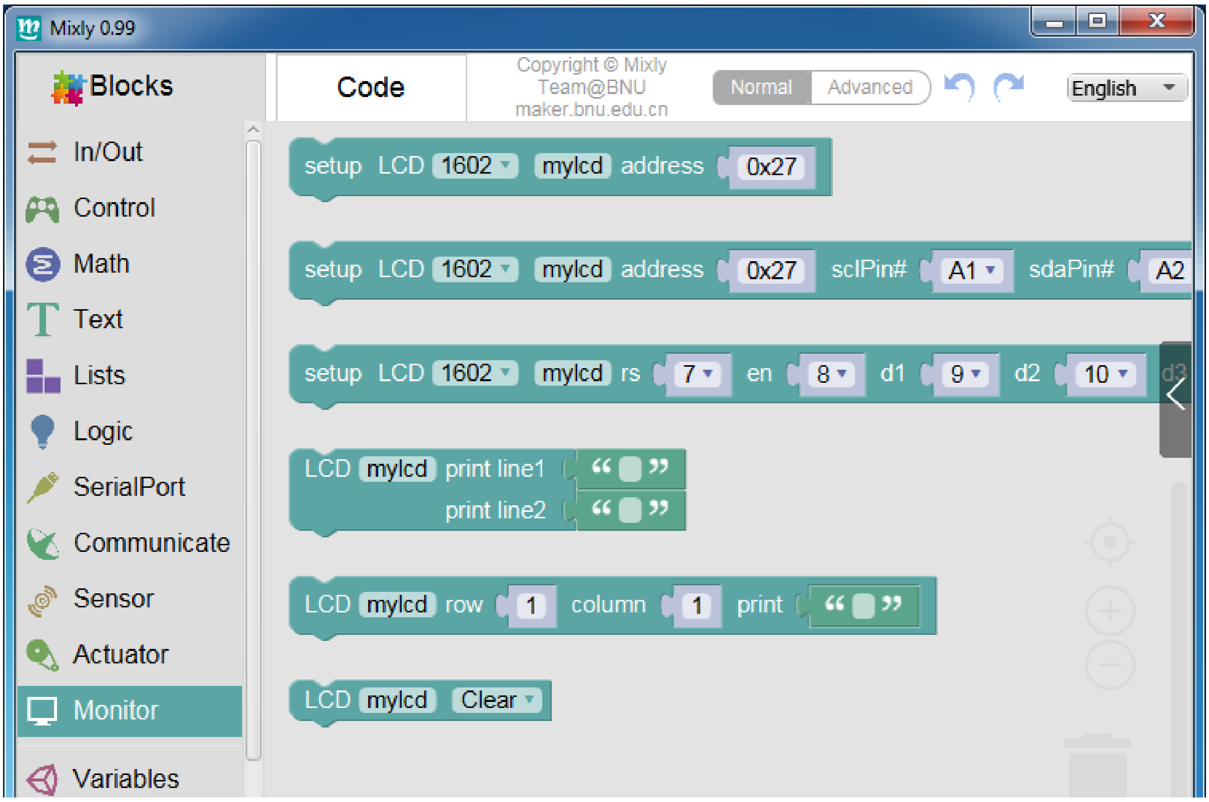
- Sensor: ultrasonic, DHT11, DS18B20.


Mixly 0.99
Blocks
Code
Copyright © Mixly Team@BNU maker.bnu.edu.cn
Normal
Advanced
English
In/Out
Control
Math
Text
Lists
Logic
SerialPort
Communicate
Sensor
Actuator
Ultrasonic ranging(cm) Trig# 1 Echo# 2
DHT11 PIN# 0 getTemperature
DS18B20 PIN# 0 getTemperature °C

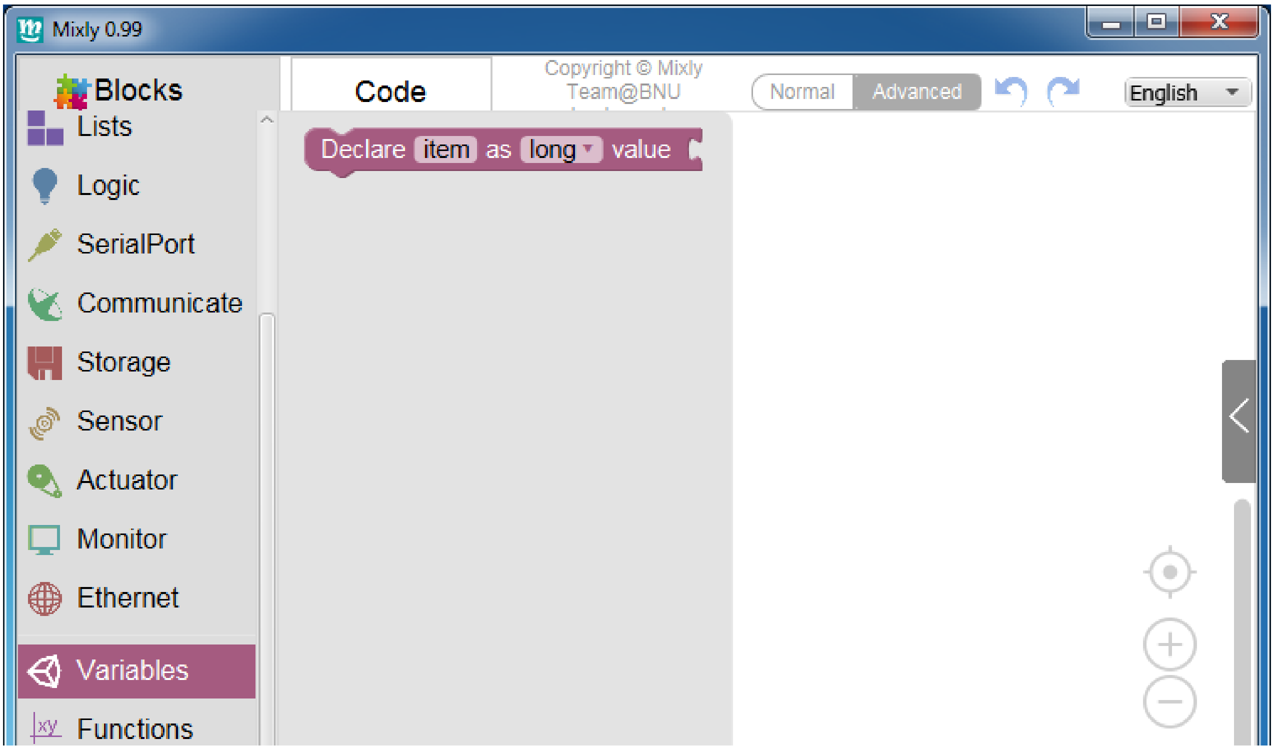
- Actuator: Tone control, servo and stepper control.


Mixly 0.99
Blocks
Code
Copyright © Mixly Team@BNU
Normal
Advanced
English
In/Out
Control
Math
Text
Lists
Logic
SerialPort
Communicate
Storage
Sensor
Actuator
Degree (0~180) 0
Delay(ms) 0
Servo PIN# 0 writeMicroseconds 1500
Servo PIN# 0 Read Degrees
Tone PIN# 0 frequency NOTE_C3
Tone PIN# 0 frequency NOTE_C3 duration 1000 ms
noTone PIN# 0

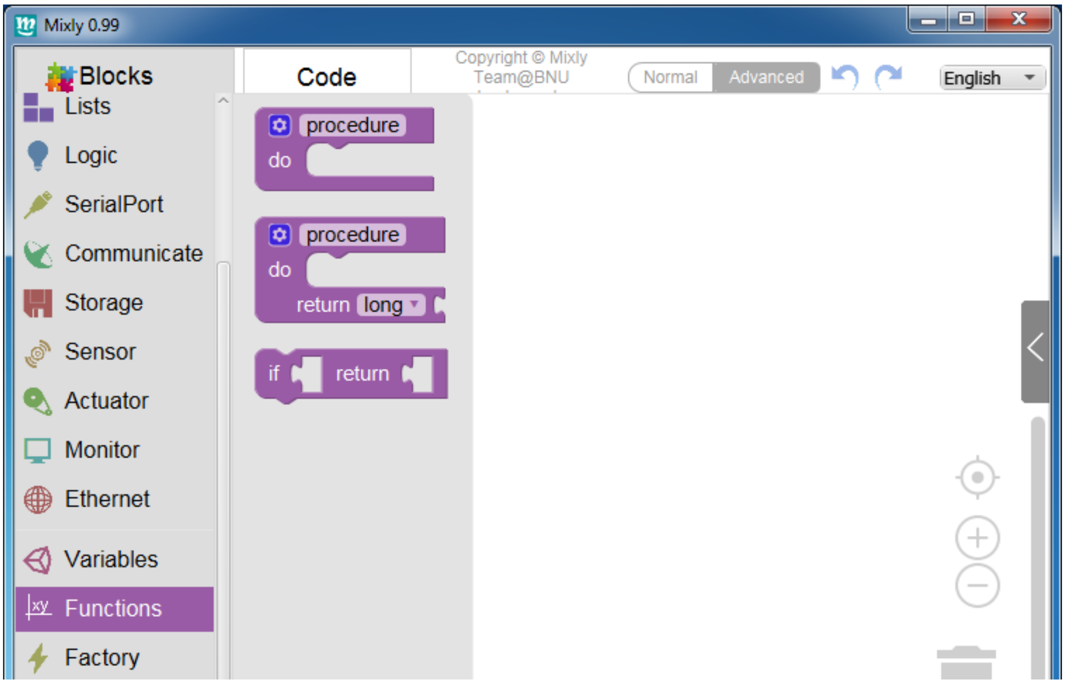
- **Monitor**: setup LCD pin, LCD print data, set LCD I2C address.


Mixly 0.99
Blocks
Code
Copyright © Mixly Team@BNU maker.bnu.edu.cn
Normal
Advanced
English
In/Out
Control
Math
Text
Lists
Logic
SerialPort
Communicate
Sensor
Actuator
Monitor
Variables
setup LCD 1602 mylcd address 0x27
setup LCD 1602 mylcd address 0x27 sclPin# A1 sdaPin# A2
setup LCD 1602 mylcd rs 7 en 8 d1 9 d2 10 d3
LCD mylcd print line1 " "
print line2 " "
LCD mylcd row 1 column 1 print " "
LCD mylcd Clear

- **Variables**: High/Low, True/False, float, integer, Boolean, string variables, etc.



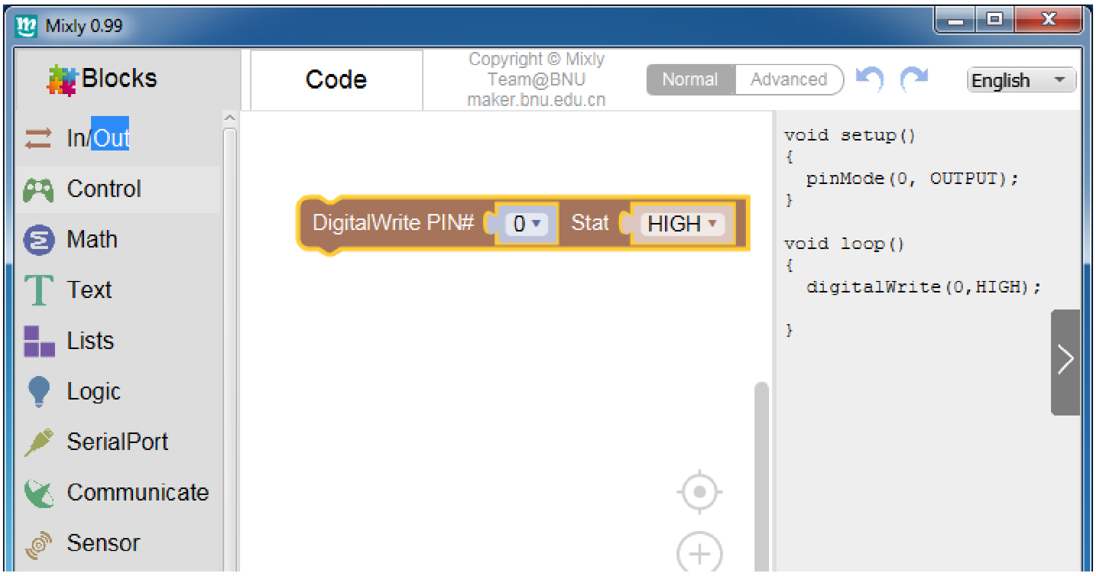
- Functions: define function, do procedure with, etc.



Code

You can do graphical programming in this coding area, and the Arduino code will be shown on the right bar for reference.

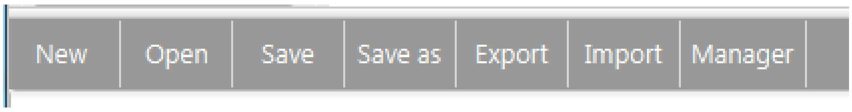
Note: The code on the right section is just for check and not editable. You can change the blocks on the left coding area to modify the code.

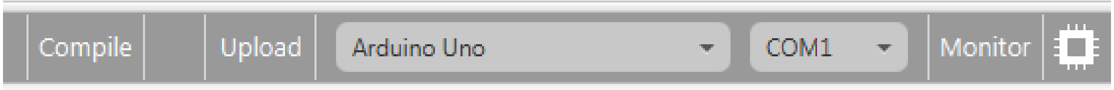


```
void setup()
{
  pinMode(0, OUTPUT);
}

void loop()
{
  digitalWrite(0,HIGH);

}
```

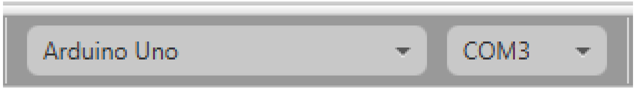
Tools

On the toolbars, you can Open or Save the code, Export or Import libraries, Compile or Upload the code, and select the Board and Port, and check the Serial Monitor.





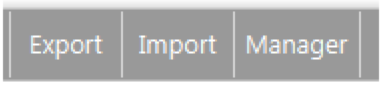
Select the board and port COMxx: Mixly supports all the official Arduino boards and SunFounder boards (Nano, MARS, and Mercury). Connect the board to the computer, and select the port of the board COMxx as shown in **Device Manager**.



Program Compile and Upload: you can do compile and upload on Mixly, and it will return information, thus you can know whether the code is compiled or uploaded successfully.

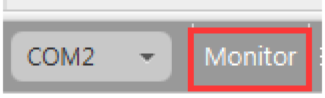
Create, Open and Save code: you can create, open and save code.

Import, Export Libraries and Manager: literally, import or export the related libraries.

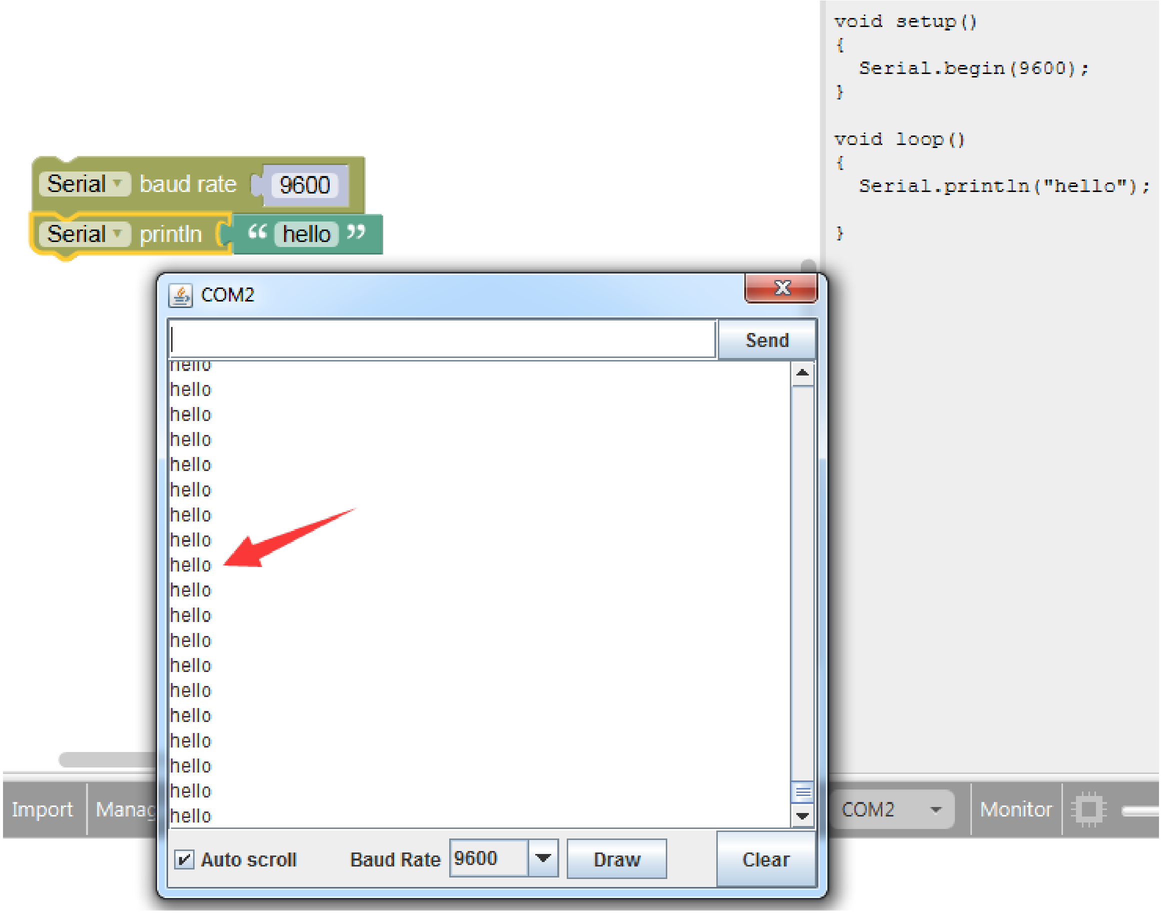


Import is to import a library, Export is to export a library, and Manager is to rename or delete the imported library which may be used in later part.

Serial Monitor: to print some results or characters you set.



For instance, set print "hello" in the code.



```
void setup()
{
  Serial.begin(9600);
}

void loop()
{
  Serial.println("hello");

}
```

```
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
hello
```

Driver

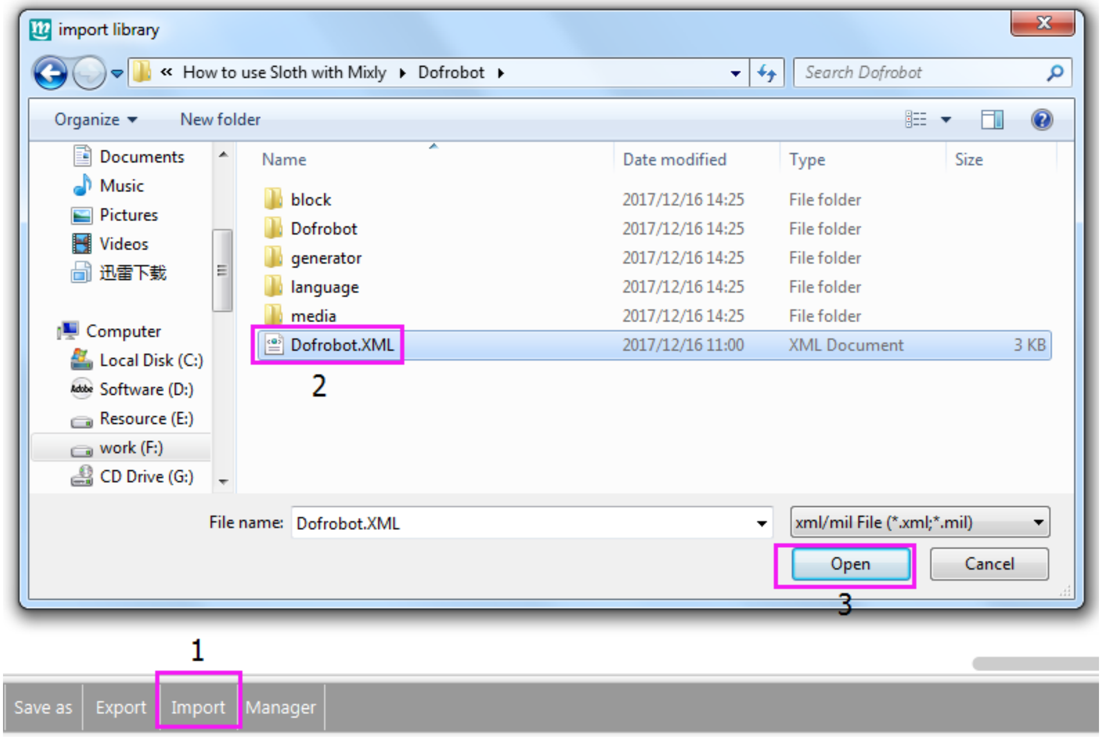
If the driver is not installed, the Nano board will not be able to be recognized by your computer. Therefore, before using it, please install appropriate driver.

For Windows users, run *PL2303_Prolific_DriverInstaller_v1180B* in the folder Driver.

For Mac users, refer to the folder *PL2303_MacOSX_1_6_1_20170620* in the folder Driver.

Add Library

Unzip **Dofrobot** package, and click **Import**, to select **Dofrobot.XML** under ***How to use Sloth with Mixly\Dofrobot***, and click **open**.



Name	Date modified	Type	Size
block	2017/12/16 14:25	File folder	
Dofrobot	2017/12/16 14:25	File folder	
generator	2017/12/16 14:25	File folder	
language	2017/12/16 14:25	File folder	
media	2017/12/16 14:25	File folder	
Dofrobot.XML	2017/12/16 11:00	XML Document	3 KB

File name: Dofrobot.XML

xml/mil File (*.xml;*.mil)

Then you will see the Dofrobot library in the left. If you want to import more libraries without affecting the uploading process, just delete the imported library. Here is how to do: click **Manage**, and select the library you want to remove, and click **delete**. If you want to use this library, just redo Import operations.

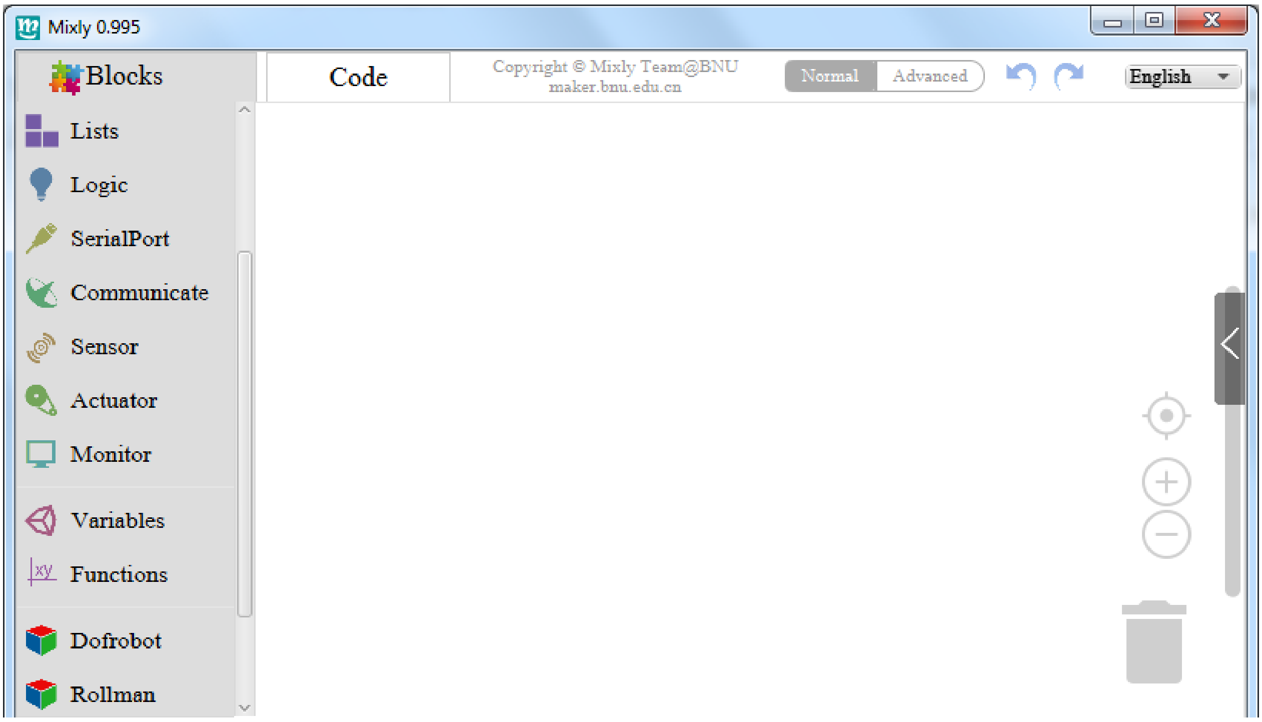
Lesson 1 Moving Forward

Overview

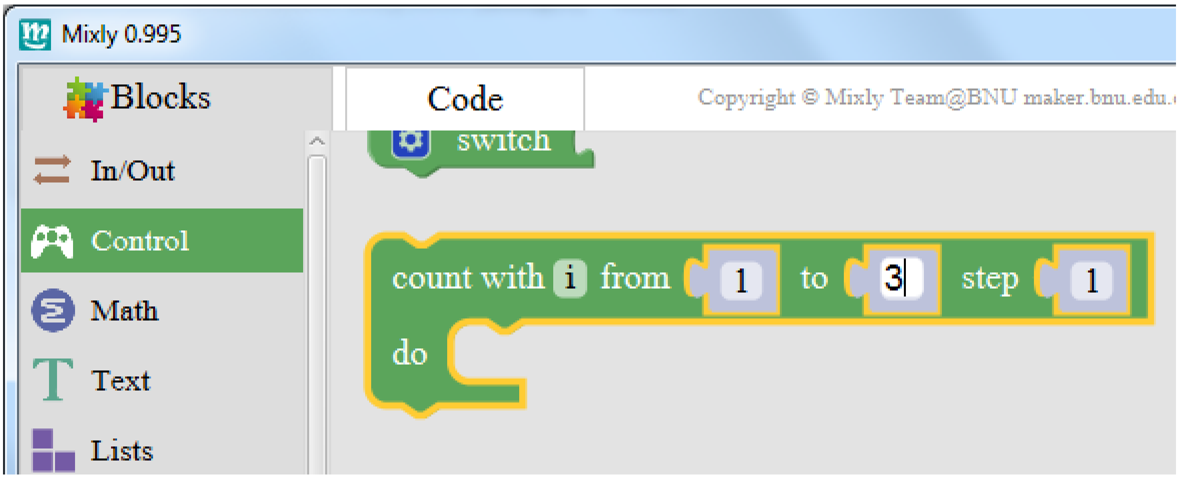
This lesson is how to command the 4-DOF Robot to moves forward and then stop.

Programming

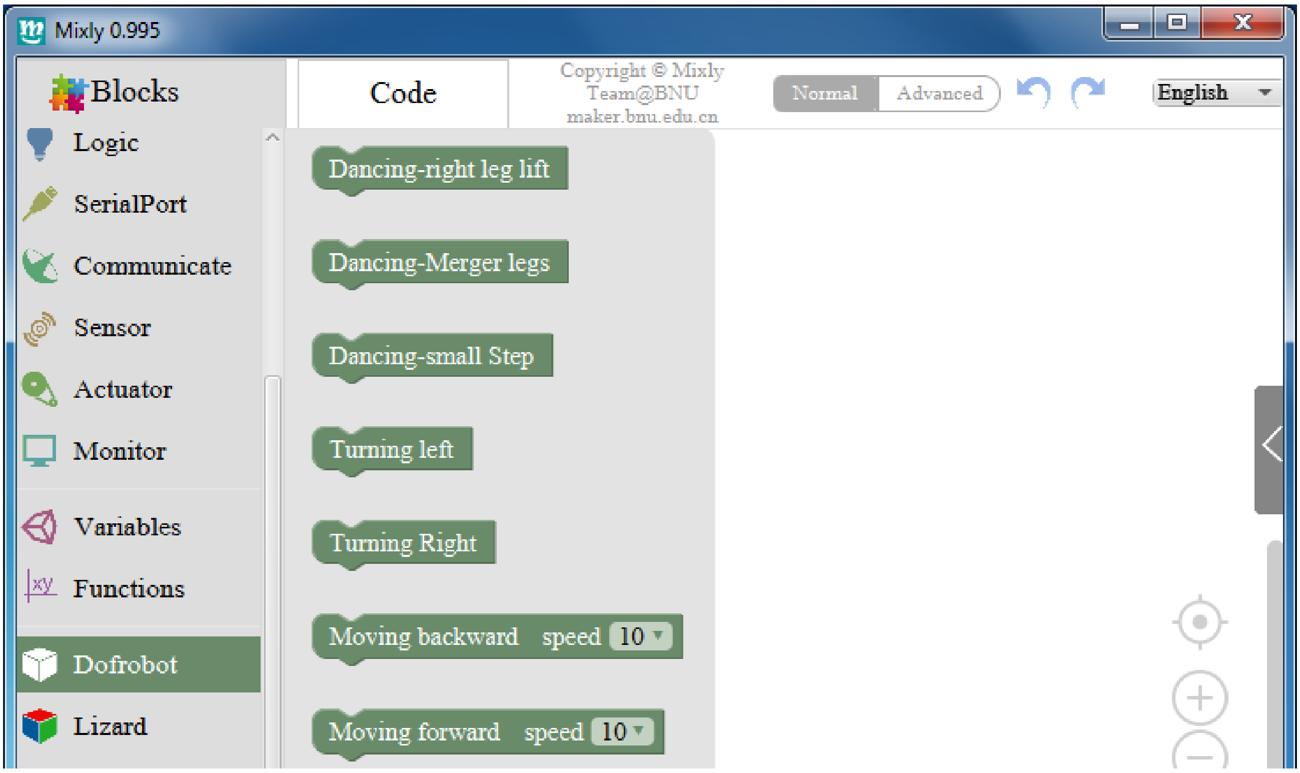
Step 1: Click the icon on the desktop to open the **Mixly** and you'll be on the homepage:



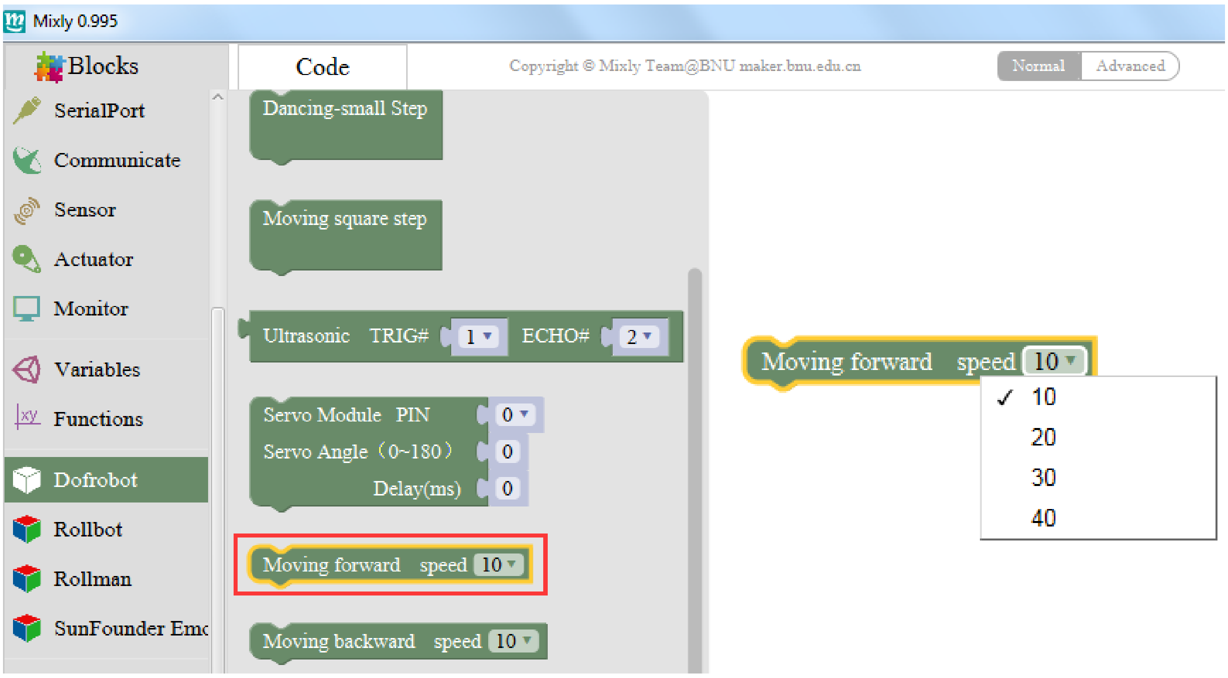
Step 2: Click Control category, drag out the count with block into the coding area. This is an accumulation block, means that count=count+1. When count=3, then stop.


Mixly 0.995
Blocks
Code
Copyright © Mixly Team@BNU maker.bnu.edu.
In/Out
Control
Math
Text
Lists
switch
count with i from 1 to 3 step 1
do

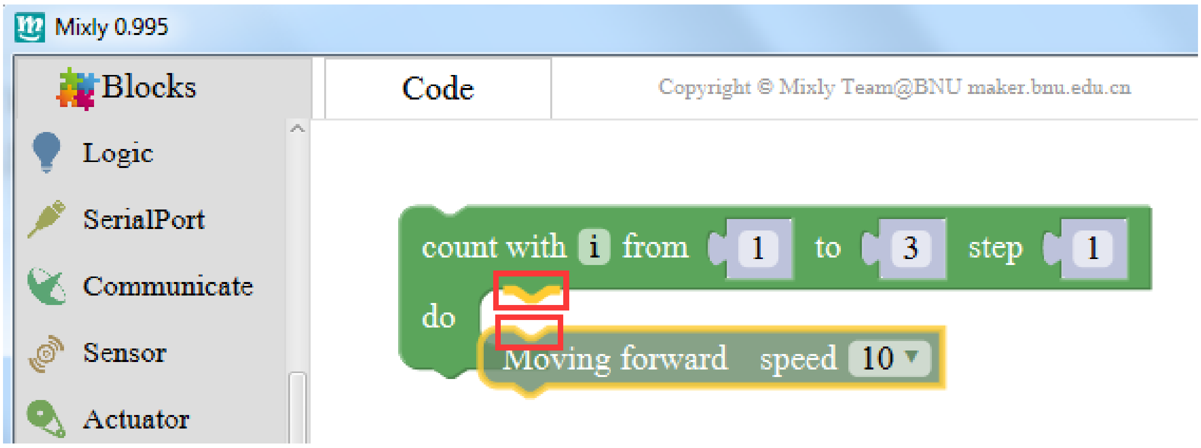
Step 3: Click Dofrobot category, then we can see several blocks.



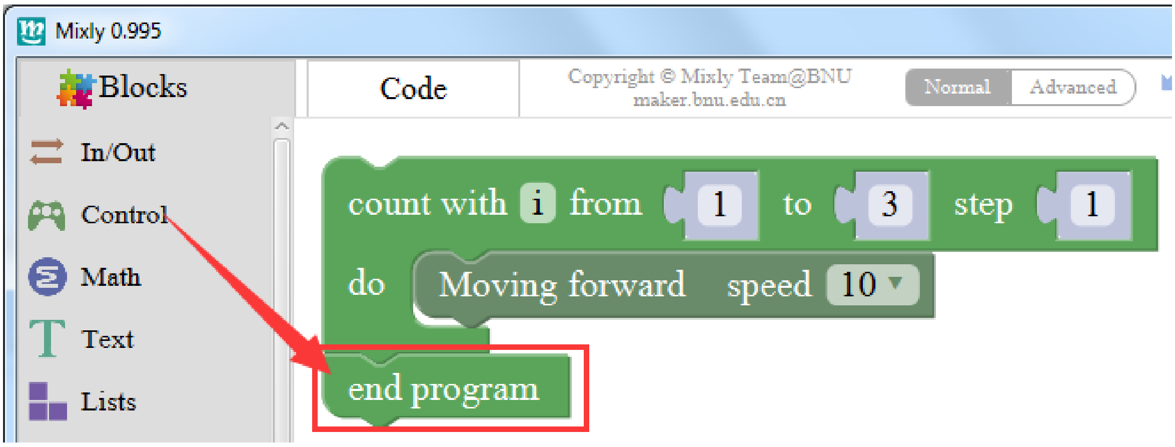
Step 4: Click and drag out Moving forward block. This is a block that can controls the robot to go forward. You can set the forward speed as 10, 20, 30, 40.



Step 5: Drag the Moving forward block to the count with block and fit the bulge and slot of the two to combine them.

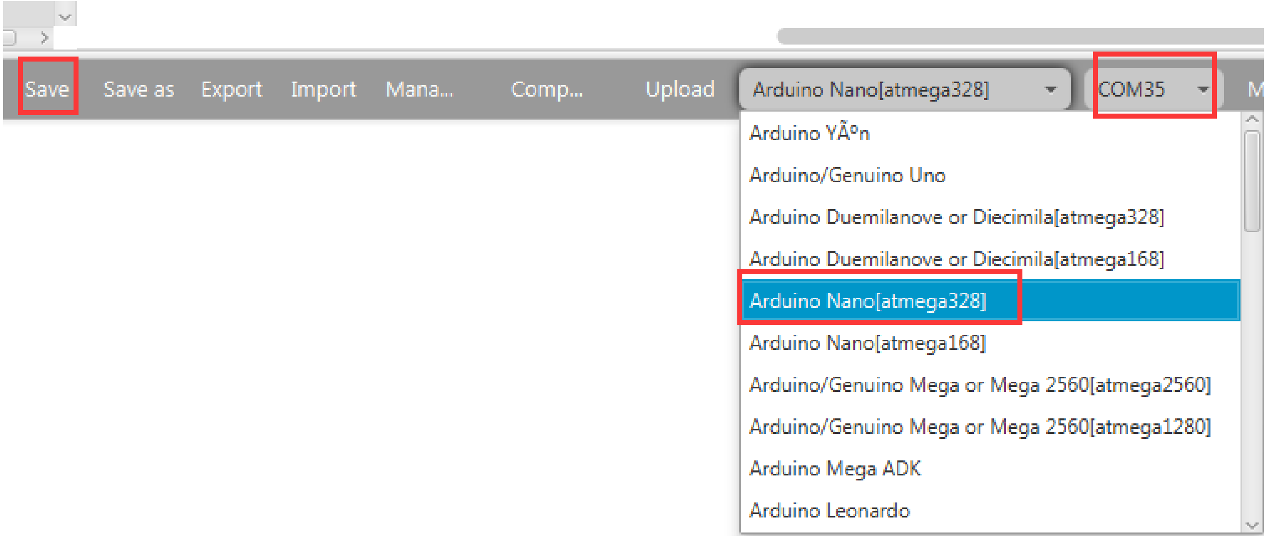


Step 6: You can end the program by the end program block from the Control category. If you don't use the end program, this process will work constantly.



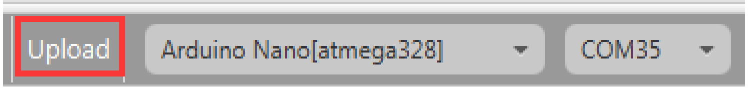
Step 7: Click **Save** after all the programming is done. Select the **board** type and **port** before uploading. For instance, if you use a **Uno** or **Mars** board, just select **Arduino/Genuino Uno**; if you use a **Mega 2560** or **Mercury**, select **Arduino/Genuino Mega** or **Mega2560**.

Then select the **port**. You can check the port in **Device Manager** when you connect the board to the computer.

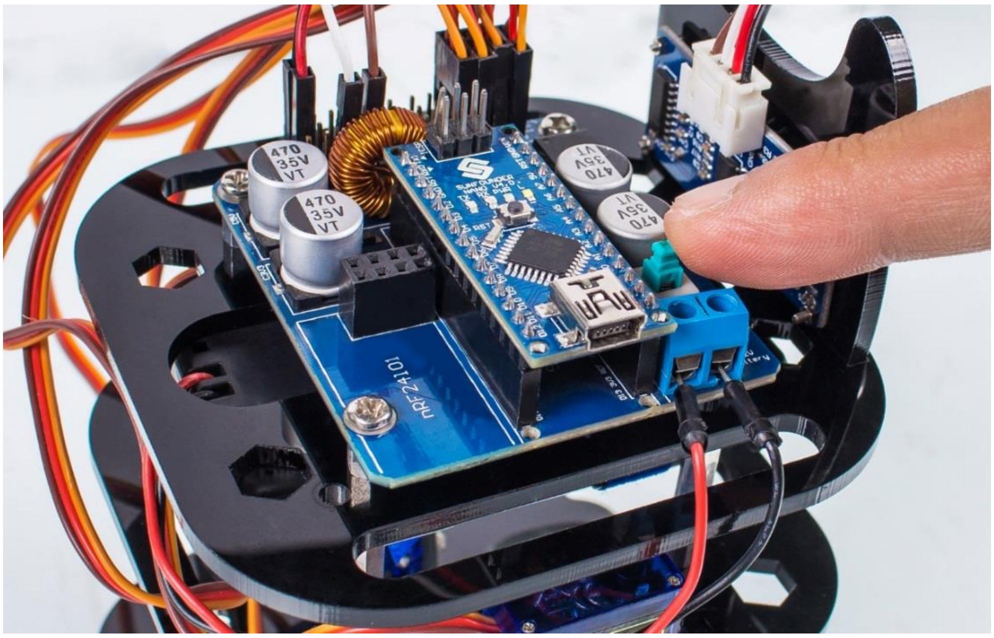


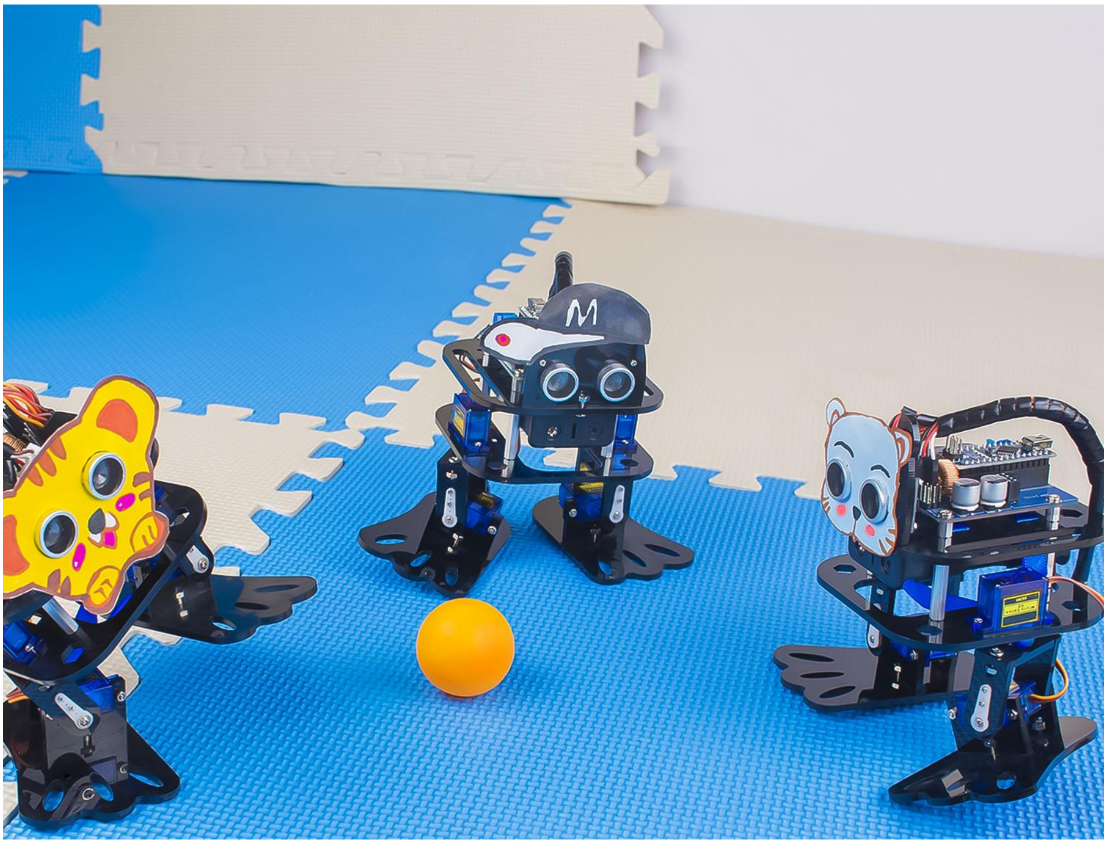
Step 8: Upload the code. If the uploading fails, check and correct the code according to the

prompt.



After burning successfully, unplug the USB cable and press the power button on the servo control board. You will see the Sloth moves forward, when two feet all go forward for three steps, it will then stop.





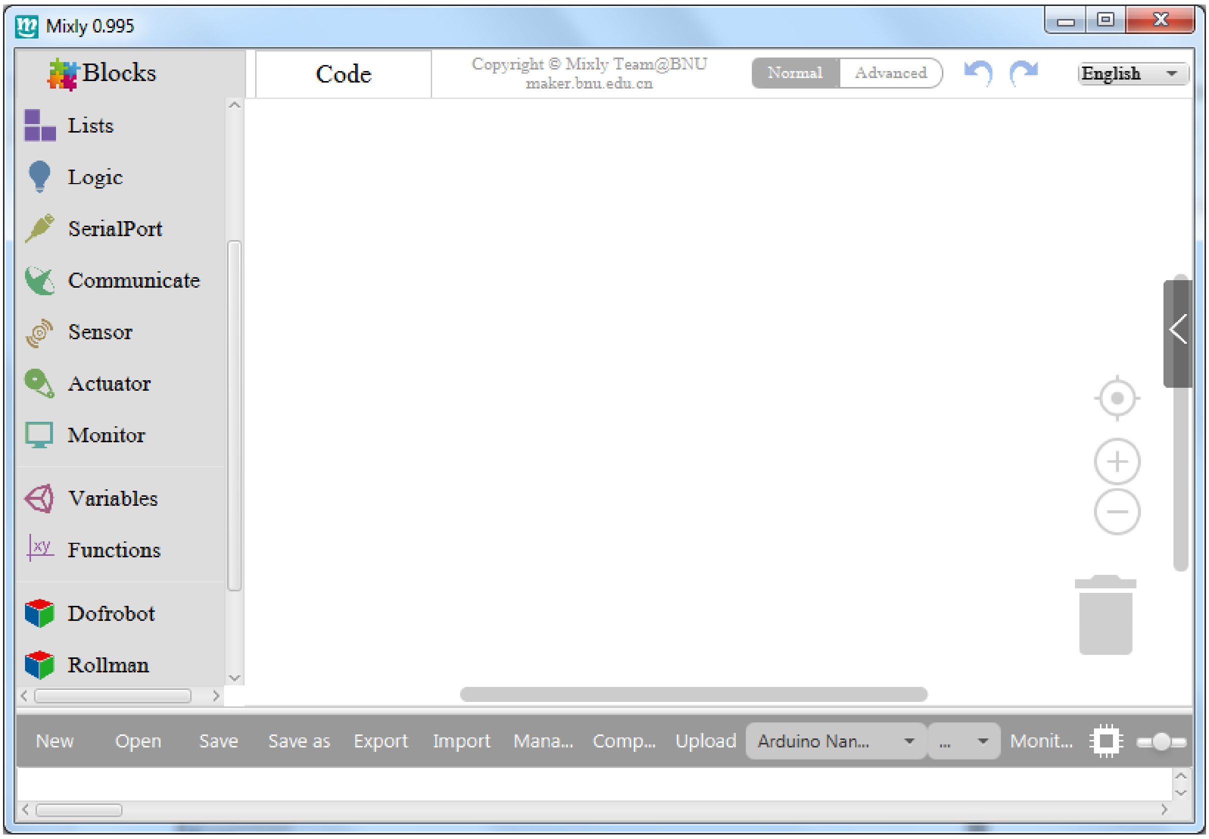
Lesson 2 Moving backward

Overview

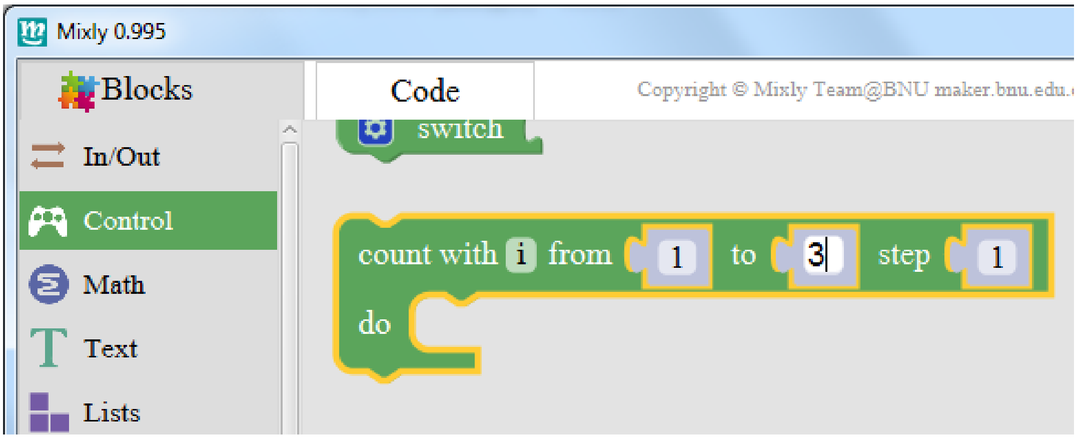
This lesson is to command the 4-DOF Robot to moves backward and then stop.

Programming

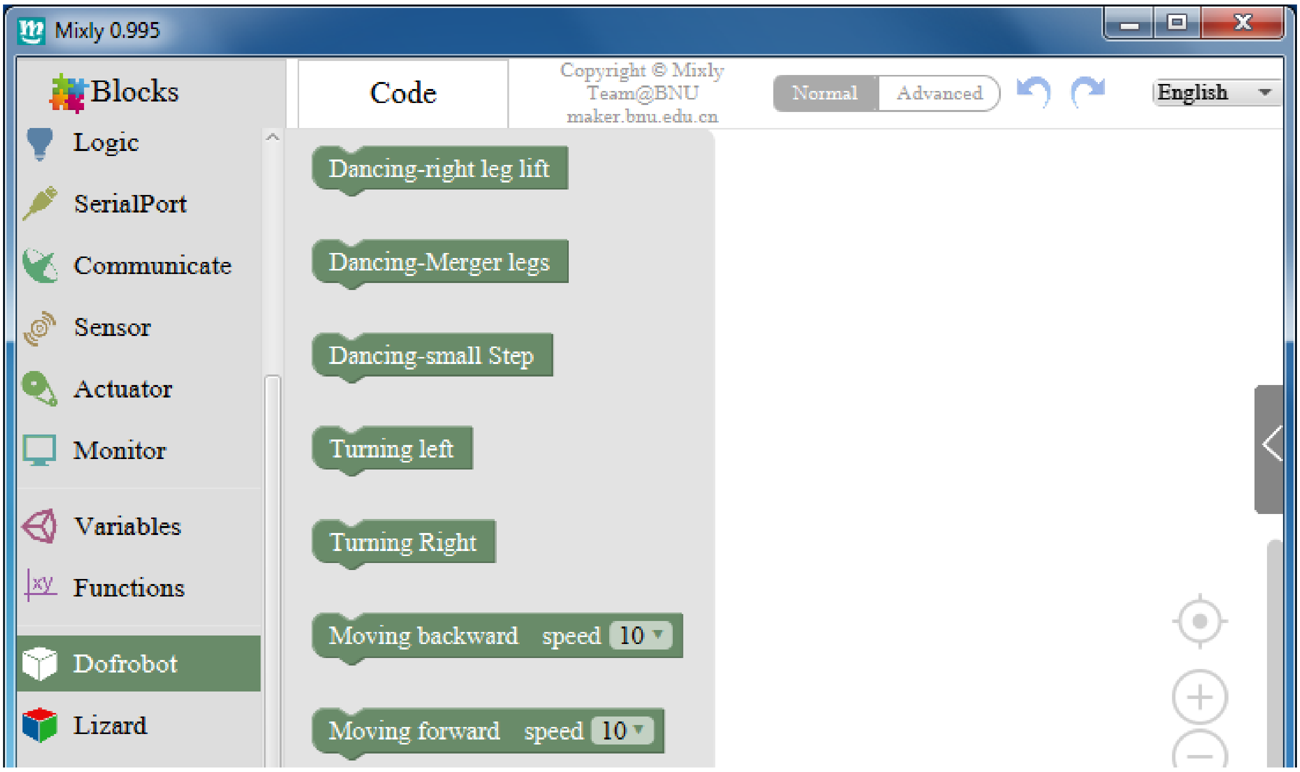
Step 1: Click the icon on the desktop, you'll be on the homepage as shown below:



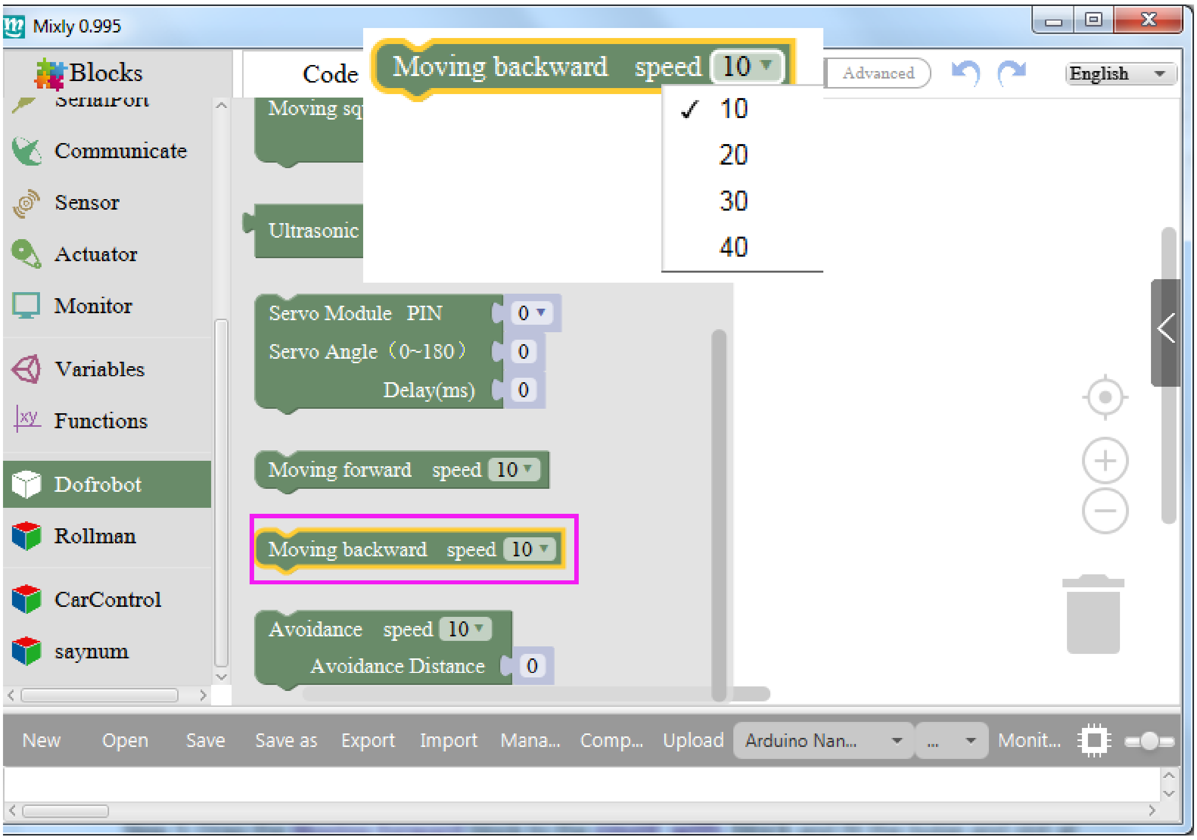
Step 2: Click the Control category, drag out the count with block into the coding area. This is an accumulation block, means that count=count+1. When count=3, the robot will stop.


Mixly 0.995
Blocks
Code
Copyright © Mixly Team@BNU maker.bnu.edu.
In/Out
Control
Math
Text
Lists
switch
count with i from 1 to 3 step 1
do

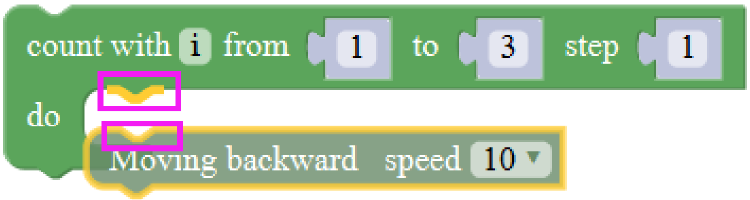
Step 3: Click Dofrobot category, then we can see several blocks.



Step 4: Click and drag out Moving backward block. This block commands the robot to moves backward. You can set the speed as 10, 20, 30 and 40.

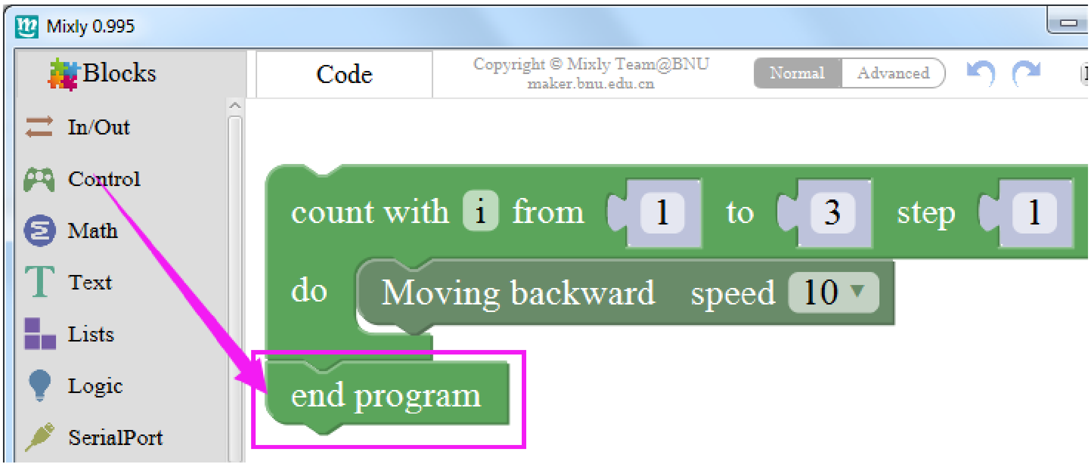


Step 5: Drag the Moving forward block to the count with block and fit the bulge and slot at the two to combine them.



```
count with i from 1 to 3 step 1
do  Moving backward  speed 10
```

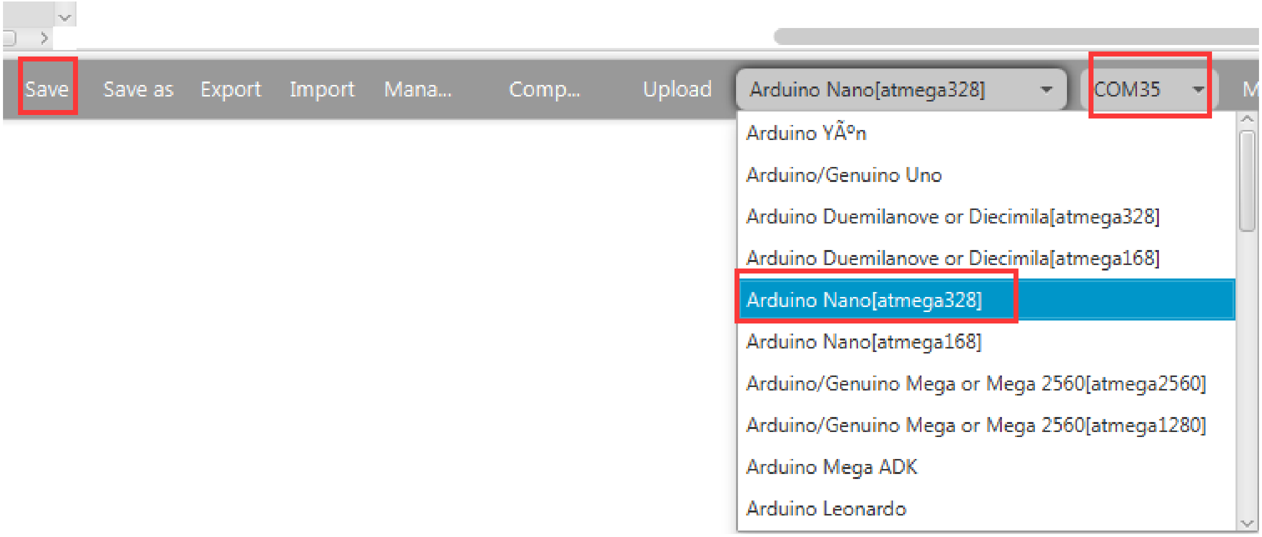
Step 6: You can end the program by the end program block from the Control category. If you don't use the end program, this process will work constantly.



```
count with i from 1 to 3 step 1
do  Moving backward  speed 10
end program
```

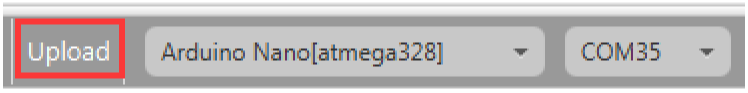
Step 7: Click **Save** after all the programming is done. Select the **board** type and **port** before uploading. For instance, if you use a **Uno** or **Mars** board, just select **Arduino/Genuino Uno**; if you use a **Mega 2560** or **Mercury**, select **Arduino/Genuino Mega** or **Mega2560**.

Then select the **port**. You can check the port in **Device Manager** when you connect the board to computer.

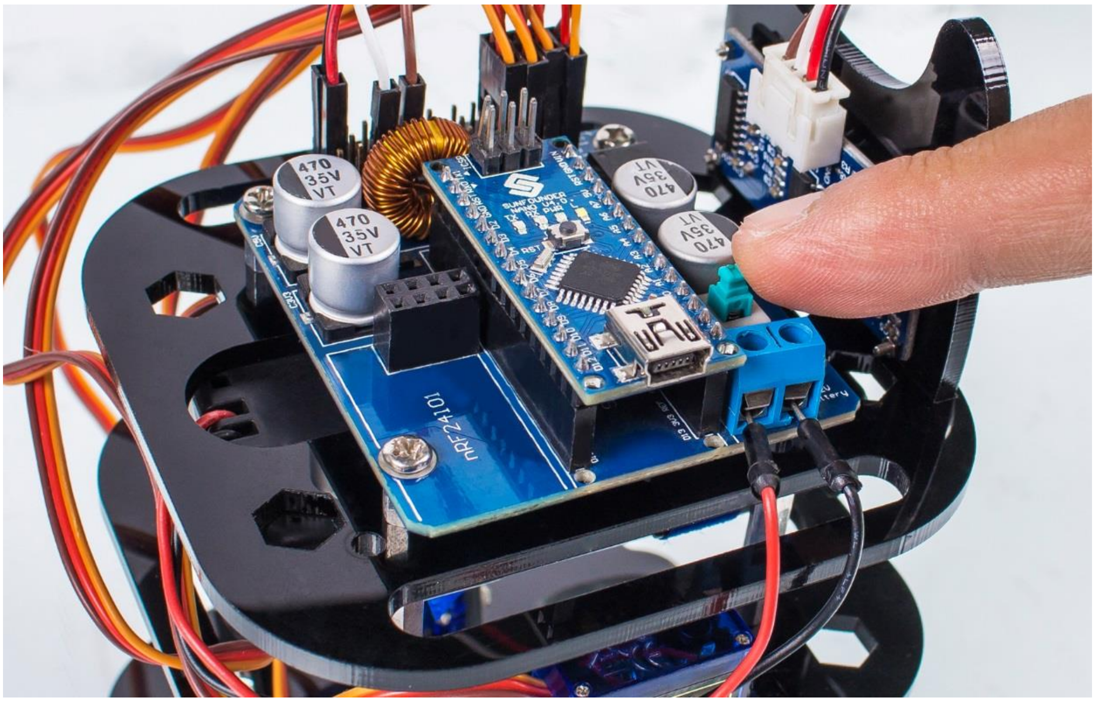


Arduino YÃºn
Arduino/Genuino Uno
Arduino Duemilanove or Diecimila[atmega328]
Arduino Duemilanove or Diecimila[atmega168]
Arduino Nano[atmega328]
Arduino Nano[atmega168]
Arduino/Genuino Mega or Mega 2560[atmega2560]
Arduino/Genuino Mega or Mega 2560[atmega1280]
Arduino Mega ADK
Arduino Leonardo

Step 8: Upload the code. If the uploading fails, check and correct the code according to the prompt.



After burning successfully, unplug the USB cable and press the power button on the servo control board. You will see the Sloth moves backward for three steps and then stop.



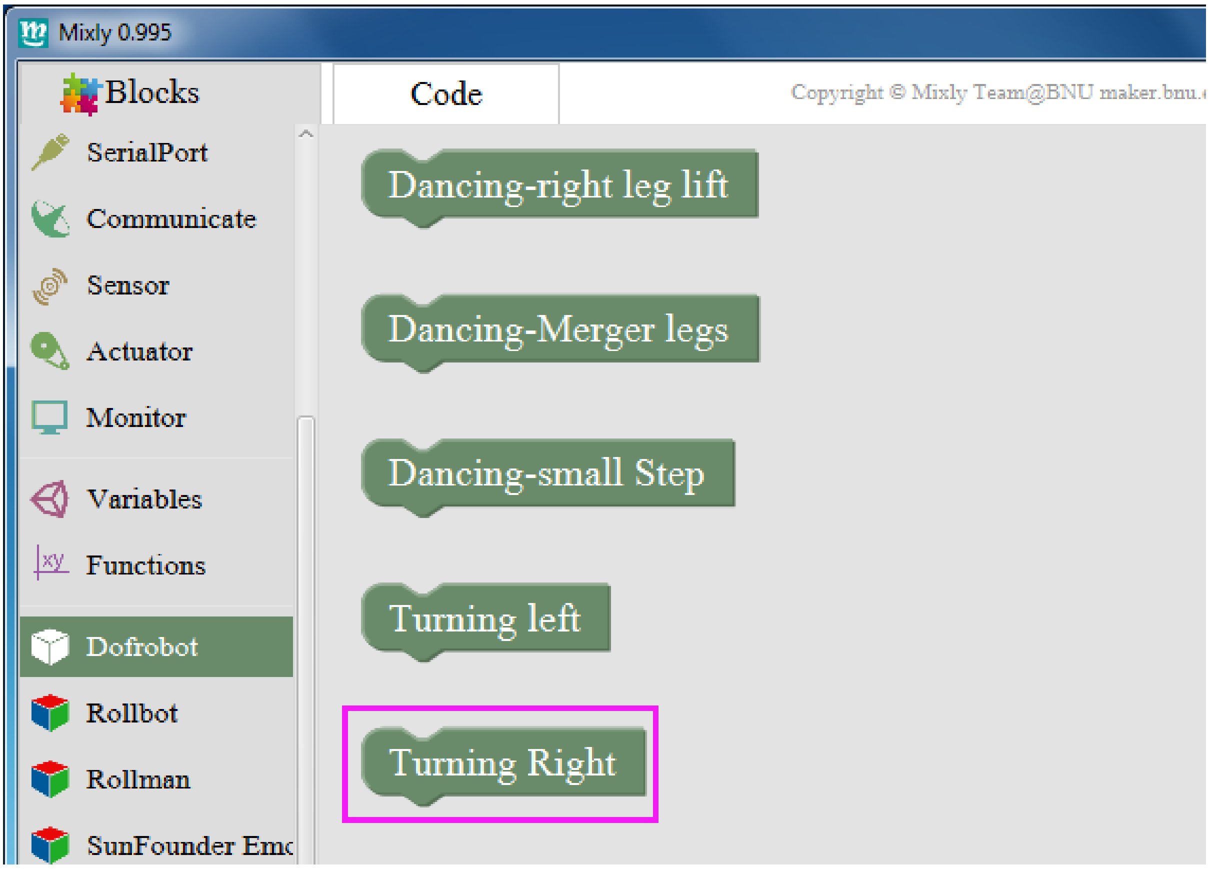
Lesson 3 Moving Forward in S-shape

Overview

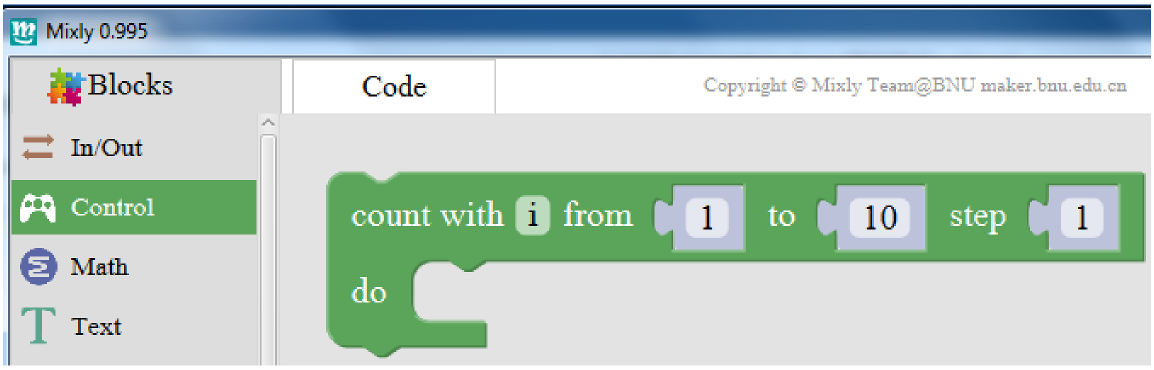
This lesson is how to command the Sloth to moves forward in S-shape.

Programming

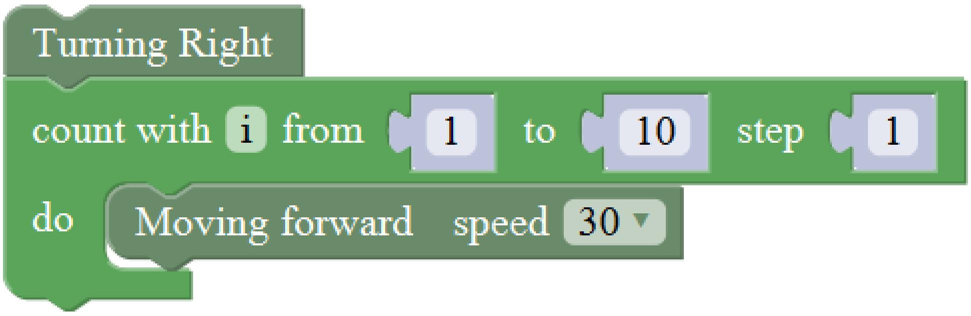
Step 1: Open the **Mixly**, and then drag out the Turning right block from Dofrobot category.



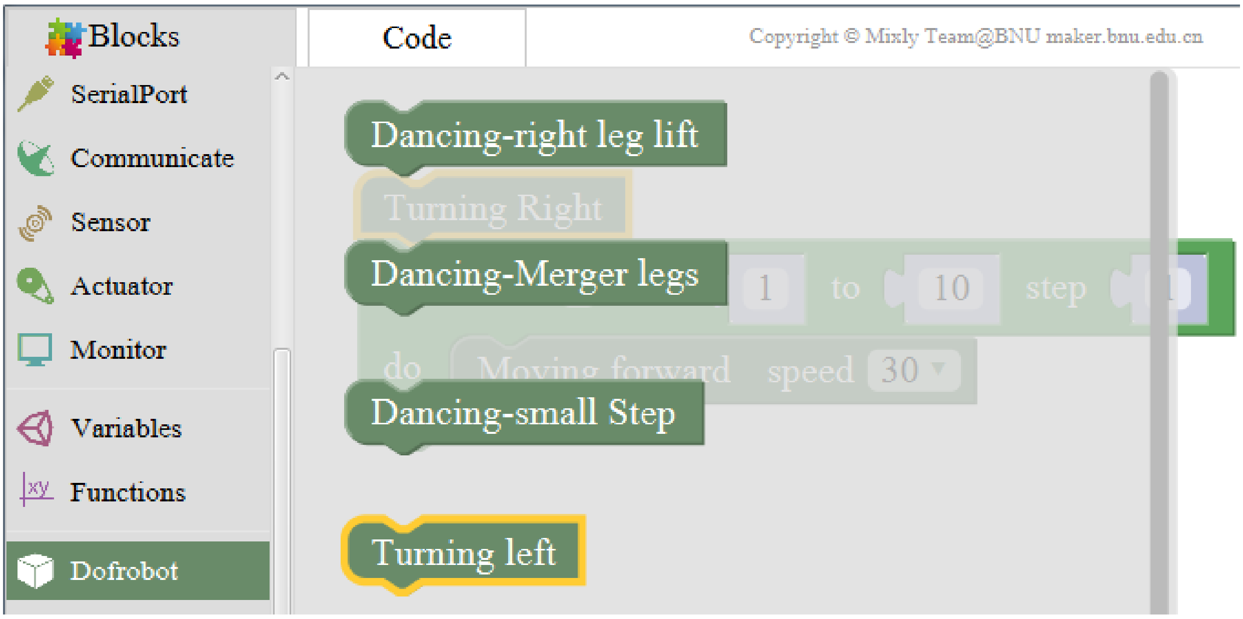
Step 2: Drag out the count with block from Control category.


Mixly 0.995
Blocks
Code
Copyright © Mixly Team@BNU maker.bnu.edu.cn
In/Out
Control
Math
Text
count with i from 1 to 10 step 1
do

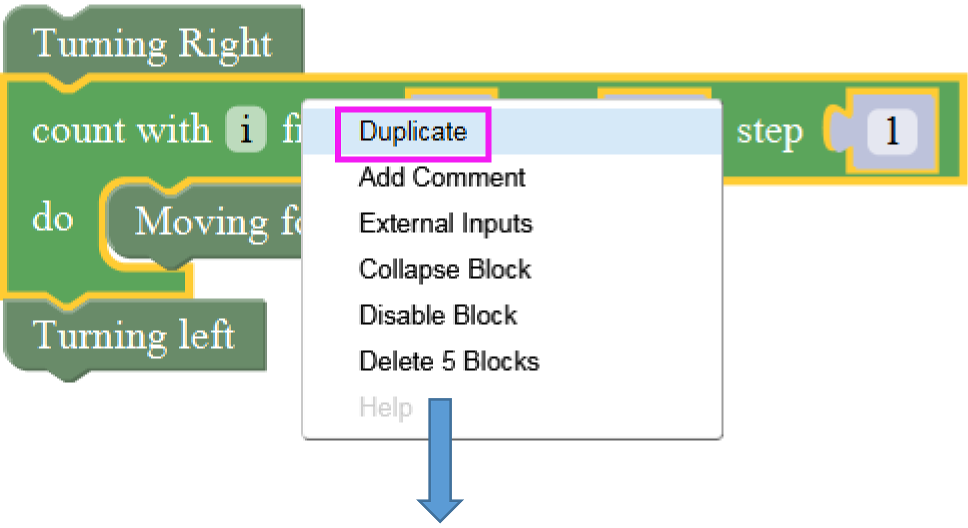
Step 3: Drag Moving forward block from Dofrobot category, thus the Sloth can turn right and move forward for 3 steps. The speed of moving forward and step can be set by yourself.

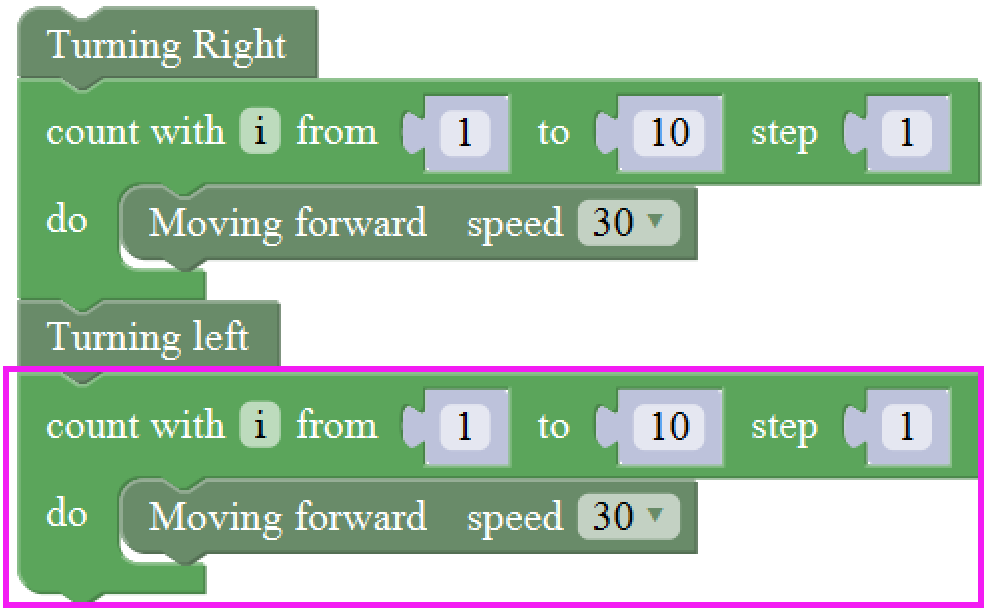


Step 4: Drag the Turning left block from Dofrobot category.



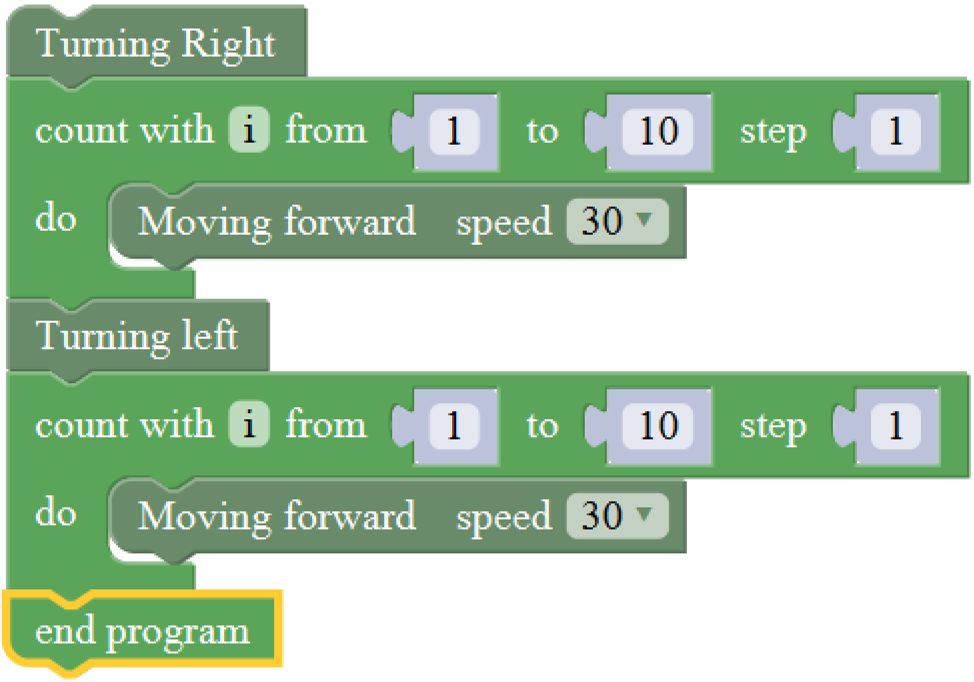
Step 5: Right click the count with block to choose the **Duplicate**, then combine with Turning left block.





```
Turning Right
count with i from 1 to 10 step 1
do  Moving forward  speed 30
Turning left
count with i from 1 to 10 step 1
do  Moving forward  speed 30
```

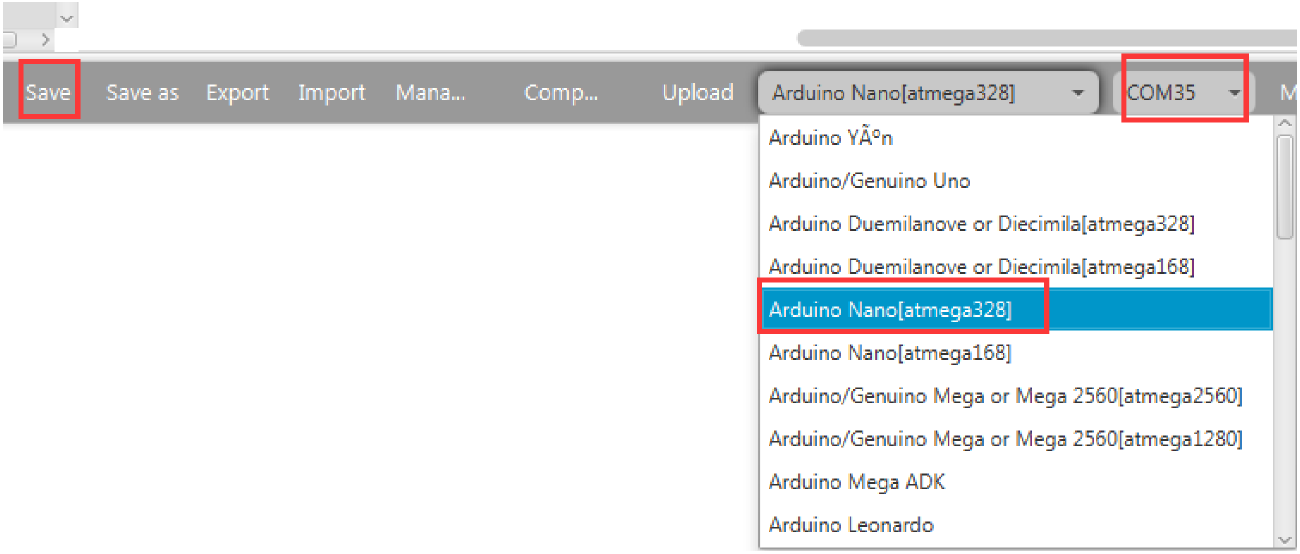
Step 6: Finally end the process by the end program.



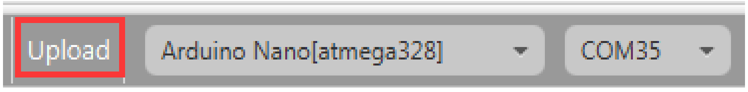
```
Turning Right
count with i from 1 to 10 step 1
do  Moving forward  speed 30
Turning left
count with i from 1 to 10 step 1
do  Moving forward  speed 30
end program
```

Step 7: Click **Save** after all the programming is done. Select the **board** type and **port** before uploading. For instance, if you use a **Uno** or **Mars** board, just select **Arduino/Genuino Uno**; if you use a **Mega 2560** or **Mercury**, select **Arduino/Genuino Mega** or **Mega2560**.

Then select the **port**. You can check the port in **Device Manager** when you connect the board to computer.



Step 8: Upload the code. If the uploading fails, check and correct the code according to the prompt.



After burning successfully, unplug the USB cable and press the power button of the servo control board. You'll see the Sloth turn left and move forward for 3 steps, then turn right and move forward for 3 steps.

Note : Different surfaces have different friction rate, thus the Sloth turning angle may not too big in some kind of abrasive surface.

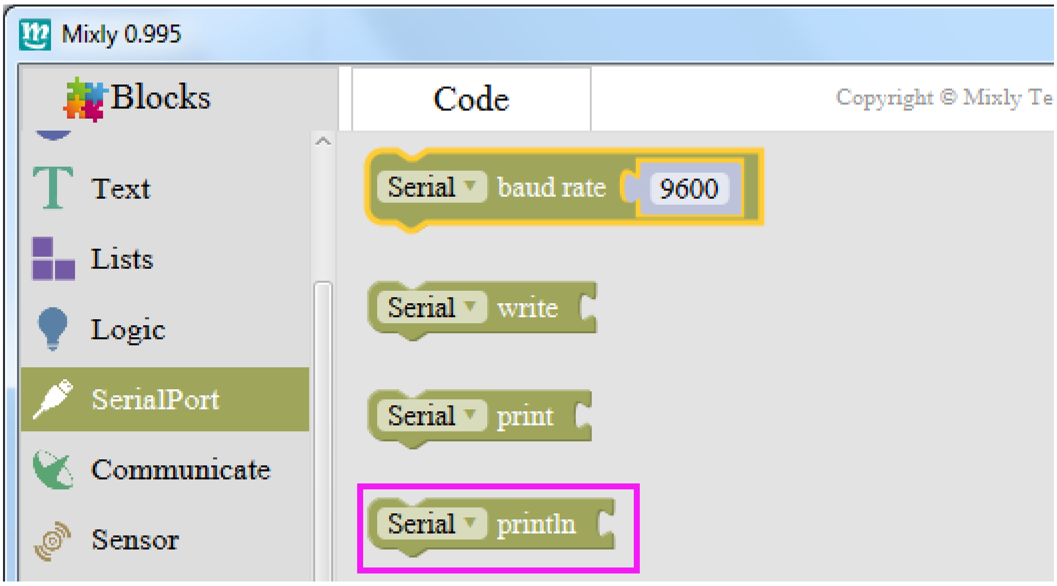
Lesson 4 Test Ultrasonic Module

Overview

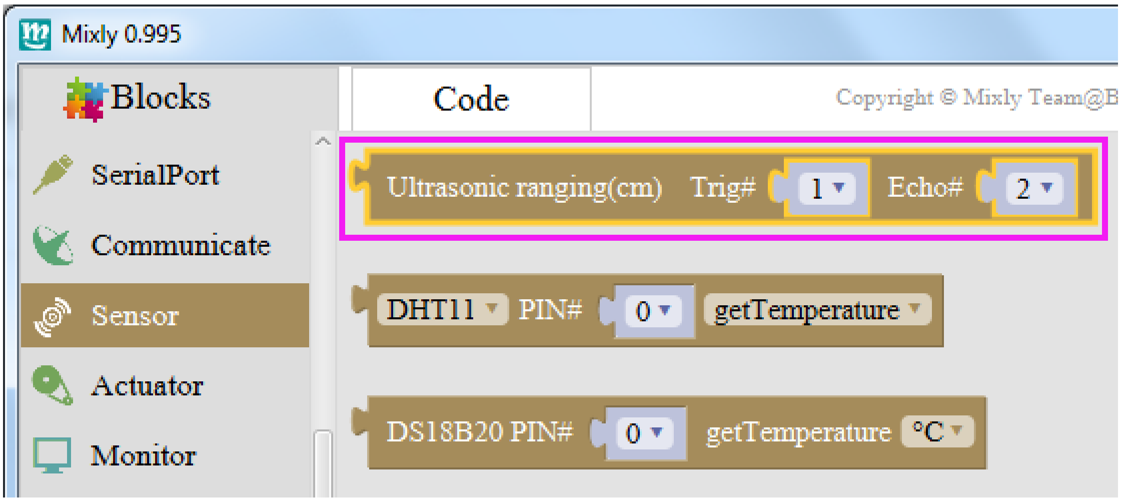
Sloth also has an ultrasonic module as its eyes to avoid obstacles. Now let’s test the ultrasonic module.

Programming

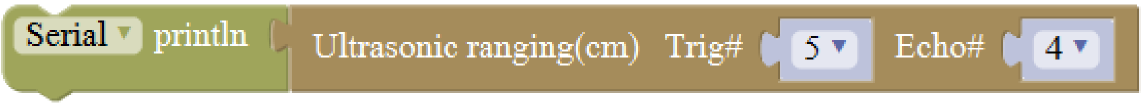
Step 1: Click the SerialPort category, drag the Serial.println to the coding area.



Step 2: Click Sensor, and select the Ultrasonic block, then drag to the back of Serial.println.


Mixly 0.995
Blocks
Code
Copyright © Mixly Team@B
SerialPort
Communicate
Sensor
Actuator
Monitor
Ultrasonic ranging(cm) Trig# 1 Echo# 2
DHT11 PIN# 0 getTemperature
DS18B20 PIN# 0 getTemperature °C

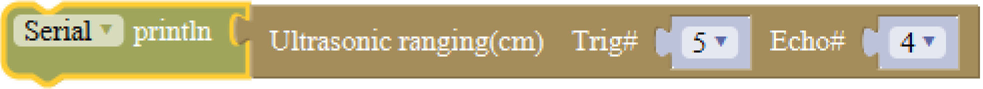
Step 3: Choose the pins for TRIG and ECHO, if the TRIG connect to 4, and ECHO connect to 3, then when you set the numbers, each should plus 1, which means TRIG is 5 and ECHO is 4.



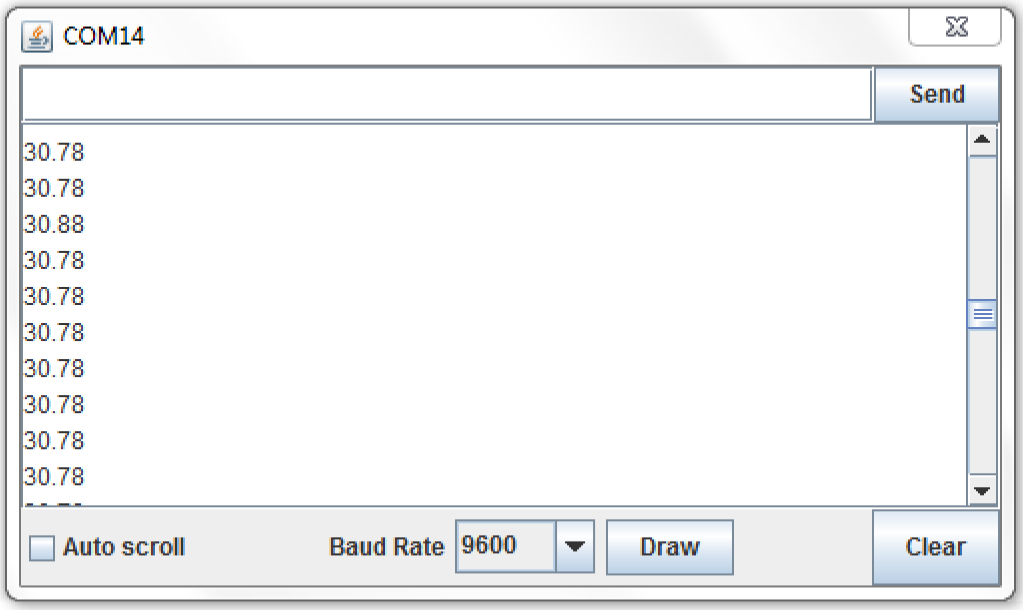
Step 4: Select the **board** type and **port** before uploading.

Step 5: Click **Upload** to run the code. After it, press the power button on the Sloth and keep USB connect with computer.

Step 6: Click the **Monitor** button, you will see the distance appear on the Serial Monitor.

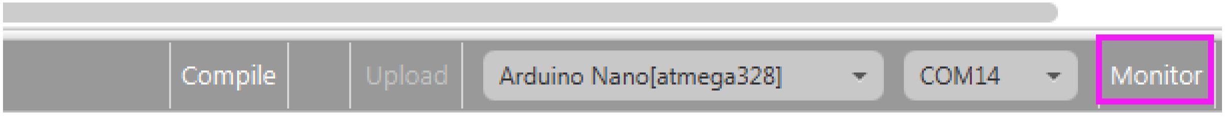


Serial println Ultrasonic ranging(cm) Trig# 5 Echo# 4



COM14

```
30.78
30.78
30.88
30.78
30.78
30.78
30.78
30.78
30.78
30.78
```



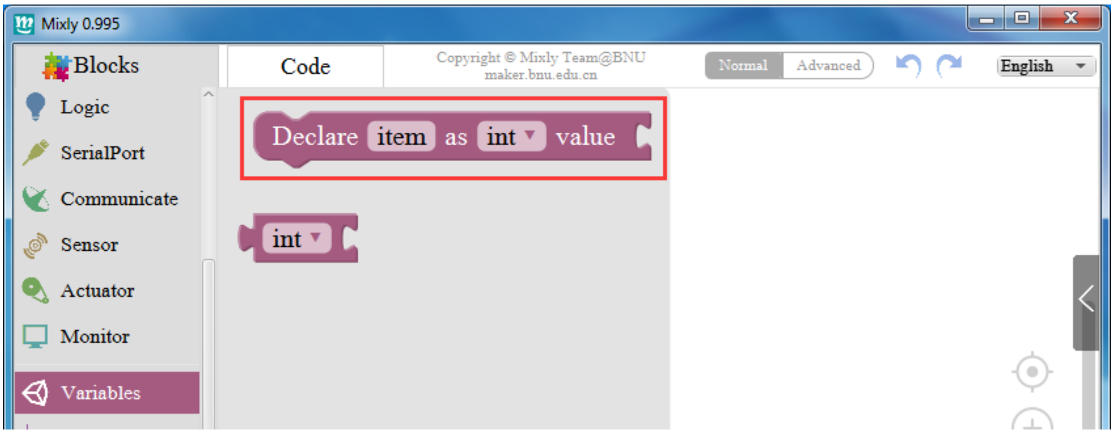
Lesson 5 Obstacle Avoidance

Overview

This lesson is to command the Sloth to turn left when obstacles appear in 5cm range.

Programing

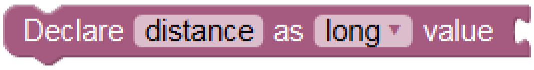
Step 1: Declare a variable distance to store the detected distance data.



Declare item as int value

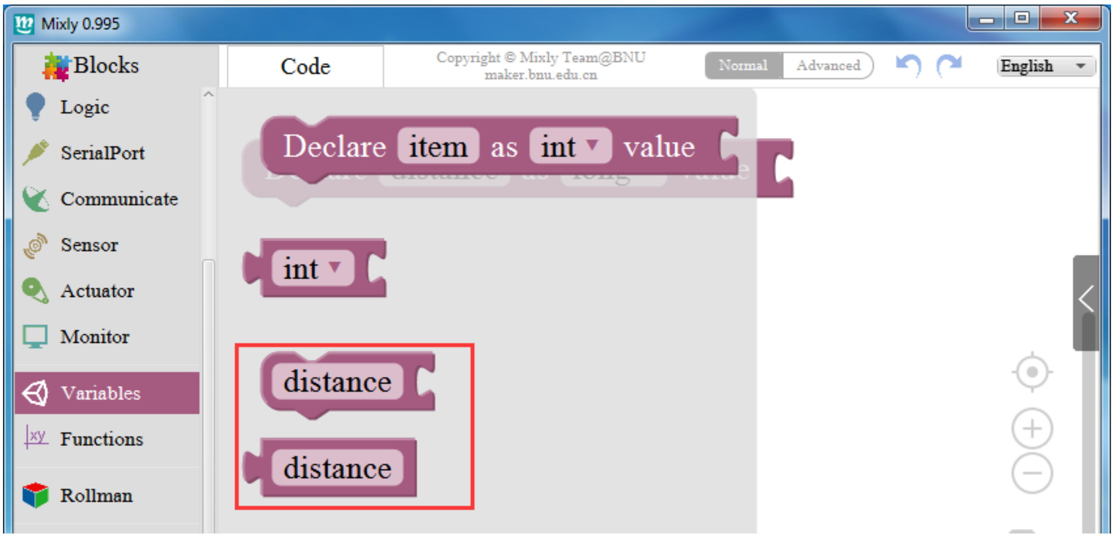
int

Change **item** into **distance** in the slot:



Declare distance as long value

Step 2: Click Variables again and you can see two distance blocks with different ending patterns: input and output, with slot and bulge respectively.



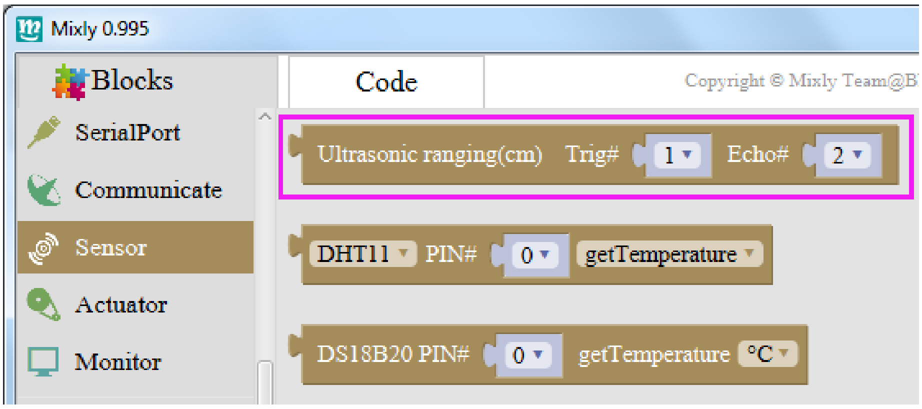
Declare item as int value

int

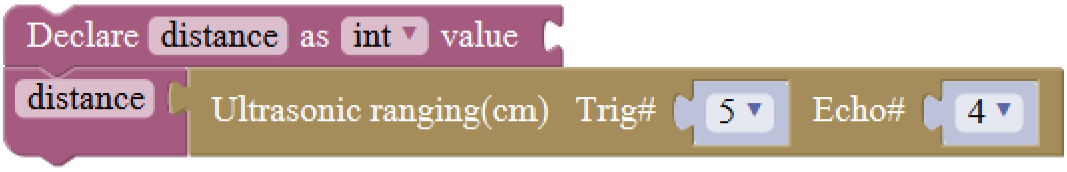
distance

distance

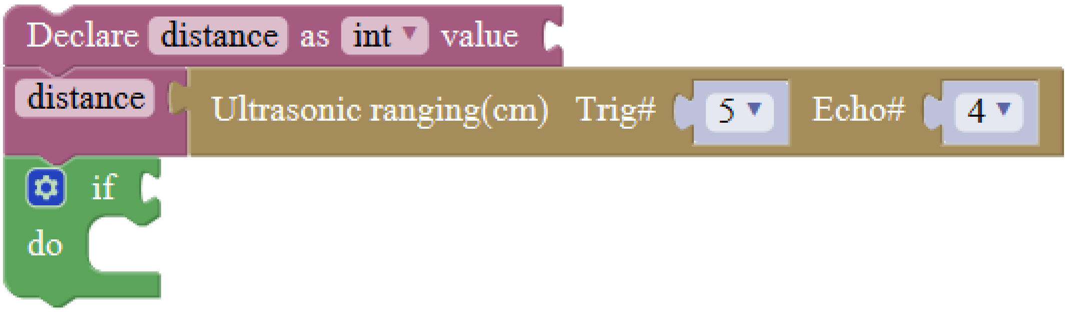
Step 3: Click Sensor, and select the Ultrasonic block.


Mixly 0.995
Blocks
Code
Copyright © Mixly Team@B
SerialPort
Communicate
Sensor
Actuator
Monitor
Ultrasonic ranging(cm) Trig# 1 Echo# 2
DHT11 PIN# 0 getTemperature
DS18B20 PIN# 0 getTemperature °C

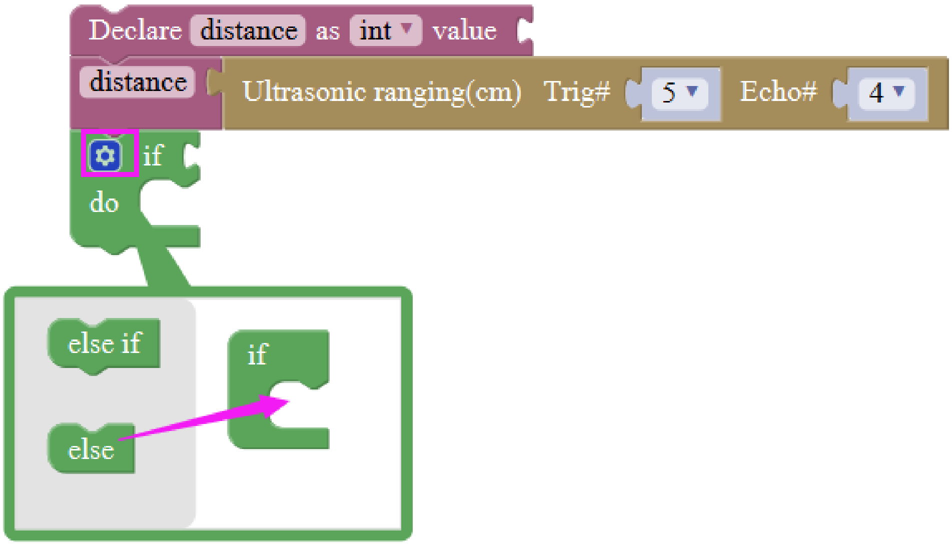
Step 4: Drag it behind the distance variable to combine and store the detected distance, then correct the TRIG and ECHO.


Declare distance as int value
distance Ultrasonic ranging(cm) Trig# 5 Echo# 4

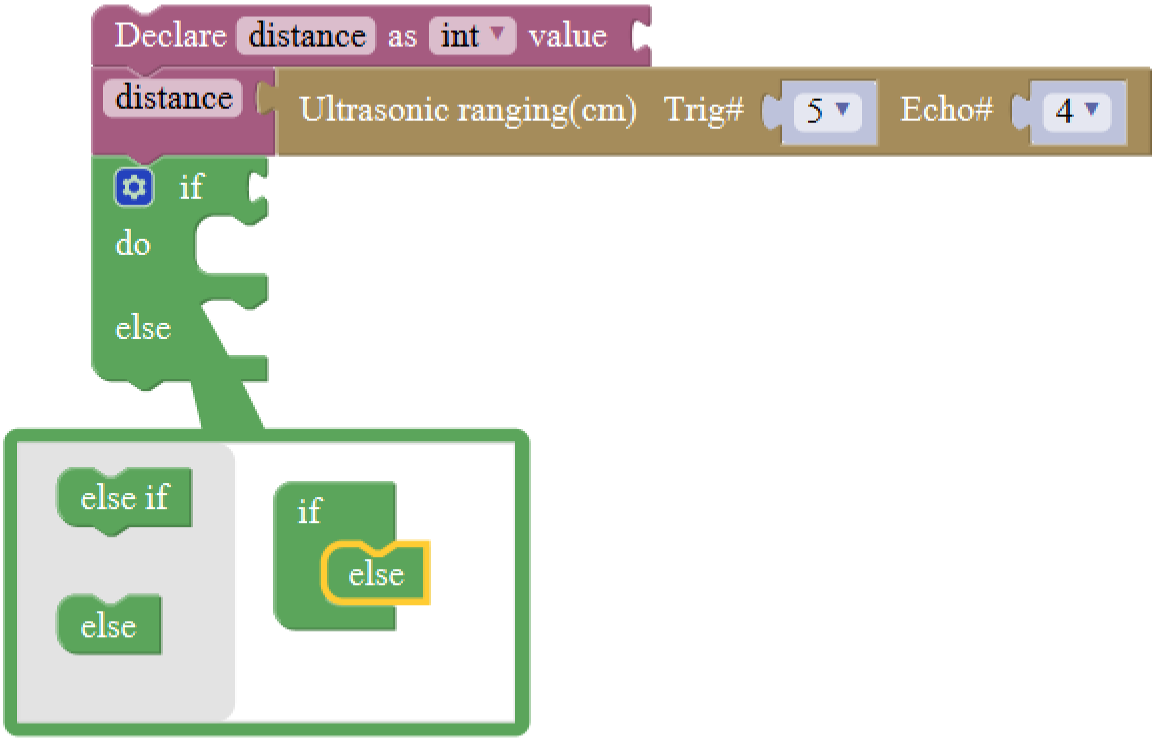
Step 5: To judge whether the detected distance is less than 5cm, click **Control**, drag out an if_do block and drop it under distance category.


Declare distance as int value
distance Ultrasonic ranging(cm) Trig# 5 Echo# 4
if
do

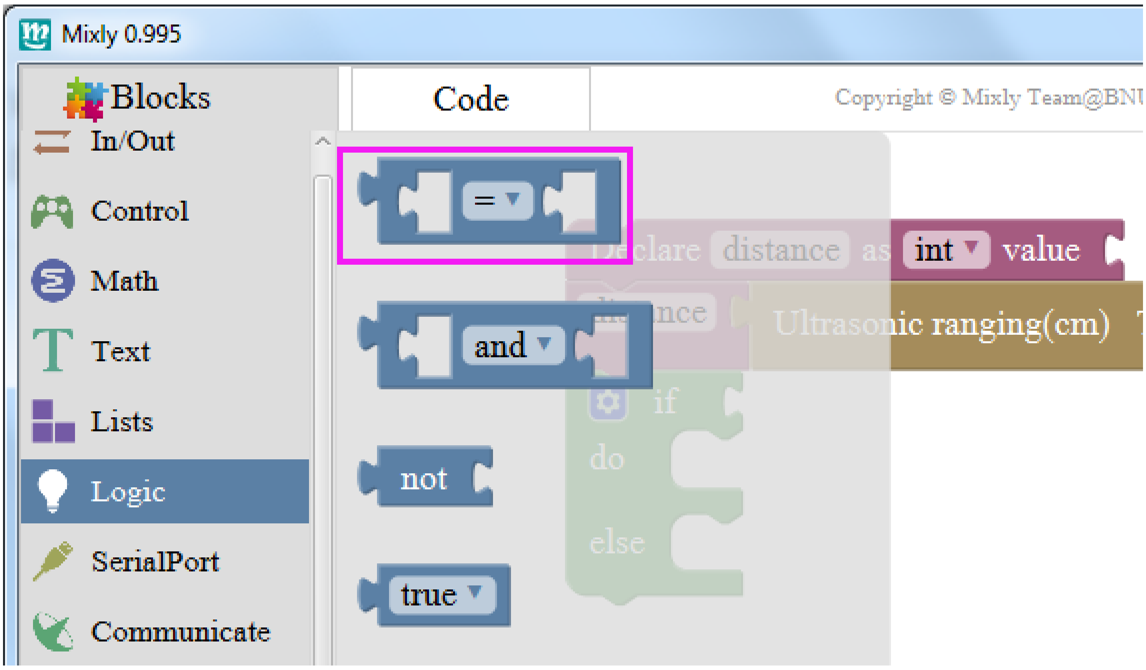
Also add a reverse condition **else**, for what to do if the detected distance is or more than 20cm. Click the setting icon ⚙ beside if, and drag else into the right if block.


Declare distance as int value
distance Ultrasonic ranging(cm) Trig# 5 Echo# 4
if
do
else if
else
if

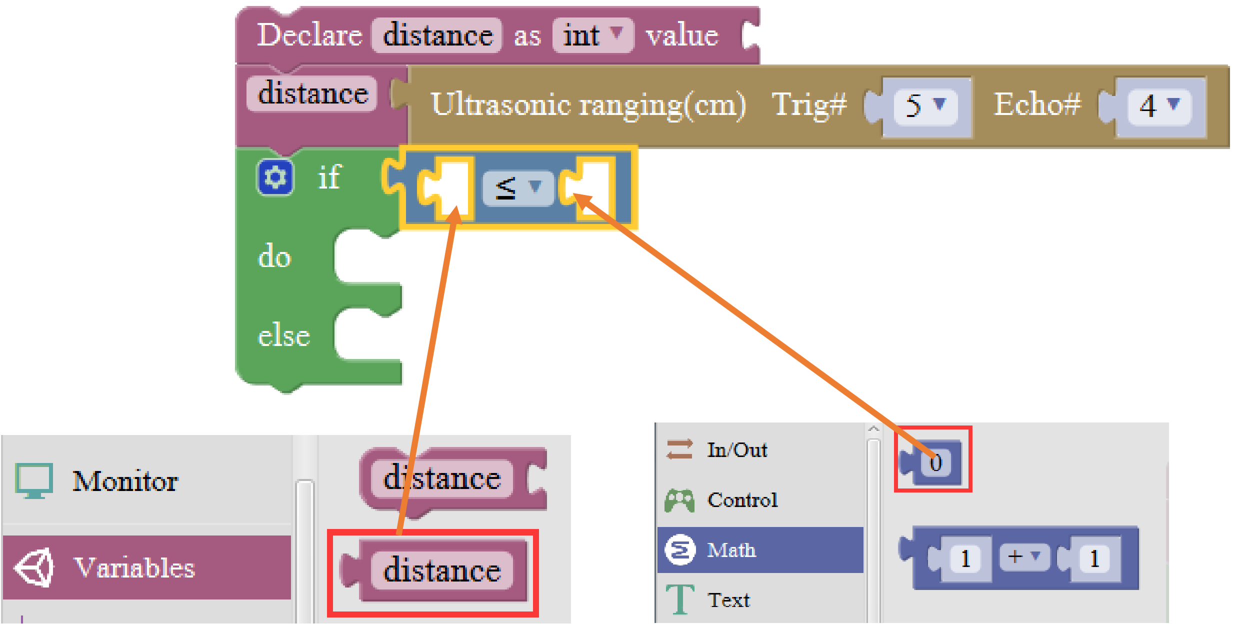
Then it becomes if_do_else block, click the ⚙ icon again to fold the pop-up.


Declare distance as int value
distance
Ultrasonic ranging(cm) Trig# 5 Echo# 4
if
do
else
else if
else
if
else

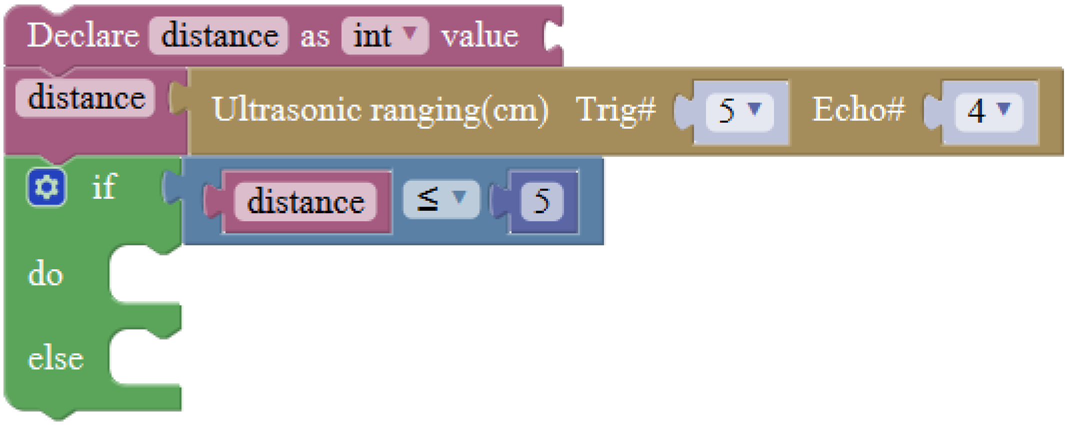
Step 6: Now, let's edit the less than 5 judgement, click Logic, and drag the first block behind the if block to combine.



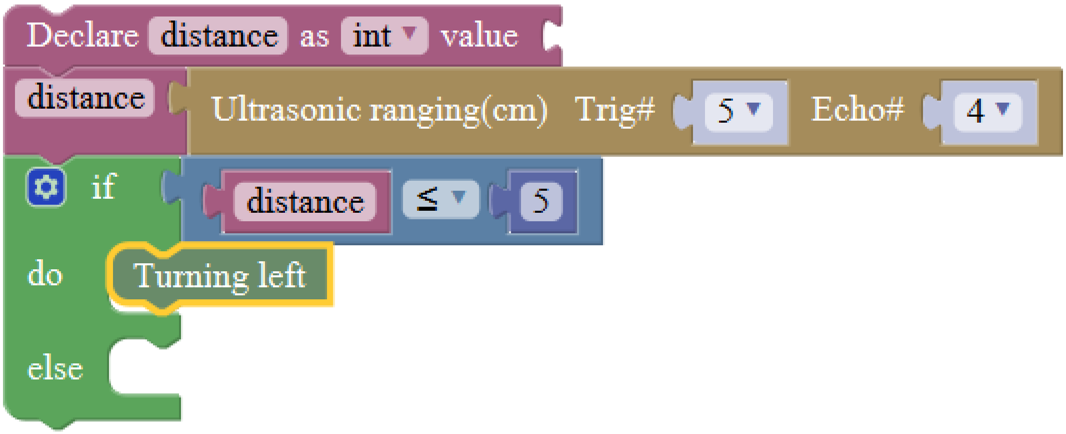
Step 7: Click the triangle icon next "=" to select "<" on the list, drag an output/bulge distance in Variables to the first slot, and then a constant in Math to the second.



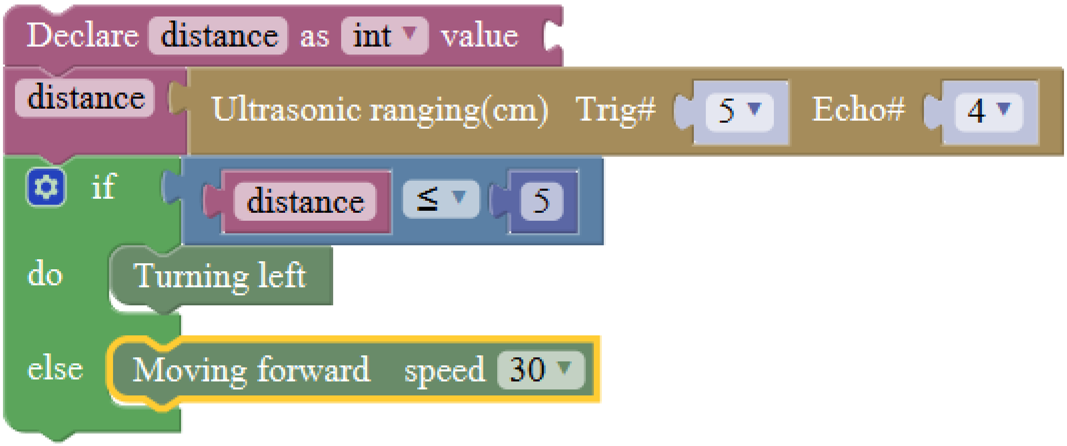
Change **0** into **5** in the slot as shown below:


Declare distance as int value
distance
Ultrasonic ranging(cm) Trig# 5 Echo# 4
if
distance ≤ 5
do
else

Step 7: Command the sloth to turn left when distance<=5, drag the turning left block under the Dofrobot category. You can also command it to turn right by turning right block if meet obstacles.

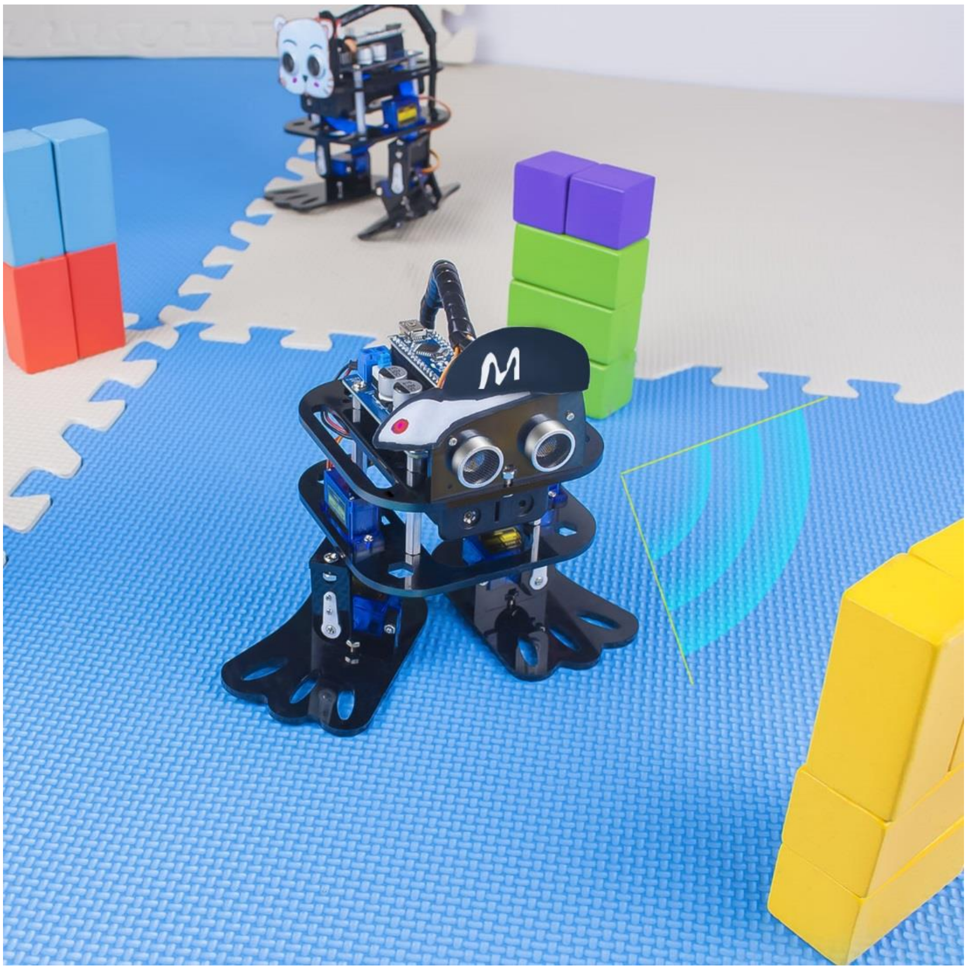

Declare distance as int value
distance
Ultrasonic ranging(cm) Trig# 5 Echo# 4
if
distance ≤ 5
do
Turning left
else

Step 8: The else is the reverse judgement: command the sloth to move forward when distance>5. Drag the Moving Forward block, end the program with end program block.



```
Declare distance as int value
distance  Ultrasonic ranging(cm)  Trig# 5  Echo# 4
if   distance ≤ 5
do   Turning left
else Moving forward  speed 30
```

Step 9: Click **Save** after all the programming is done, Select the **board** type and **port** before uploading. Click Upload to run the code. After the code is running successfully, press the power button of the Sloth. When the Sloth is moving forward and there has obstacle forward in 5cm range or you put your hand before it, the Sloth will turn left and then moves forward.



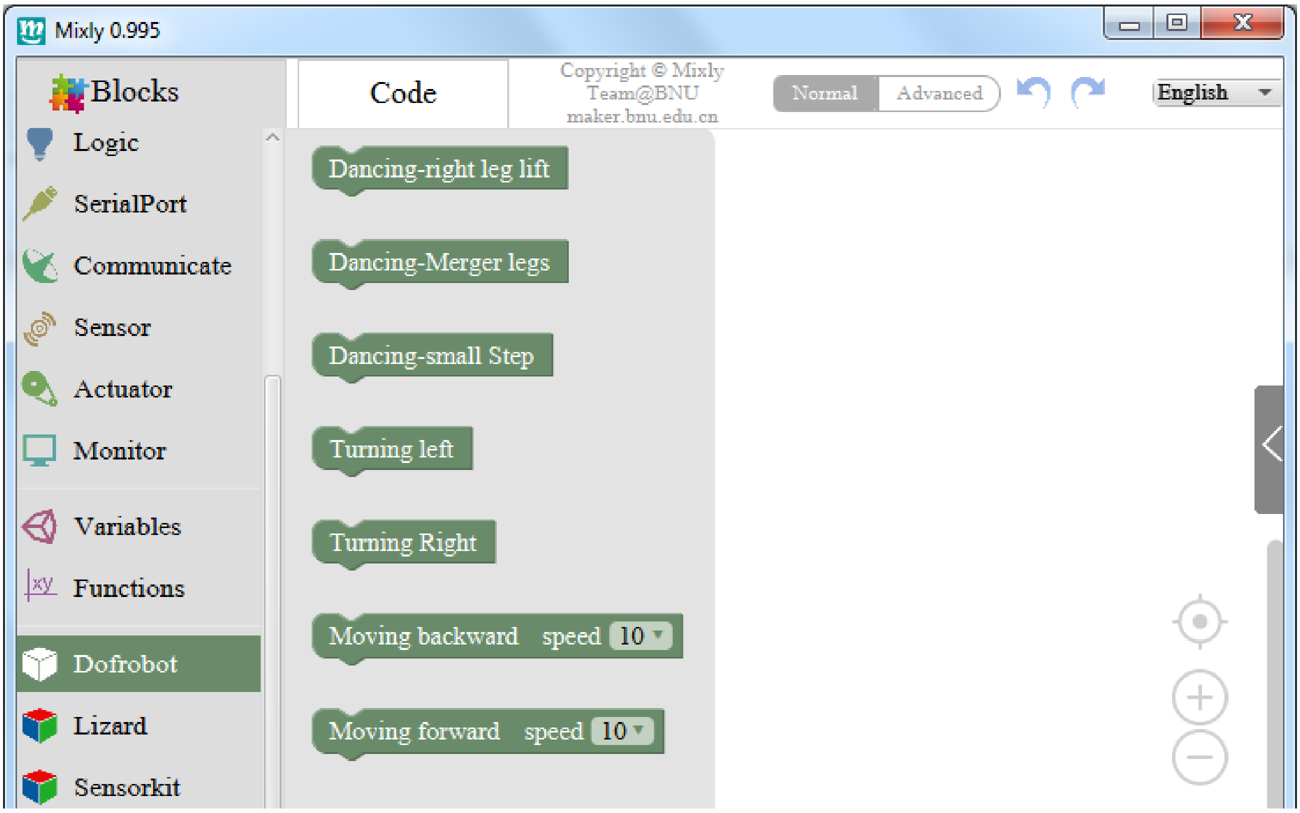
Lesson 6 Dance

Overview

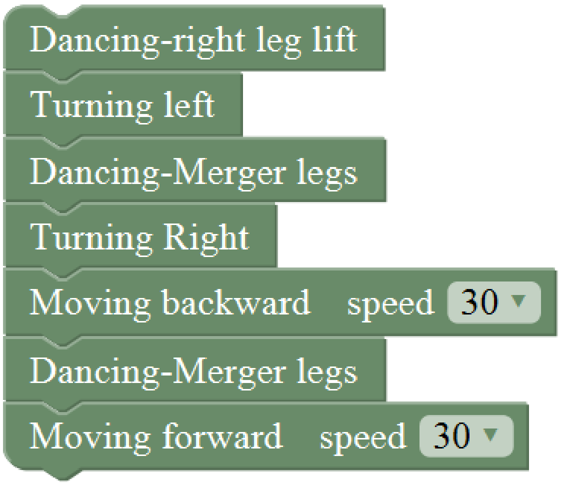
In the Dofrobot category, there have many different blocks wrote to command the Sloth to do different actions. The Sloth can dance if combining these blocks together.

Programing

Step 1: Click the Dofrobot category, drug out these blocks if you want.



Step 2: Combine them together.



```
Dancing-right leg lift
Turning left
Dancing-Merger legs
Turning Right
Moving backward   speed 30
Dancing-Merger legs
Moving forward   speed 30
```

Step 3: Click **Save** after all the programming is done, Select the **board** type and **port** before uploading. Click Upload to run the code. After the code running successfully, press the power button on the Sloth. You will see the Sloth starts to dance.