



Servo Control —the lab course of Snake Robot

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Background



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Servo Overview

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3

Servo Principle

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5

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Pulse-Width Modulation (PWM)

Output signal alternates between on and off within specific period



Duty Cycle= $t_{on}/(t_{on} + t_{off})$

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PWM in Servo





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Servo Modification



7



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Arduino Nano Overview



- **Tips** Power Supply: Mini-B USB, Pin 27 +5V
 - 6-PWM Output: D3, 5, 6, 9, 10, 11
 - Test LED Pin D13: High-On, Low-Off

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Arduino Servo Connection





9

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Download and Install

Download Arduino compiler and development environment from:

https://www.arduino.cc/en/Main/Software?setlang=cn

- Current Version: 1.6.5
- Available for:
 - ✓ Windows
 - ✓ MacOX
 - ✓ Linux
- Before running Arduino, plug in your board using USB cable(external power is not necessary)
- When USB device is not recognized, navigate to and select the appropriate driver from the installation directory

Using the Arduino IDE



Select your Arduino Nano Board

| 💿 BareMinimum A | rduino 1.0 | | | | |
|--|--|---|---|----------|---|
| File Edit Sketch To | ools Help | _ | | | _ |
| BareMinimum void setup() // put your | Auto Format Ctrl+T Archive Sketch Fix Encoding & Reload Serial Monitor Ctrl+Shift+M | | | <u>ې</u> | • |
| | Board + | • | Arduino Uno | | |
| } | Serial Port | | Arduino Duemilanove w/ ATmega328 | | |
| <pre>void loop() { // put your</pre> | Programmer + Burn Bootloader | | Arduino Diecimila or Duemilanove w/ ATmega168 Arduino Nano w/ ATmega328 Arduino Nano w/ ATmega168 | | |
| | | | Arduino Mega 2560 or Mega ADK Arduino Mega (ATmega1280) Arduino Mini w/ ATmega328 Arduino Mini w/ ATmega168 Arduino Ethernet Arduino Fio Arduino BT w/ ATmega328 Arduino BT w/ ATmega168 LilyPad Arduino w/ ATmega328 LilyPad Arduino w/ ATmega168 Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328 Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168 | | |
| | | | Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328 Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168 | | |
| | | | Arduino NG or older w/ ATmega168 Arduino NG or older w/ ATmega8 | | |
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Select Serial Port

| 💿 BareMinimum | Arduino 1.0 | 1.00 | 100.000 | No. | |
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| File Edit Sketch | Tools Help | | | | |
| | Auto Format Archive Sketch | Ctrl+T | | | <u>P</u> |
| BareMinimum | Fix Encoding & Reload | | | | M |
| // put your | Serial Monitor | Ctrl+Shift+M | | | |
| 3 | Board | • | | | |
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| 1 | | | | | Arduino Uno on COM9 |

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13

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Arduino Sketch Structure

- #include <Servo.h>
 - Some specific libraries will be included in your Sketch, which will simplify your codes
- void setup()
 - Will be executed only when the program begins or reset button is pressed
- void loop()
 - Will be executed repeatedly

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14

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Servo library-Servo.h

- Functions:
 - Servo myservo; //create servo object to control a servo
 - *myservo*.attach(pin) ;//Attach the Servo variable to a pin
 - o myservo.write(angle);//Writes an angle value to the servo
 - *myservo*.writeMicroseconds(uS);//Writes an PWM value in microseconds (uS) to the servo

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o delay(ms);

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Example

Sweep

Sweeps the shaft of a servo motor back and forth across 180 degrees.

Find out the stop position after servo modification
 Find out the stop position by using *writeMicroseconds*

 Those codes will be first simulated by Proteus Software and then will be conducted on the Arduino board.

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16

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Practice

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- Controlling a servo to sweep by using "Servo.h"
- Modify all the servos and test out the stop points, label the PWM value on the servos

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