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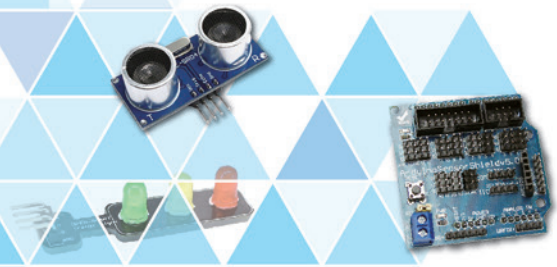
S Science T Technology E Engineering M Maths

# ARDUINO
## 智能遙控爬行機械教學套件
## Smart RC Climbot Teaching Kit

（圖片只供參考）

- 含豐富的軟硬件資源
  Rich in hardware and software resources
- 採用mBlock + Arduino實作的方式
  Practical implementation of mBlock & Arduino
- 深入淺出地學習各項硬件原理和編程技巧的實際應用
  To learn hardware principles and practical programming skills easily
- 教學材料採用開放源碼軟硬件
  Teaching materials are developed using open-source hardware and software
- 可配合設計與科技科課程自訂教學內容及STEM學習活動
  The teaching content and STEM learning activities can be customized to cater for the Design & Technology curriculum



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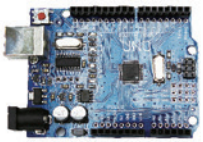
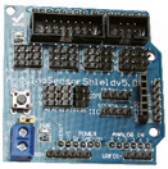
# 主要零件 Key Parts



Arduino Uno R3兼容主板 /
Arduino Uno R3 Compatible Board

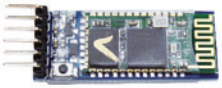


Arduino Uno R3感應器擴展板v5.0 /
Arduino Uno R3 Sensor Shield v5.0

SG90伺服電動機 (360度連續轉動) /
SG90 Servo Motor (360-degree Continuous Rotation)

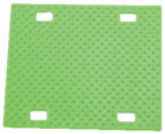
LED 紅黃綠燈模組 /
LED Traffic Light Module

HC-SR04超聲波感應器 /
HC-SR04 Ultrasonic Sensor



HC-05藍牙模組 /
HC-05 Bluetooth Module

多孔膠棒 /
Perforated Plastic Rod



多孔固定膠板 /
Perforated Plastic Panel

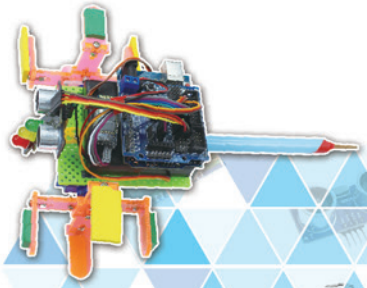
多孔塑膠角碼 /
Perforated Plastic Angle Bracket

3mm亞加力膠輪腿部件 /
3mm Acrylic Wheel-Leg Parts

USB線 /
USB Cable

10cm杜邦線 (公對母、母對母)
10cm Jumper Wires (M/F, F/F)

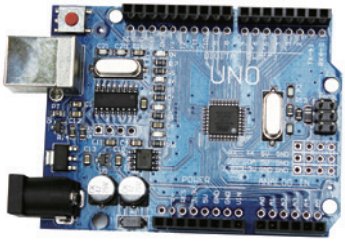
4節AA電池盒（連開關）* /
4-AA Battery Holder (w/ switch)



* 4粒AA電池不包括在套件內

# 重要零件介紹 Introduction to Major Parts

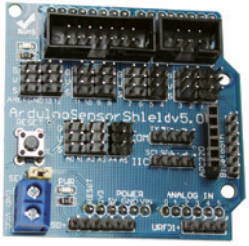
## Arduino Uno R3 兼容主板
## Arduino Uno R3 Compatible Board




Arduino Uno R3 是 Arduino Uno 的第三代改進版，是一款易用型開放源碼微控制器開發板。其運作原理主要是運用按扭、感應器或手機等等把訊息輸入 UNO 板，透過執行所燒載的程式而作出反應，輸出的零部件可以是直流電動機、伺服電動機、LED 等等。

Arduino Uno R3 is the third revision of Arduino Uno, a user-friendly microcontroller board which operates by receiving input signals through buttons, sensors, mobile phones, etc. and responding through executing the loaded program. The output devices can be DC motors, servo motors, LEDs, etc.

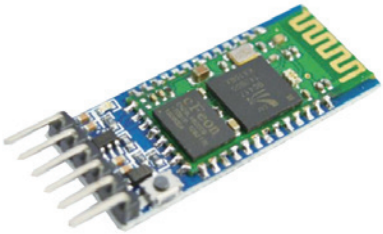
## Arduino Uno R3 感應器擴展板 v5.0
## Arduino Uno R3 Sensor Shield v5.0




這款感測器擴展板不單將 Arduino Uno R3 板上全部數位與模擬針腳擴展出來，還提供不同模組的專門接口，實際上是將電路簡化，能夠很容易地將常用感測器連接起來，一款感應器僅需要一種通用（兼容數位 / 類比）的 3 針連接線。

This type of sensor expansion board not only extends out all digital and analog pins on Arduino Uno R3, but also provides a variety of ports for specific modules, which practically simplifies the circuit by easily connecting up those commonly used sensors. It works with any sensor using a universal (digital/analog compatible) 3-pin connector.

## HC-05 藍牙模組
## HC-05 Bluetooth Module



HC-05 藍牙模組支援電子設備與 Android 應用程式以藍牙無線形式在 10 米範圍內通訊。用家只要把藍牙模組與流動設備配對連線及調校兩者的鮑率至相同數值，即可便兩者連接並傳送資料。

HC-05 Bluetooth Module allows wireless communication between a digital device and an Android app through Bluetooth within a 10m range. In order to enable data transmission between a mobile device and the module, users just need to pair them up and set their baud rates the same.

## 伺服電動機
## Servo motor


伺服電動機又被稱為 RC 伺服機或伺服馬達舵機，並分為直流和交流電動機兩種。它由電動機、齒輪箱、輸出軸和控制電路板所組成。各款型號的伺服電動機的輸出軸轉動範圍由 0 至 360 度不等。一般而言，用家可以設定不同的訊號，控制伺服電動機轉動的速度和扭力。

A servo motor is also called as an RC servo. It can be divided into two types, DC and AC motors. A servo motor consists of a motor, a set of gears, a shaft and a control circuit board. The angular range of servo shaft rotation varies with models, from 0 to 360 degrees. In general, users can control the speed and torque of a servo motor by setting different signals.

### 超聲波感應器
### Ultrasonic Sensor

超聲波感應器由超聲波發射器、接收器和控制電路板所組成，主要用來測量感應器與附近物體之間的距離。它把超聲波由發射器發射的時間與反彈回來的時間作運算，並把超聲波訊號轉換成電訊號，便可使機械知道自己與阻礙物之間的距離。

The ultrasonic sensor consists of a transmitter, a receiver and a control circuit board. It is used for measuring its distance from nearby objects. It calculates the duration of the ultrasonic's travel to and back and then converts the ultrasonic signal into an electrical signal. Thus, the robot will know its distance from obstacles.

## 程式語言 Programming Language


Scratch 程式語言是由 MIT 開發的免費教學用程式語言，特別為中小學生而設計。Scratch 使用圖形化的積木編程界面，簡單易用。

參考書目：① PA01 Scratch 初階；② PA02 Scratch 進階

Scratch is a free educational programming language that was developed by MIT and geared towards kids ages 8-16. Scratch's drag-and-drop programming blocks can fit into each other like jigsaw puzzle pieces.

Reference Books: ① PA01 Scratch: Basic Skills；② PA02 Scratch: Advance Skills

# 產品特色 Product Features

## 1. 詳盡自學教程 Detailed Self-Learning Tutorial

- 教學內容詳盡，鼓勵同學自學。
  Detailed teaching and learning materials are provided to facilitate student's self-learning.
- 充足及清晰指引以提升學生學習效率。
  Adequate and clear instructions are given to enhance student's learning efficiency.
- 教程支援電腦、平板及智能手機，方便易用。
  Tutorial supports different devices including computers, tablets and smart phones.

## 2. Scratch 語言教學 Scratch Programming Language

- 採用流行、簡易並免費的 Scratch 程式語言來進行教學，學與教更簡便。
  Scratch, a popular, simple and free programming language, is used, which makes learning and teaching easy.
- 特別加入與硬件相關的編程技巧。
  Hardware-related programming skills are covered.

## 3. 開放源碼的軟硬件 Open-Source Software & Hardware

- Arduino 和 mBlock 都是開放源碼的，教師可以按校本需要調整內容。
  Arduino and mBlock are open-source. Teachers can adjust the teaching content according to school needs.

# 教材和學材 Teaching and Learning Materials

## 1. 基礎知識 Basic Knowledge

- 附多個基礎知識教程，即使完全不懂 mBlock 和電路，也能輕鬆學習。教師可根據學生的水平，靈活調適教程。

  Basic knowledge tutorials of mBlock and electric circuit are provided for beginners. Teachers can adjust the curriculum according to needs.

## 2. 自學教材 Self-Learning Guide

- 每個專案都有詳盡的自學教材，鼓勵自主學習。

  Each project contains detailed self-study materials in order to encourage self-study.

## 3. 資源檔案及建議答案 Resource Files & Suggested Answers

- 全部與編程有關的作業均配備相關的資源檔案及建議答案。

  All assignments related to programming are provided with relevant resource files and suggested answers.

## 4. 互動光碟及專用網站 Interactive CD-ROM & Companion Website

- 光碟和網站均提供完整的教材和學材，方便備課、教學或自學。

  A CD-ROM and a website with full teaching and learning materials are provided.

  ( 網址 Website：http://www.apricot.com.hk/stemkit/)

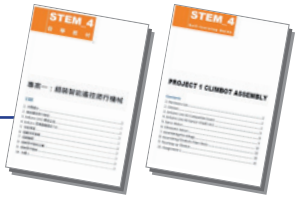
# 專案一：組裝智能遙控爬行機械
# Project I: Climbot Assembly

在本專案，學生會認識多款在機械模型常用到的電子零件，並需要動手組裝一隻爬行機械。

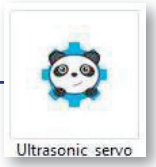
In this project, students will learn about different electronic parts commonly used in robots and how to assemble a climbot.

## 專案資源 Project Resources

自學教材
Self-Learning Guide




資源檔案
Resource files




建議答案
Suggested Answers

# 專案二：透過 mBlock 編寫爬行機械避障程式
# Project II: Programming an Obstacle Avoiding Climbot in mBlock

同學需要運用 mBlock 編寫程式使爬行機械繞過障礙物，亦會設計其他程式令機械一邊避障，一邊閃燈或完成其他指令。

Students need to code on mBlock to instruct a climbot to avoid obstacles and design other programs to enable the climbot to flash or perform other tasks.

## 專案資源 Project Resources

自學教材
Self-Learning Guide


資源檔案
Resource files


建議答案
Suggested Answers

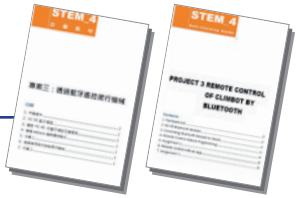
# 專案三：透過藍牙遙控爬行機械
# Project III: Remote Control of Climbot by Bluetooth

同學會利用 mBlock 為藍牙模組編程，並透過流動裝置上的藍牙和免費應用程式，遙控爬行機械。

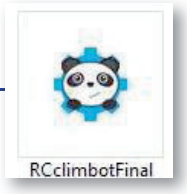
Students will use mBlock to code a Bluetooth module and remotely control a climbot via Bluetooth and a free app on a mobile device.

## 專案資源 Project Resources

自學教材
Self-Learning Guide




資源檔案
Resource files

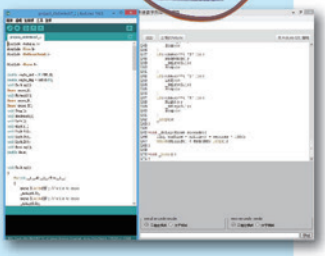



建議答案
Suggested Answers

本教學套件為配合教育局推行的STEM教學而設計，適合中小學生使用，學與教材料齊備，方便作課堂教學、專題研習或自主學習之用。

## 產品特色 Product Features

- 開放源碼的軟硬件 Open-Source Software & Hardware
- 詳盡自學教程 Detailed Self-Learning Tutorial
- 採用Scratch語言教學 Scratch Programming Language for Teaching
- 提供活動相關的基礎知識 Related Basic Knowledge Provided
- 資源檔案及建議答案 Resource Files & Suggested Answers
- DIY內容 DIY Materials
- 互動光碟及專用網站 Interactive CD-ROM & Companion Website



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