



感應器

Sensor 應用教學套件 Application Teaching Kit

- 含豐富的軟硬件資源
Rich in hardware and software resources
- 操用 Scratch + Arduino 實作的方式
With the implementation of Scratch & Arduino
- 深入淺出地學習各項硬件原理和編程技巧的實際應用
Learns the principles of hardware and the practical application of programming skills easily
- 全部教學材料採用開放源碼軟硬件
Teaching materials are developed with open-source hardware and software
- 可配合校本課程修訂教學內容 / STEM 教學活動
The teaching content can be edited to meet any school-based curriculum / STEM learning





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零件 Parts

USB 線 / USB Cable



潛水泵 /
Submersible Water Pump



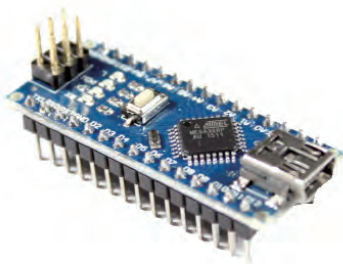
擴展板 /
Nano Shield



Y 形轉接頭 /
Y connector



Arduino NANO 兼容主板 /
Arduino NANO Compatible Board



1602 液晶顯示模組 /
1602 LCD Module



連接線 / Jumper Wires



紅外線接近開關模組 /
Infrared Proximity Sensor



激光發射模組 /
Laser Transmitter Module



光敏電阻模組 /
LDR Sensor Module



土壤濕度感應器模組 /
Soil Moisture Sensor Module

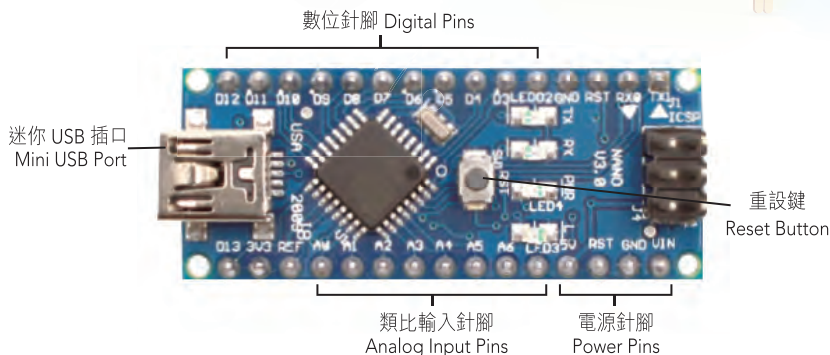


水位感應器模組 /
Water Level Sensor Module



重要零件介紹 Introduction to Major Parts

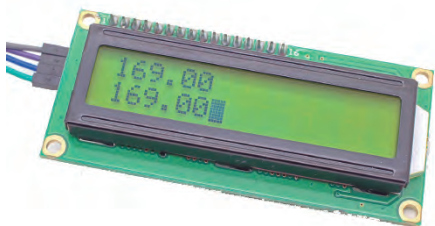
Arduino NANO 兼容主板 Arduino NANO Compatible Board



Arduino Nano 是基於 ATmega328 的微處理器，可以直接應用在麪包板上。它具有與 Arduino UNO 相同的功能，但體積更小。它沒有直流電源插孔，並改用了迷你 USB 插頭。

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328. It has the same functionality of the Arduino UNO, but in a much smaller package. It lacks only a DC power jack, and works with a Mini USB cable.

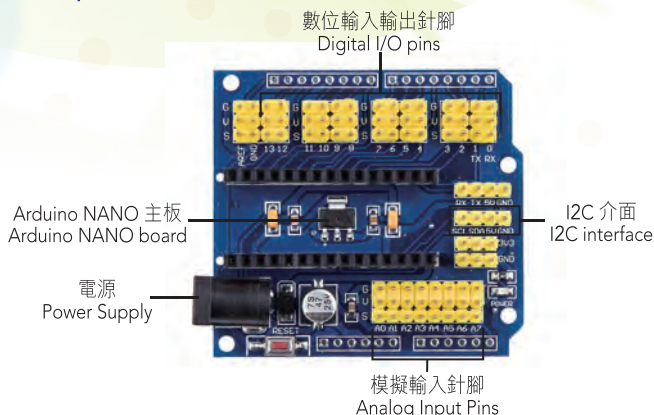
1602 液晶顯示模組 1602 LCD Module



1602 液晶顯示模組能同時顯示兩行，每行 16 個，總共 32 個字符，其背光通常是黃綠色或者是藍色。

This is a basic 16 character by 2 line dot matrix display, usually comes with black text on green or blue background.

Arduino NANO 多用途擴展板 I/O Expansion Shield for Arduino NANO



Arduino NANO 多用途擴展板是專為 Arduino NANO 而設，方便連接各類感應器的多用途擴展板。擴展板支援直接使用跳線，而每個輸入輸出針腳都配備了 5V 和 GND，以方便連接感應器模組。擴展板有獨立的 I2C 介面以供 I2C 設備使用。擴展板更有獨立的供電模組，為感應器和摩打提供額外的電源。

The Arduino Nano I/O Expansion Shield acts as an expansion board for the Arduino Nano microcontrollers. The shield supports jumper wires for rapid prototyping and each pinout includes 5V and GND pins for easy connection to sensors. It has an independent I2C interface for connecting I2C devices. It also has independent power supply to provide extra power for servo and other sensors.

紅外線接近開關模組 Infrared Proximity Sensor



這是一個易於使用的紅外線感應器模組。它具有檢測距離較長，可見光干擾少的特點。這款感應器不會直接輸出距離值。相反，當感應到檢測範圍內的物件時，它便會發出數字輸出信號。

This is an easy to use infrared sensor with a long detection distance and has less interference by visible light. This sensor does not output a distance value. Instead, it gives a digital output signal when it senses something within the detection range.

光敏電阻模組 LDR Sensor Module

光敏電阻模組用於檢測光的強度。它同時擁有模擬輸出針腳 (AO) 和數字輸出針腳 (DO)，適合不同的應用。

LDR sensor module is used to detect the intensity of light. It has both analog output pin and digital output pin labelled as AO and DO respectively on the board.



激光發射模組 Laser Transmitter Module

這個激光發射模組採用了 650nm 紅色激光二極管。由於它只需要 30mA 的電流，所以可以直接在 Arduino 上面使用。

警告：小心操作，切勿直視激光頭。

This laser transmitter module consists of a 650nm red laser diode head and a resistor. It can be directly powered from an Arduino output pin as it only draws 30 mA current.

Warning: Handle with caution, do not look directly into the laser head.



水位感應器模組 Water Level Sensor Module

這個水位感應器模組通過測量水的導電率來檢測水位。它可輸出一個模擬信號給 Arduino 讀取。

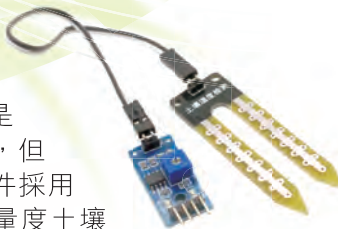
This water level sensor detects the water level by measuring the conductivity of the water. It will output an analog signal for the Arduino to read.



土壤濕度感應器模組

Soil Moisture Sensor Module

土壤濕度感應器是用來測量土壤中的體積含水量。最理想的方法是直接測量土壤含水量需要採集樣本，但涉及乾燥和稱重等繁複程序。本套件採用較易使用的土壤濕度感應器，通過量度土壤的其他屬性（例如電阻）來間接測量土壤的體積含水量。



Soil moisture sensors measure the volumetric water content in soil. The best way using the direct gravimetric measurement of free soil moisture requires removing, drying and weighting of a sample, but involving a complicated process. Instead, this kit adopting soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance.

程式語言

Programming Language

Scratch 程式語言是由 MIT 開發的教學用程式語言，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. It is geared towards kids age 8-16. Users program in Scratch by dragging-and-dropping programming blocks onto each other like jigsaw puzzle.



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



產品特色

Product Features

1. 詳盡教學課程 Detailed Teaching and Learning Materials

- 資料詳盡，鼓勵有效學習。
Detailed information is provided to facilitate student's learning.
- 涵蓋多個學科的知識和技能，實踐跨學科學習。
Covers knowledge and skills of various subjects, practises interdisciplinary learning.
- 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.
- 教程另備 WORD 格式，教師可配合校本課程修訂教學內容。
Tutorials are equipped with WORD format. Teachers can adjust the teaching content according to school-based curriculum.

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 Scratch 都是開放源碼的，教師可以按校本需要調整內容。
Arduino and Scratch 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 Arduino、Scratch 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 Arduino, Scratch and electric circuit are provided for beginners. Teachers can adjust the curriculum according to the 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, encourages self-directed learning.

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

- 全部作業均配備相關的資源檔案及建議答案。
All assignments are equipped with relevant resource files and suggested answers.

4. DIY 內容 DIY Materials

- 額外為專案提供 AI 格式的設計圖檔，讓學生發揮創意，自行美化作業。

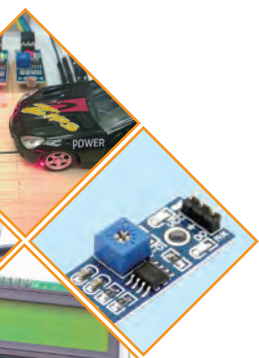
Design files with AI format are provided for the projects, students can beautifying their assignments.

5. 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。

CD Rom and website with full teaching and learning materials are provided.

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



專案一：紅外線人流記錄儀

Project I: Infrared People Counter

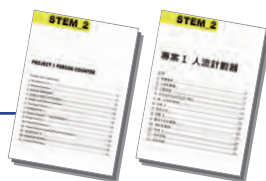
學們能從本專案學習使用幾款不同的感應器，並從中選出合適的感應器來建立一個人流記錄儀器。

Students will learn to use several different sensors from this project, and then they can choose the suitable sensors to build themselves a person counter.

專案資源 Project Resources

學習教材

Learning Guide



資源檔案及建議答案

Resource Files & Suggested Answers

E1B-000N.png	3/12/2017 10:48	199 KB	13 KB
Proximity-sensors.fzz	5/12/2017 15:32	122 檔案	10 KB
Proximity-sensors.ab2	8/12/2017 15:28	mBlock Project File	75 KB
Single-Light-Beam-Counter.fzz	9/12/2017 11:18	122 檔案	8.1 KB
Single-Light-Beam-Counter.ab2	9/12/2017 18:15	mBlock Project File	74 KB
Two-directional-people-counter.fzz	5/12/2017 18:14	122 檔案	45 KB
Two-directional-people-counter.ab2	8/12/2017 18:18	mBlock Project File	75 KB
Two-Light-Beams.fzz	5/12/2017 11:14	122 檔案	49 KB
Two-Light-Beams.ab2	8/12/2017 11:32	mBlock Project File	75 KB
Using-a-1602-LCD-Module.fzz	7/12/2017 14:15	122 檔案	18 KB
Using-a-1602-LCD-Module.ab2	11/12/2017 14:25	mBlock Project File	14 KB



DIY 內容

DIY Materials



專案二：智能植物澆水系統

Project II : Smart Plant Watering System

本專案讓同學們組合幾款不同的感應器，以建造一個全自動的智能澆水系統。

This project allows students to combine several different sensors to build a fully automatic smart plant watering system.

專案資源 Project Resources

學習教材

Learning Guide



資源檔案

Resource Files



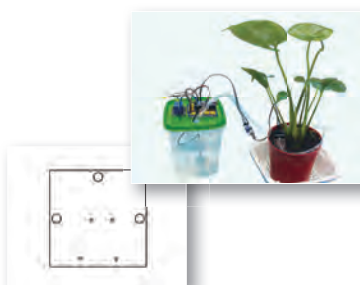
建議答案

Suggested Answers



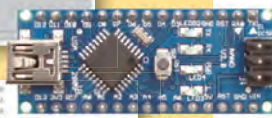
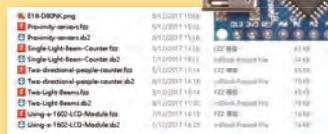
DIY 內容

DIY Materials



產品特色 Product Features

- 互動光碟及專用網站
Interactive CD-Rom & Companion Website



Address: Unit A, 11/F, Leahander Centre,
28 Wang Wo Tsai Street, Tsuen Wan, N.T., Hong Kong
Website: www.apricot.com.hk
Email: service@apricot.com.hk
Tel: (852) 2411 1280 Fax : (852) 3693 4453

