

STEM_5

自學教材

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樣本

專案一：物聯網應用（上）

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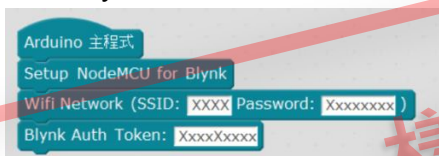
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2. Blynk 遙控 NodeMCU 測試

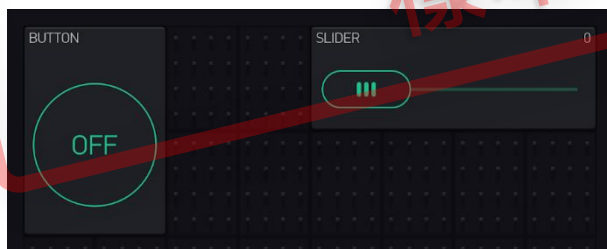
物聯網的應用主要有兩個最重要功能，分別是從遠端遙距控制硬體設備及從硬體設備把數據發送至遠端。本專案會利用一些例子，以 Blynk 應用程式設計遠端用戶界面，透過無線網絡遙控配備 NodeMCU 微控制器的硬體設備。

讓我們先學習 Blynk 基本控制硬體設備的方法。我們先於 Blynk 新增一個專案，再利用 mBlock 及 Arduino IDE 準備好及上傳程式碼到 NodeMCU，讓微控制器與 Blynk 連接。¹

連接 Blynk 需要這三個積木，輸入參數後，把程式碼上傳到 NodeMCU。



現在我們開始建立 Blynk 用戶界面。



新增按鈕(Button)及滑桿(Slider)元件各一個，它們都是 Blynk 最基礎的控制元件，負責控制微控制器各個腳位。

點擊按鈕元件進入設定頁，我們可進行不同的設定。Blynk 的每個元件的名稱及顯示顏色都可於設定中更改。

¹ 詳細步驟請參閱本套件的基礎知識文件：《使用 Blynk 開發物聯網專案》及《使用 mBlock 及 Arduino IDE 為 NodeMCU 編程》。

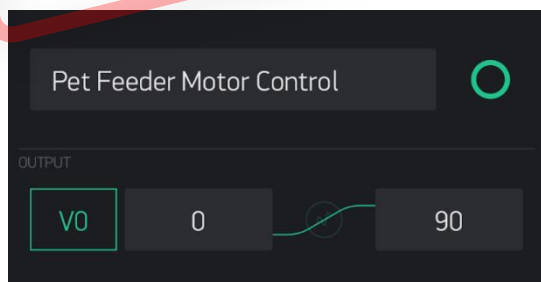
4. 寵物餵食器

物聯網其中一個最強大的功能，就是能利用互聯網跨越距離及地域的限制，即使身在遠方也能控制家中的裝置。



我們會製作一個寵物餵食器，並加添網絡功能，即使我們不在家中甚至身處外地，也能為家中的寵物提供食物。為了善用資源，我們會利用一些家居棄置物料製作裝置(詳情請參閱相關的 DIY 內容)。

餵食器的操作原理是在膠瓶上開幾個小孔，利用伺服電動機轉動瓶身，每轉動一次就會有少量的寵物飼料掉下來。餵食器按照上一節的方式編程，透過虛擬腳位用 Blynk 遙控伺服電動機的旋轉角度。由於餵食器投下食物時旋轉幅度並不太大，所以需修改 Blynk 控制元件的設定。



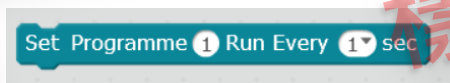
例如把滑桿控件的 OUTPUT 值限制在 0 和 90 之間，便可避免餵食器過度轉動。

5. 為 Blynk 物聯網專案編程

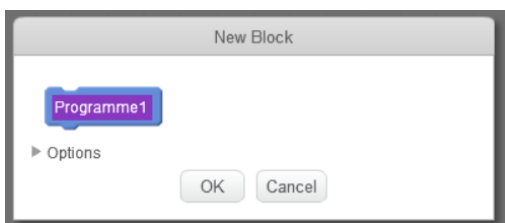
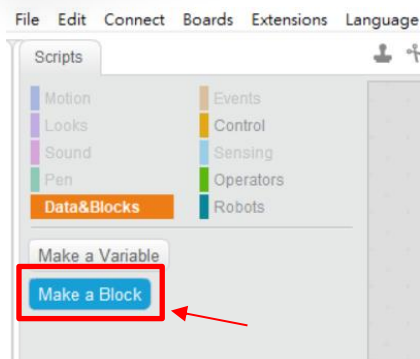
以上述的寵物餵食器機為例，雖然可以遙距為寵物提供食物，但操作比較麻煩，因為必須每一次用人手滑動滑桿元件才能投下食物。如果要簡化過程，可利用 mBlock 為物聯網自動化操作程序編程。

基於 Blynk 的操作模式，我們不會像常見的 Arduino 編程那樣編寫循環（Loop）模組，而是會編寫獨立的程序（Programme），並利用 SimpleTimer 函式庫的功能，以指定的時間間隔不斷觸發程序；若程序中執行特定指令的條件成立，設備便會執行該指令。

我們可利用 mBlock 中編寫自訂的程序，再加上「Blynk_with_NodeMCU」擴展中的積木，便可簡易地編寫物聯網自動化操作程序。



利用擴展中以上的積木，可設定觸發程序的時間間隔。在積木第一個參數空位中輸入程序數字編號，以辨別不同程序。



在 mBlock 中 **Data&Blocks** 類別下按 **Make a Block**，然後在彈出來的「New Block」對話框中為自訂積木命名。為

6. 作業 1

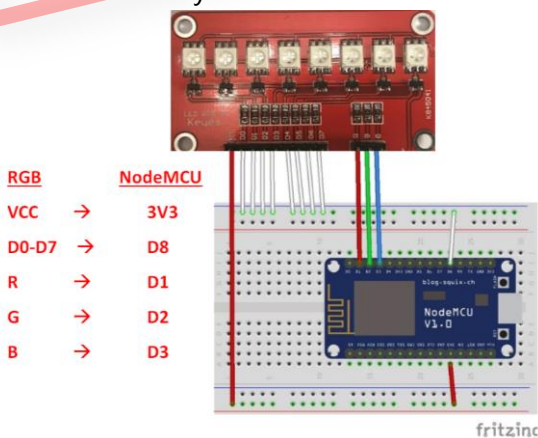
1. 試改良遙控寵物餵食器的專案，讓用家只需按一個按鈕便可以完成一次投餵的過程。

7. RGB LED 流水燈模組

這個模組包含 8 顆 RGB 全彩 LED。LED 亮着的顏色會跟據 3 個針腳所接駁的數位腳位的 PWM 訊號變化。8 顆 LED 各有 1 個針腳獨立控制開關，利用不同的程式碼可產生不同的燈光效果，配合 Blynk 更可製作遙控的燈光系統。

注意模組的 8 顆 LED 都以「流入」(Sink) 模式接駁，所以其邏輯是倒置的：輸入為低電位時 LED 會亮着，輸入為高電位時會熄滅。顏色的控制也是用類似的邏輯。

讓我們先利用 Blynk 開關 LED 及改變其發亮的顏色。



專案 1 作業 1 建議答案

問題 1：



於 Blynk 應用程式利用按鈕控件控制虛擬腳位（Virtual Pin）V0。當我們按下按鈕時，伺服電機（Servo motor）會轉動 90°；當我們放開按鈕時，伺服電機會返回原本的位置，這樣便完成一次投餵。

[mBlock 程式檔：Project1_Assignment1_Answer.sb2]

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Self-learning Guide

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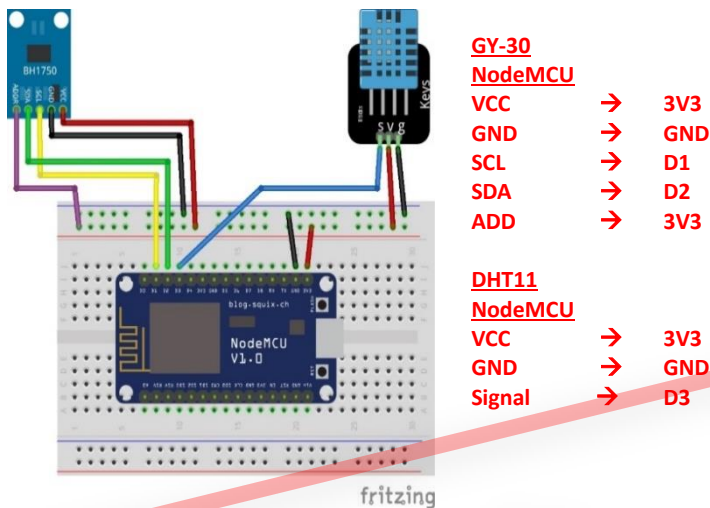
Sample

PROJECT 2 IOT APPLICATION (2)

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4. Cloud-based Mini Weather Station



By means of a microcontroller and environment sensors, along with IoT technology, remote environmental data can be collected easily. Furthermore, with support from Blynk's cloud database, massive quantity of data could be stored up. Here we are going to use DHT11 Humidity & Temperature Sensor Module, GY-30 BH1750 Light Intensity Module and NodeMCU to set up a mini weather station.

For mBlock coding, if we don't read digital and analog data with Blynk directly, a virtual pin would be needed to send data from the sensors to Blynk's cloud server. The data would then be read with the Blynk app on the device, which would need blocks from the "Blynk_with_NodeMCU" extension.

Push Value from **Sensor** to Virtual Pin V **0** Every **1** Sec

The above block specifies the virtual pin on which a sensor's data is to be "pushed" to the Blynk Cloud. The PUSH frequency is defined by the last

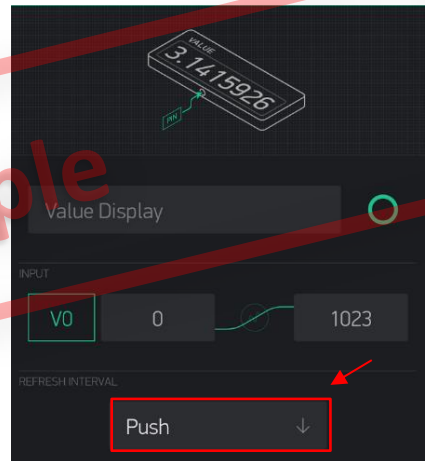
parameter on this block (how many second for one push). An advantage of the PUSH mode is that even while the Blynk app is offline, data will keep being pushed to the Cloud until the next time for the app to go online again when the data will be sent to the client's device.

Read Data from **Sensor** by Virtual Pin **V0**

This block specifies the virtual pin by which a sensor's data is to be read. The reading frequency can be set in the Blynk app, allowing more flexibility in data collection. However, the data can be read only when the Blynk app is online.

In the Blynk app, the common display widgets for sensor reading are Value Display and Labeled Value widgets.

If we select a virtual pin for INPUT, the Value Display widget offers us an option for the PUSH mode, but settings must have been made in coding.



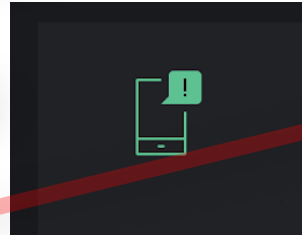
8. Instant Messaging by Blynk Server

A major function of the smart home inflammable gas detector is to notify the client who is away from home of the possibility of an emergency. To create this function, we can code a program to enable Blynk to send a notification message to the client's smartphone over the network through a notification widget of the app when a predefined condition is met.

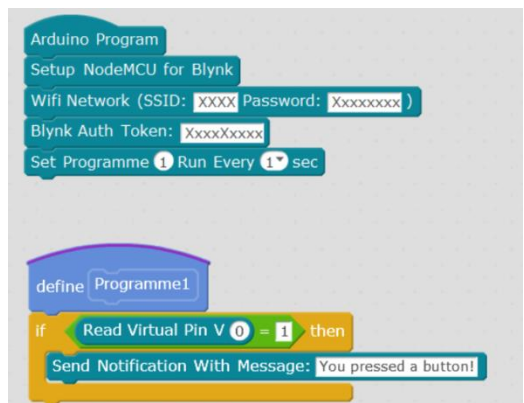
Send Notification With Message: Hello World!

Use this block to instruct the microcontroller to send out a notification message and to define the message content.

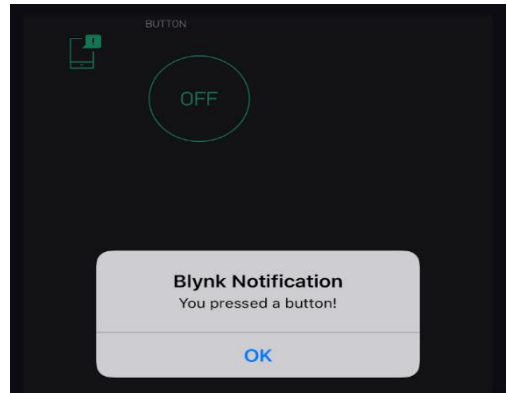
Just like coding automation programmes before, now use a custom block to create an automation programme and define the condition for the programme to send out a message in a specific situation. Meanwhile, to the Blynk app interface, we only need to add the widget as shown on the right. Then the hardware will be able to send out a message to a smartphone when the program is being executed.




We may test with the example on the right:



Before executing this program, install a Button widget on the Blynk app interface to control the virtual pin V0. When you press the Button, you will receive a message sent to your smartphone from the server. Note that the system only allows a message to be sent as frequently as every 5 seconds at most.



[Resource file : Blynk_Notification.sb2 / Blynk settings : ]

10. Assignment 2

Improve on the program in Assignment 1 and build a smart home inflammable gas detector:

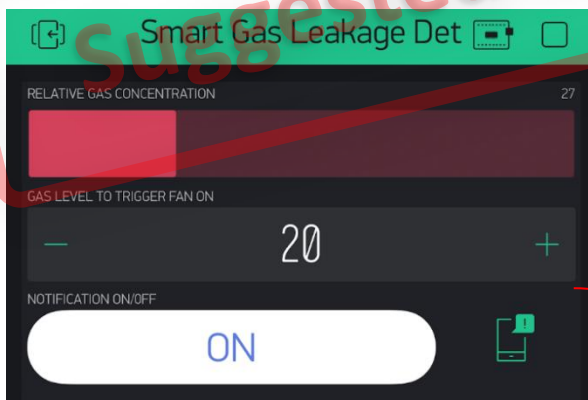
1. When the **relative** concentration of the inflammable gas goes beyond a certain percentage, the detector will automatically turn on the DC cooling fan. The specific condition for the fan to be turned on can also be adjusted at any time to meet different needs;
2. When the relative concentration of the inflammable gas goes beyond 80%, the detector will automatically send out a notification to the smartphone.

Question 2:

In Programme2, the detector will automatically send out a notification to the smartphone when “RelConc” is greater than 80. In order to avoid sending notification repeatedly, we can add a condition of reading the status of Virtual Pin V2.



Besides, on the Blynk app, we have to add and switch on the “notification control” so that the system will automatically send out a message to the smartphone under certain condition.



Notification Control

[Resource file : Project2_Assignment2_Answer.sb2]



[Blynk setting :]