

App Inventor2 連接 開放資料庫JSON格式 空氣品質APP製作 進階功能

國立臺中教育大學 大學部人工智慧應用
數位系三年級

吳智鴻

教學網站：[HTTP://120.108.221.55/PROFCHWU/DCTEC](http://120.108.221.55/PROFCHWU/DCTEC)

FB社團： 10X 數位系人工智慧

APP INVENTOR PROJECT: AIRQUALITY



兩個重要的空氣品質監控網站



1. 空氣品質監測網

<https://taqm.epa.gov.tw/taqm/tw/default.aspx>

行政院環境保護署
Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

空氣品質監測網

環保署提醒竹山、高屏及屏東(琉球)地區橘色提醒(對敏感族群不健康)。

環保署 \ 空氣品質監測網 \ 空氣品質指標

環 保 署 地方環保局 大型事業 特殊性工業區 全國即時監測 全國交通空氣品質監測

空氣品質指標 空氣品質指標(GIS) 空氣品質預報 前一日空氣品質指標 細懸浮微粒濃度

健康影響與活動建議

發布時間：2017/12/13 10:00 請點擊左方測站位置或
空氣品質指標(AQI) 所屬單位：

地區： >

發布時間：2017-12-13 10:00:00

基隆 (一般站)

AQI 37
空氣品質指標 良好

O ₃ (ppb)	8小時 移動平均	40
臭氧	小時 濃度	39
PM _{2.5} (µg/m ³)	移動 平均	5
細懸浮微粒	小時 濃度	5
PM ₁₀ (µg/m ³)	移動 平均	12
懸浮微粒	小時 濃度	11

馬祖

金門

澎湖

北部

竹苗

宜蘭

中部

花東

雲嘉南

高屏

- 空氣品質監測網
- 空氣品質監測
- 普通測站
- 交通空氣品質監測
- 光化測站
- 空氣品質指標
- 預報作業
- 空氣品質標準
- 儀器資料庫
- 微脈衝雷射雷達測站
- 空氣盒子簡問簡答
- 沙塵網站
- 河川揚塵監測
- 紫外線監測
- 品質保證作業
- 資料查詢與服務
- 地方監測站資料
- 鹿林山背景站
- 東沙東引背景站
- 南海環境品質監測
- 常見問題
- 相關網站
- 網站導覽
- 環境即時通 (app)
- 歷年監測資料
- 測站地圖資訊

重要的空氣品質指標與判斷標準

污染物	O ₃ , 8hr	O ₃ ⁽¹⁾	PM _{2.5}	PM ₁₀	CO	SO ₂	NO ₂
即時統計	最近連續 8小時移動 平均值	即時 濃度值	0.5 ×前12小時平均 + 0.5 × 前4小時平均	0.5 ×前12小時平均 + 0.5 × 前4小時平均	最近連續 8小時移動 平均值	即時 濃度值	即時 濃度值
單位	ppm	ppm	µg/m ³	µg/m ³	ppm	ppb	ppb
AQI 值							
0~50	0.000 - 0.054	-	0.0 - 15.4	0 - 54	0 - 4.4	0 - 35	0 - 53
51~100	0.055 - 0.070	-	15.5 - 35.4	55 - 125	4.5 - 9.4	36 - 75	54 - 100
101~150	0.071 - 0.085	0.125 - 0.164	35.5 - 54.4	126 - 254	9.5 - 12.4	76 - 185	101 - 360
151~200	0.086 - 0.105	0.165 - 0.204	54.5 - 150.4	255 - 354	12.5 - 15.4	186 - 304 ⁽³⁾	361 - 649
201~300	0.106 - 0.200	0.205 - 0.404	150.5 - 250.4	355 - 424	15.5 - 30.4	305 - 604 ⁽³⁾	650 - 1249
301~400	⁽²⁾	0.405 - 0.504	250.5 - 350.4	425 - 504	30.5 - 40.4	605 - 804 ⁽³⁾	1250 - 1649
401~500	⁽²⁾	0.505 - 0.604	350.5 - 500.4	505 - 604	40.5 - 50.4	805 - 1004 ⁽³⁾	1650 - 2049

資料來源：<https://taqm.epa.gov.tw/taqm/tw/b0203.aspx>

2. 空氣品質open data

OpenData.epa
行政院環境保護署·環境資源資料開放平臺

資料集目錄 / 資料查詢

空氣品質指標(AQI)

請增加過濾條件

請選擇要過濾的項目

請選擇要過濾的方式

輸入過濾條件 加篩選條件

顯示查詢結果

關於資料集 資料檢視

應用程式存取網址

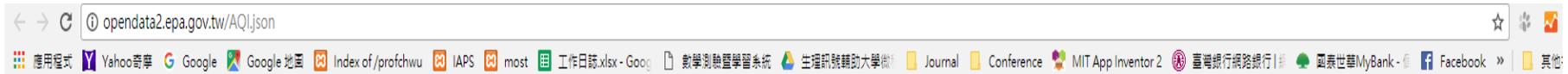
顯示欄位設定 網頁嵌入 使用範例

JSON XML CSV

AQI	CO	CO_8hr	County
37	0.17	0.2	基隆市
41	0.21	0.2	新北市
44	0.13	0.1	新北市
30	0.41	0.3	新北市
31	0.36	0.3	新北市
31	0.4	0.3	新北市
32	0.35	0.3	新北市
31	0.37	0.3	新北市
31	0.29	0.2	新北市

<https://opendata.epa.gov.tw/Data/Contents/AQI/>

程式存取網址 (JSON格式) : <http://opendata2.epa.gov.tw/AQI.json>

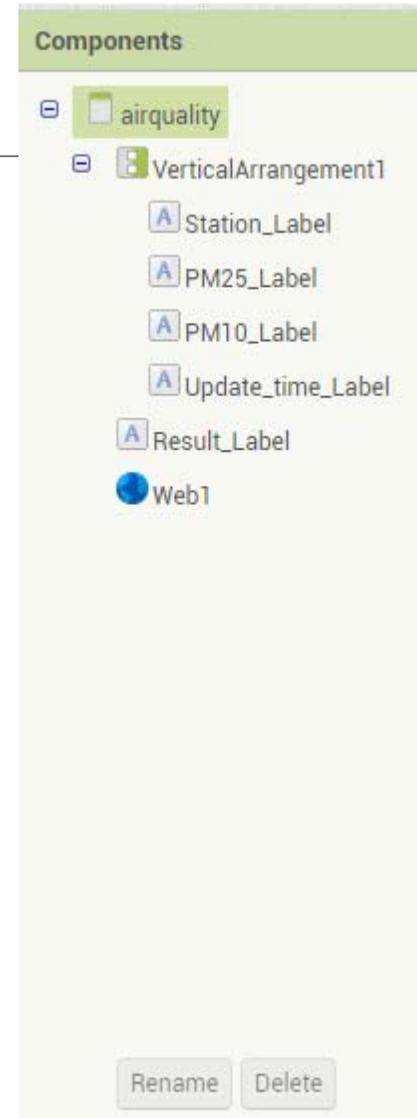
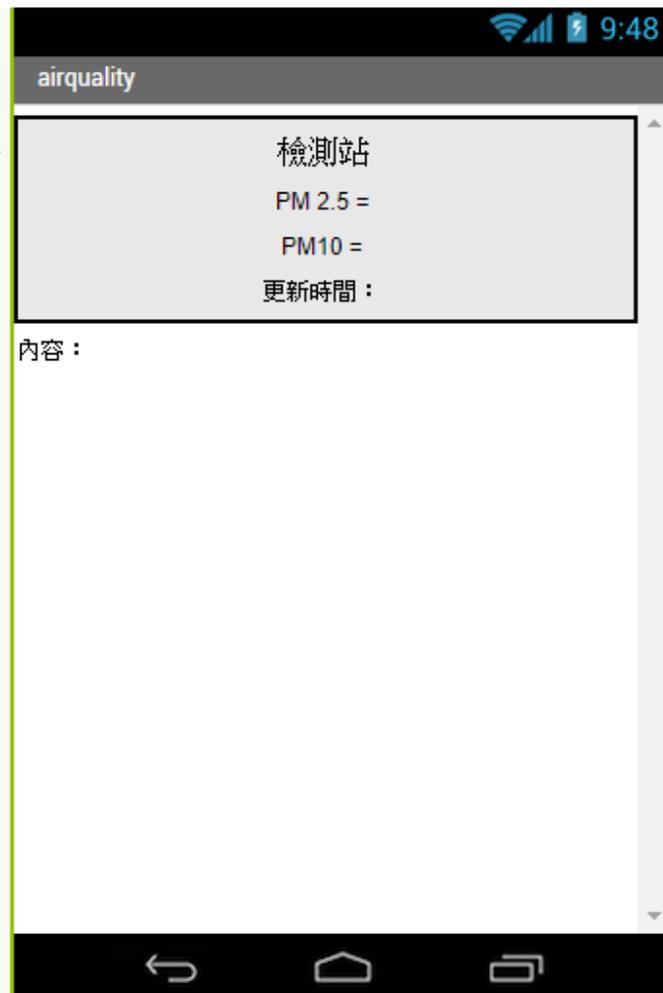


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先以臺中市的空氣品質 試做雛形



螢幕設計



Non-visible components

Web1

程式

```
initialize global airquality to create empty list

when airquality .Initialize
do
  set Web1 . Url to "http://opendata2.epa.gov.tw/AQI.json"
  call Web1 .Get

when Web1 .GotText
  url responseCode responseType responseContent
do
  set global airquality to call Web1 .JsonTextDecode
  jsonText get responseContent
  set Result_Label . Text to get global airquality
```



執行結果

先確認能否抓到資料，
再做下一步的資料解析。

右方顯示已經能抓到資料了。

airquality

檢測站

PM 2.5 =

PM10 =

更新時間：

((AQI 37) (CO 0.17) (CO_8hr 0.2) (County 基隆市) (NO 0.4) (NO2 3.6) (NOx 4) (O3 40) (O3_8hr 40) (PM10 13) (PM10_AVG 12) (PM2.5 5) (PM2.5_AVG 5) (Pollutant) (PublishTime 2017-12-13 11:00) (SO2 0.4) (SiteName 基隆) (Status 良好) (WindDirec 74) (WindSpeed 2.8)) ((AQI 41) (CO 0.2) (CO_8hr 0.2) (County 新北市) (NO 3.4) (NO2 11) (NOx 15) (O3 36) (O3_8hr 36) (PM10 13) (PM10_AVG 11) (PM2.5 12) (PM2.5_AVG 13) (Pollutant) (PublishTime 2017-12-13 11:00) (SO2 1) (SiteName 汐止) (Status 良好) (WindDirec 30) (WindSpeed 3.4)) ((AQI 44) (CO 0.14) (CO_8hr 0.1) (County 新北市) (NO 0.7) (NO2 1.2) (NOx 1.9) (O3 47) (O3_8hr 47) (PM10 24) (PM10_AVG 24) (PM2.5 8) (PM2.5_AVG 10) (Pollutant) (PublishTime 2017-12-13 11:00) (SO2 1.5) (SiteName 萬里) (Status 良好) (WindDirec 51) (WindSpeed 12)) ((AQI 30) (CO 0.33) (CO_8hr 0.3) (County 新北市) (NO 4.3) (NO2 16) (NOx 20) (O3 29) (O3_8hr 31) (PM10 11) (PM10_AVG 10) (PM2.5 12) (PM2.5_AVG 9) (Pollutant)

資料結構長這樣

```
array ▶ 0 ▶
├─ array [77]
│   └─ 0 {20}
│       AQI : 37
│       CO : 0.17
│       CO_8hr : 0.2
│       County : 基隆市
│       NO : 0.4
│       NO2 : 3.6
│       NOx : 4
│       O3 : 40
│       O3_8hr : 40
│       PM10 : 13
│       PM10_AVG : 12
│       PM2.5 : 5
│       PM2.5_AVG : 5
│       Pollutant : value
│       PublishTime : 2017-12-13 11:00
│       SiteName : 基隆
│       SO2 : 0.4
│       Status : 良好
│       WindDirec : 74
│       WindSpeed : 2.8
└─ 1 {20}
```

確認一下資料抓取是否正確

程式

```
initialize global airquality to create empty list
initialize global number to 1
initialize global Air_Record to create empty list
initialize global Air_field to create empty list

when airquality.Initialize
do
  set Web1.Url to "http://opendata2.epa.gov.tw/AQI.json"
  call Web1.Get

when Web1.GotText
  url responseCode responseType responseContent
do
  set global airquality to call Web1.JsonTextDecode
  jsonText get responseContent
  for each item in list get global airquality
  do
    set global Air_Record to select list item list get global airquality
    index get global number
    set global number to get global number + 1
  set Result_Label.Text to get global Air_Record
```

最後一筆資料

```
airquality
    檢測站
    PM 2.5 =
    PM10 =
    更新時間：
    ((AQI) (CO) (CO_8hr) (County 新北市)
    (NO) (NO2) (NOx) (O3) (O3_8hr) (PM10)
    (PM10_AVG 34) (PM2.5) (PM2.5_AVG 12)
    (Pollutant) (PublishTime 2017-12-13 11:00)
    (SO2) (SiteName 富貴角) (Status 設備維護)
    (WindDirec) (WindSpeed))
```

比對程式執行結果與原始資料是否一致？ (設定抓到最後一筆)

程式執行結果

```
airquality
    檢測站
    PM 2.5 =
    PM10 =
    更新時間：
((AQI ) (CO ) (CO_8hr ) (County 新北市)
(NO ) (NO2 ) (NOx ) (O3 ) (O3_8hr ) (PM10 )
(PM10_AVG 34) (PM2.5) (PM2.5_AVG 12)
(Pollutant ) (PublishTime 2017-12-13 11:00)
(SO2 ) (SiteName 富貴角) (Status 設備維護)
(WindDirec ) (WindSpeed ))
```

原始資料

```
▼ 76 {20}
AQI : {value}
CO : {value}
CO_8hr : {value}
County : 新北市
NO : {value}
NO2 : {value}
NOx : {value}
O3 : {value}
O3_8hr : {value}
PM10 : {value}
PM10_AVG : 34
PM2.5 : {value}
PM2.5_AVG : 12
Pollutant : {value}
PublishTime : 2017-12-13 11:00
SiteName : 富貴角
SO2 : {value}
Status : 設備維護
WindDirec : {value}
WindSpeed : {value}
```

現在以臺中市 忠明觀測站
為範例



程式裡面的資料

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
AQI	CO	CO_8hr	County	NO	NO2	Nox	O3	O3_8hr	PM10	PM10_AVG	PM2.5	PM2.5_AVG	Pollutant	PublishTime	SiteName	SO2	Status	WinDirect	WinSpeed
43	0.32	0.5	臺中市	12	17	29	19	7	26	22	9	13		2017/12/13	忠明	2.6	良好	336	1.9

有顏色的欄位是我們
想要抓的資訊



原始資料資料

```
▼ 30 {20}
AQI : 43
CO : 0.32
CO_8hr : 0.5
County : 臺中市
NO : 12
NO2 : 17
NOx : 29
O3 : 19
O3_8hr : 7
PM10 : 26
PM10_AVG : 22
PM2.5 : 9
PM2.5_AVG : 13
Pollutant : value
PublishTime : 2017-12-13 11:00
SiteName : 忠明
SO2 : 2.6
Status : 良好
WindDirec : 336
WindSpeed : 1.9
```

要訣：要把原始資料轉成程式裡面我們熟悉的陣列格式

- initialize global AQI to create empty list
- initialize global County to create empty list
- initialize global PM25 to create empty list
- initialize global PM10 to create empty list
- initialize global Publish_time to create empty list
- initialize global Station to create empty list
- initialize global Status to create empty list

新增這些清單
來儲存
重要的資訊

執行結果

```
when Web1 . GotText
  url responseCode responseType responseContent
do
  set global airquality to call Web1 . JsonTextDecode
  jsonText get responseContent
  for each item in list get global airquality
  do
    set global Air_Record to select list item list get global airquality
    index get global number
    set global AQI to select list item list get global Air_Record
    index 1
    set global County to select list item list get global Air_Record
    index 4
    set global PM10 to select list item list get global Air_Record
    index 10
    set global PM25 to select list item list get global Air_Record
    index 12
    set global Publish_time to select list item list get global Air_Record
    index 15
    set global Station to select list item list get global Air_Record
    index 17
    if select list item list get global County = get global County_name
    index 2
    then set Station_Label . Text to select list item list get global Station
    index 2
    set global number to get global number + 1
  set Result_Label . Text to get global Air_Record
```

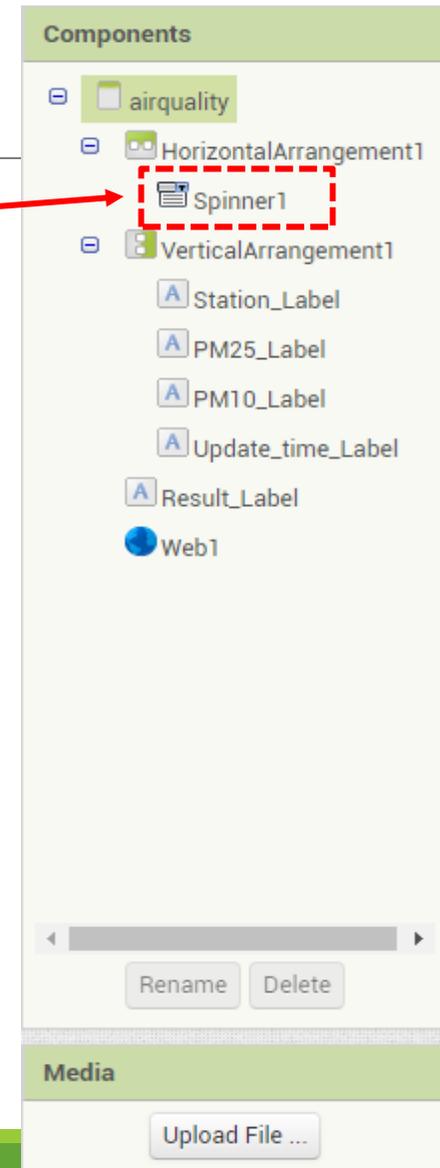
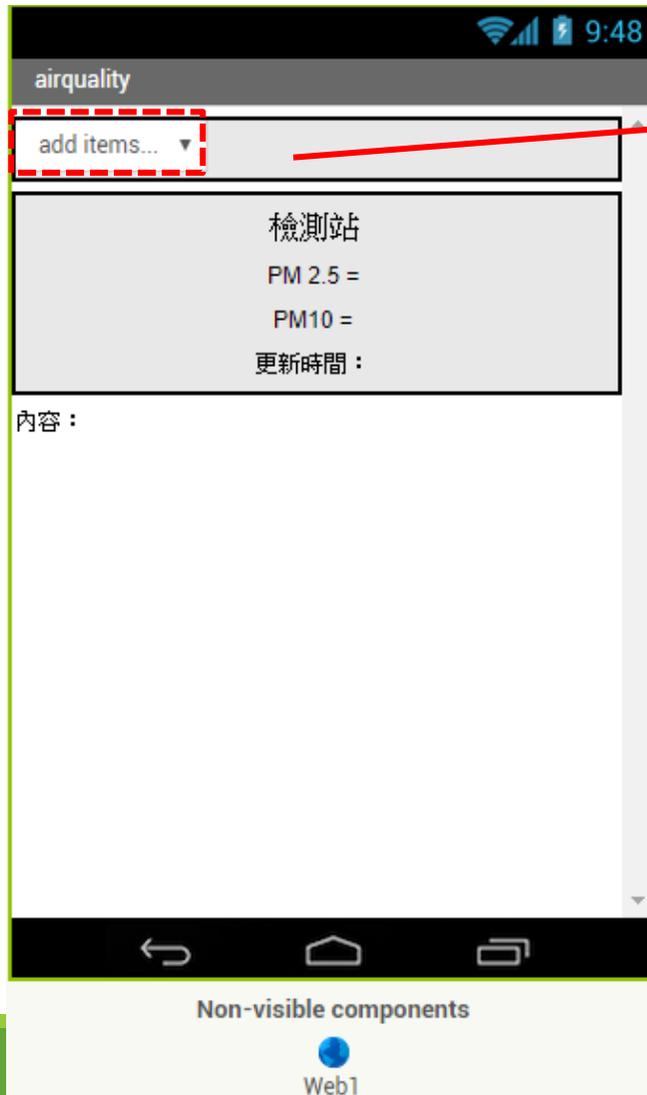
initialize global County_name to 臺中市



加上選擇縣市功能



螢幕設計： 加上Spinner



加上SPINNER選擇城市

initialize global County_name to "臺中市"

initialize global county_selection to make a list "新北市"
"臺中市"

when Spinner1 .AfterSelecting
selection
do set global County_name to get selection
call Web1 .Get

用清單來建立
城市的選項

當使用者選擇選
項後，把選擇的
城市存入變數

可以選縣市

```

when Web1 .GotText
do
  set global airquality to call Web1 .JsonTextDecode
  jsonText get responseContent
  for each item in list get global airquality
  do
    set global Air_Record to select list item list get global airquality
    index get global number
    set global AQI to select list item list get global Air_Record
    index 1
    set global County to select list item list get global Air_Record
    index 4
    set global PM10 to select list item list get global Air_Record
    index 10
    set global PM25 to select list item list get global Air_Record
    index 12
    set global Publish_time to select list item list get global Air_Record
    index 15
    set global Station to select list item list get global Air_Record
    index 17
    if select list item list get global County = get global County_name
    index 2
    then
      set Station_Label .Text to join select list item list get global Station
      index 2
      " 觀測站 "
      set PM25_Label .Text to join " PM 2.5 = "
      select list item list get global PM25
      index 2
      set PM10_Label .Text to join " PM 10 = "
      select list item list get global PM10
      index 2
      set Update_time_Label .Text to join " 更新時間: "
      select list item list get global Publish_time
      index 2
      set Result_Label .Text to get global Air_Record
      set global number to get global number + 1
  
```

```

initialize global County_name to " 臺中市 "
initialize global county_selection to make a list
" 新北市 "
" 臺中市 "
  
```

```

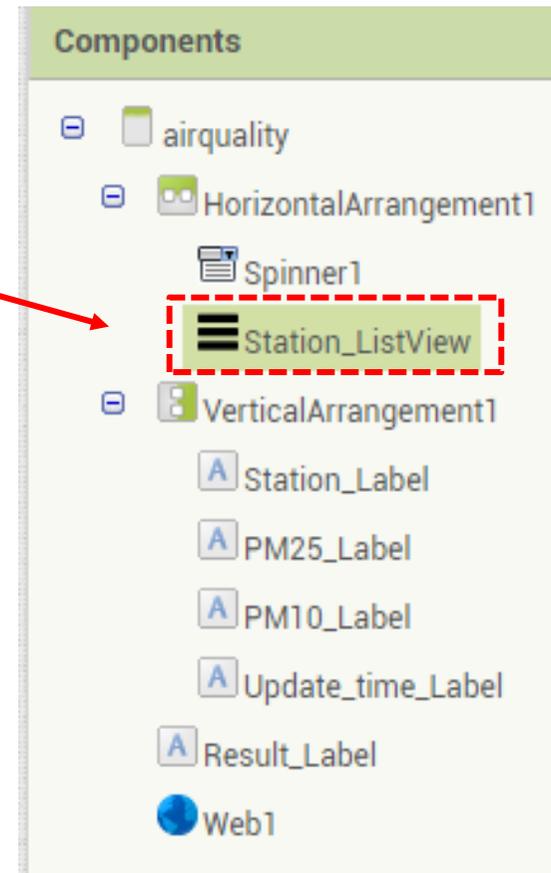
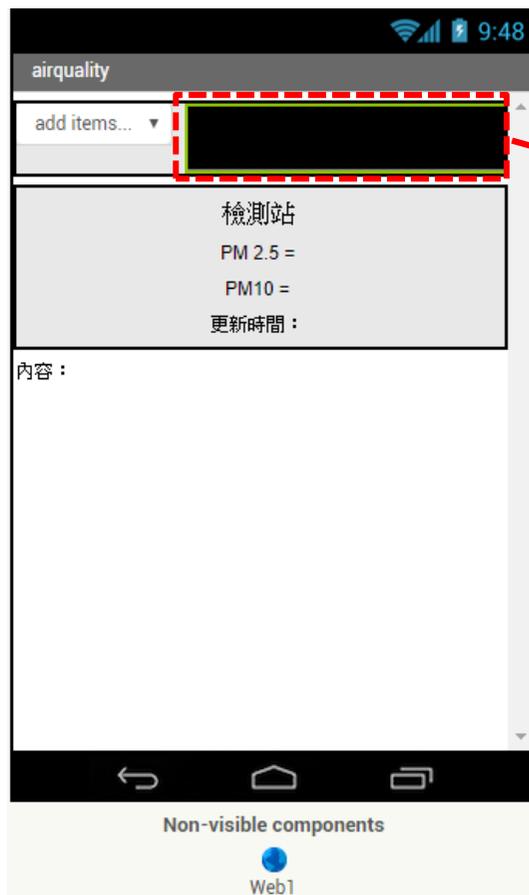
when Spinner1 .AfterSelecting
  selection
  do
    set global County_name to get selection
    call Web1 .Get
  
```



進階功能
想要能夠從資料庫自動抓取
所有觀測站，不要寫死在程
式中。



螢幕設計 新增ListView (也可以用Spinner或ListPicker)



修改原先的WEBGET程式

想法

1. 第一次讀入WEBGET的JSON資料時，就把所有要抓的資料，分別存入不同陣列，方便之後顯示與讀取。
例如城市->(County)、觀測站->(Station)、PM25->(PM25)等
2. 城市選單Spinner採用程式內建的程式，而不是用程式自動判斷，因為城市名稱為固定，且不多。若用程式撈取JSON開放資料在來自動寫入，城市名稱會有重複的問題，比較不好處理。
3. 使用者選好城市之後，再從JSON開放資料中，自動抓取該城市對應的觀測站至ListView中，讓使用者選擇。這樣就不用在程式中內建觀測站，可以隨著資料有更新觀測站自動更新。

程式#1 定義變數

initialize global airquality to create empty list

initialize global number to 1

initialize global Air_Record to create empty list

initialize global Air_field to create empty list

```
when airquality.Initialize
do
  set Spinner1.Elements to get global county_selection
  set Station_ListView.Selection to false
  set Web1.Url to "http://opendata2.epa.gov.tw/AQI.json"
  call Web1.Get
```

initialize global County_name to "臺中市"

```
when Spinner1.AfterSelecting
  selection
do
  set global County_name to get selection
  call addStation_Selection
    County get global County_name
```

initialize global AQI to create empty list

initialize global County to create empty list

initialize global PM25 to create empty list

initialize global PM10 to create empty list

initialize global Publish_time to create empty list

initialize global Station to create empty list

initialize global Status to create empty list

initialize global county_selection to make a list

- "基隆市"
- "新北市"
- "臺北市"
- "臺中市"

initialize global station_selection to create empty list

程式#2 定義變數 (修改原先WebGet)

```
when Web1 .GotText
  url responseCode responseType responseContent
do
  set global airquality to call Web1 .JsonTextDecode
  jsonText get responseContent
  for each item in list get global airquality
  do
    set global Air_Record to select list item list get global airquality
    index get global number
    add items to list list get global AQI
    item select list item list get global Air_Record
    index 1
    add items to list list get global County
    item select list item list get global Air_Record
    index 4
    add items to list list get global PM10
    item select list item list get global Air_Record
    index 10
    add items to list list get global PM25
    item select list item list get global Air_Record
    index 12
    add items to list list get global Publish_time
    item select list item list get global Air_Record
    index 15
    add items to list list get global Station
    item select list item list get global Air_Record
    index 17
    add items to list list get global Status
    item select list item list get global Air_Record
    index 19
  set global number to get global number + 1
```

用清單來把所有
要的資料分別存
入對應的清單中

程式#3 自動抓取觀測站，並存入ListView

```
to addStation_Selection County
do
  set global number to 1
  set global station_selection to create empty list
  for each item in list get global County
  do
    if
      select list item list select list item list get global County = get global County_name
      index get global number
    then
      add items to list list get global station_selection
      item select list item list select list item list get global Station
      index get global number
    set global number to get global number + 1
  set Station_ListView.Elements to get global station_selection
  set Station_ListView.Visible to true
```

```
when Station_ListView.AfterPicking
do
  set Station_ListView.Visible to false
  call show_info
  station_input Station_ListView.Selection
```

程式#4 修改顯示資訊部分

1. 把它變成副程式。 2. 呼叫時傳送參數（觀測站名稱）

呼叫時須傳入
觀測站名稱

判斷觀測站
名稱

```
to show_info station_input
do
  set global number to 1
  for each item in list get global Station
  do
    if
      select list item list index
      select list item list index
      get global Station = get station_input
      get global number
    then
      set Station_Label . Text to
        join
          select list item list index
          select list item list index
          get global Station
          get global number
          " 觀測站 "
      set PM25_Label . Text to
        join
          " PM 2.5 = "
          select list item list index
          get global PM25
          index
          2
      set PM10_Label . Text to
        join
          " PM 10 = "
          select list item list index
          get global PM10
          index
          2
      set Update_time_Label . Text to
        join
          " 更新時間: "
          select list item list index
          get global Publish_time
          index
          2
      set Result_Label . Text to
        get global Air_Record
    set global number to
      get global number + 1
```

美化畫面 當把程式功能測試完成後， 就可以把畫面美化了。

要訣：要先把雛形 & 功能作出來，不要考慮畫面美觀。

確認程式功能與資訊都正常後，就可以加上畫面。



螢幕設計



Non-visible components



Components

- airquality
 - HorizontalArrangement1
 - Spinner1
 - Station_ListView
 - VerticalArrangement1
 - Station_Label
 - Status_Button
 - HorizontalArrangement1
 - PM25_color_Button
 - PM10_color_Button
 - HorizontalArrangement1
 - PM25_Button
 - PM10_Button
 - Update_time_Label
 - Result_Label
 - Web1

Properties

Status_Button

- BackgroundColor
 - Default
- Enabled
 -
- FontBold
 -
- FontItalic
 -
- FontSize
 - 60
- FontTypeface
 - default
- Height
 - 150 pixels...
- Width
 - 150 pixels...
- Image
 - None...
- Shape
 - oval
- ShowFeedback
 -
- Text
 - Air
- TextAlignment
 - center : 1
- TextColor
 - Default
- Visible
 -

顯示資訊的程式

```
to show_info station_input
do
  set global number to 1
  for each item in list get global Station
  do
    if
      select list item list select list item list get global Station = get station_input
      index get global number
    then
      set Station_Label . Text to join
        select list item list select list item list get global Station
        index get global number
        " 觀測站 "
      set Status_Button . Text to
        select list item list select list item list get global Status
        index get global number
      if
        Status_Button . Text = " 良好 "
      then
        set Status_Button . BackgroundColor to #00FF00
      set PM25_Button . Text to
        select list item list select list item list get global PM25
        index get global number
      set PM10_Button . Text to
        select list item list select list item list get global PM10
        index get global number
      set Update_time_Label . Text to
        join " 更新時間: "
        select list item list select list item list get global Publish_time
        index get global number
    set global number to get global number + 1
```

執行結果

