

Computational Thinking and STEAM Activity in Game Development Makecode Arcade

運算思維/創客教育於遊戲設計

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STEAM & CT介紹

STEAM，代表的是

- Science(科學)
- Technology(科技)
- Engineering(工程)
- Art藝術
- Math(數學)

目的

- 培養跨領域能力
- 培養問題解決能力
- 培養創造力

運算思維CT四個步驟

問題拆解(Decomposition)

模式辨別(Pattern Recognition)

抽象化(Abstraction)

演算法(Algorithm)

STEM & CT 課程

教育者透過PPT
和影片介紹軟體
案硬體(設備、運
作方式)

將重複的步驟和
元素利用於硬體
和軟體



分析重複的地方

學生延伸作品

STEAM Activity

本次學習活動包含以下STEAM跨領域學科主題

學科	涵蓋主題
科學 Science	數位科技/物理速度、力量
科技 Technology	Makecode coding/Python/Javascript
工程 Engineering	Meowbit 組裝安裝
藝術 Art	圖樣設計/角色設計
數學 Math	座標、向量、生命值計算、亂數



Makecode

<https://arcade.makecode.com/>

The screenshot displays the Microsoft MakeCode Arcade web interface. At the top, there is a navigation bar with the Microsoft logo, the text "MakeCode Arcade", a settings gear icon, and a "Sign In" button. Below the navigation bar is a "Join the Live Stream" section featuring a "Match Stream" button and several video thumbnails of users. The main content area is divided into two sections: "My Projects" and "Skillmaps".

My Projects (View All) includes an "Import" button and a grid of project cards:

- New Project**: Represented by an orange square with a white plus sign.
- Raptor Run**: Created 3 days ago.
- space destroyer**: Created 3 days ago.
- thirty-first-stream octoBoss!**: Created 4 days ago.
- pong-game**: Created 6 days ago.
- Wonder Woman 1984**: Created 13 days ago.
- Pong PvP**: Created 13 days ago.

Skillmaps section features a "New? Try This!" banner and a row of skillmap thumbnails:

- Beginner Skillmap**: A green and blue maze-like map.
- Save the Forest**: A map with a forest background and various obstacles.
- Sing 2**: A map with a dark, fiery background.
- Shark Attack**: A map with a purple background and shark icons.
- Turkey Day**: A map with a blue background and turkey icons.
- 80s Rockstar Maze**: A maze map with a dark, rocky background.
- Jungle Monkey Ju**: A map with a green background and monkey icons.

In the background, a code editor is visible, showing a list of assets (Sprites, Controller, Game, Music, Scene, Info, Loops, Logic) and a block-based script for a game. The script includes blocks for "on start" and "on game update", with actions like "set hero to sprite", "set vx (velocity x)", "set vy (velocity y)", "set gravity", "call initializeAnimations", "call createPlayer", "set levelCount", "set currentLevel", "call setLevelTillMap", "if hero vx (velocity x) < -8 then", "set heroFacingLeft to true", "else if hero vx (velocity x) > 8 then", "set heroFacingLeft to false", "if hero hitting wall top then", "set hero vy (velocity y) to 0", "if is down button pressed then", and "if heroFacingLeft then".

What is Makecode

Microsoft MakeCode 是免費的開放原始碼平台，用於創造生動有趣的電腦科學學習體驗，並支援邁向真實世界程式設計之路。

Makecode好處

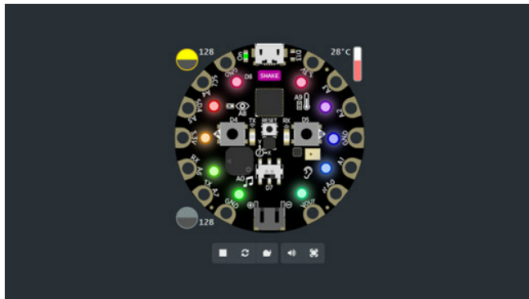


製作和編碼

使用 Microsoft MakeCode，結合製作的魔力與編碼的力量，應用在各種不同產品上。

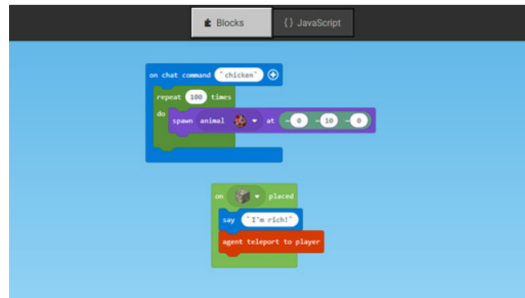
什麼是 Microsoft MakeCode？

Microsoft MakeCode 是免費的開放原始碼平台，用於創造生動有趣的電腦科學學習體驗，並支援邁向真實世界程式設計之路。



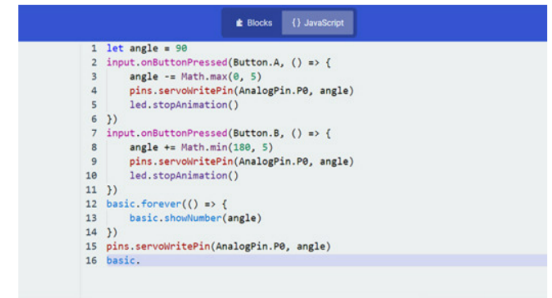
模擬器

互動式模擬器為學生的程式執行情況提供即時回饋，方便他們測試程式碼並進行偵錯。



積木編輯器

編碼初學者可以從彩色積木開始著手，將積木拖放至工作區來建構程式。










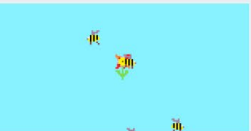


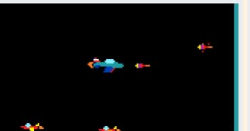
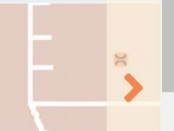









JavaScript 編輯器

在準備就緒時，學生可以使用具備程式碼片段、工具提示和錯誤偵測、功能完整的 JavaScript 編輯器，協助他們寫程式。

Space Destroy Game

Live Coding Space Arcade Game

						
Beginner Skillmap	Save the Forest	Sing 2	Shark Attack	Turkey Day	80s Rockstar Maze	Jungle Monkey Ju
Tutorials						
						
Chase the Pizza	Time Flies	Happy Flower	Winter	Lemon Leak	Galga	Free Throw
Live Coding						
						
Space Arcade Game	Chase the Pizza	Happy Flower	Lemon Leak	Maze	Simple Extensions	Galga 2 player

觀看線上教材&完成程式



https://www.youtube.com/watch?v=7pBGS_tKfmU&list=PLMMBk9hE-SepPgF7YE099S-VIuvZmRkO0

導入Meowbit 實際上手玩玩看

Meowbit



Meowbit是款具有1.8吋螢幕，並採用ARM Cortex M4微控制器的迷你電腦，使用者不但可以在上面執行遊戲，還可以利用6個可程式化按鍵、感應器，以及透過多個I/O端子連接各種周邊配備，將Meowbit改造為物聯網裝置，可以做為創客遊戲開發工具。

Meowbit

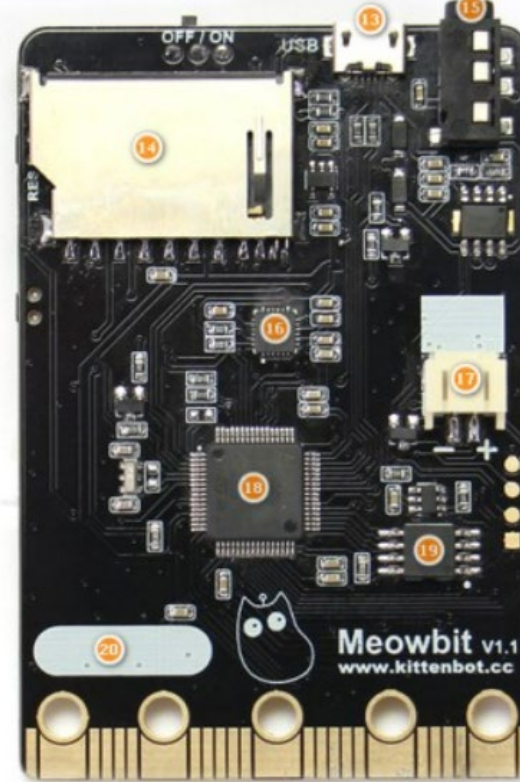
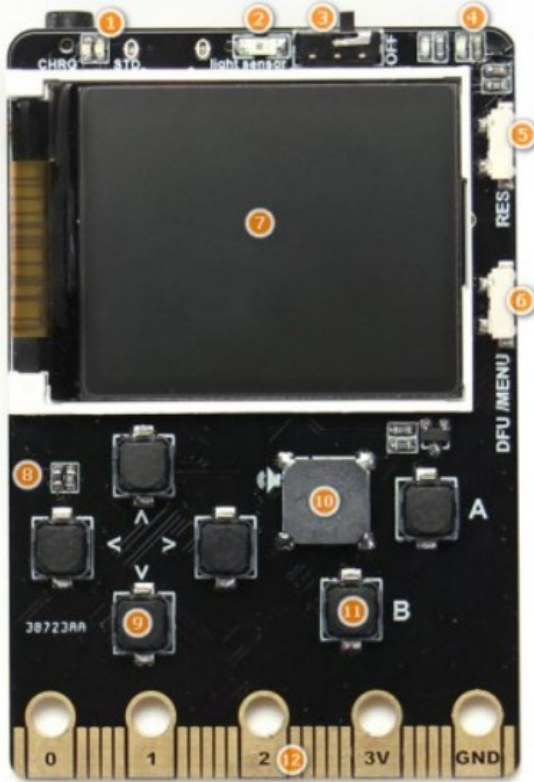


Meowbit的螢幕尺寸與解析度分別為1.8吋、160 x 128。

Meowbit



Meowbit 的核心為搭載 Arm Cortex M4 微控制器的 STMicro STM32F401RET6，並具有 6 個可程式化按鍵、光線感應器、溫度感應器、蜂鳴器、microSD 讀卡機、Micro USB，以及多個 I/O 端子。使用者不但可以透過 I/O 端子串接 2 台主機進行多人遊戲，還可連接多種周邊配備以及 [micro:bit](#) 的擴充子板。



1. Charging/work indicator
2. Light sensor
3. Power switch
4. Programmable led x 2
5. Reset
6. DFU mode button
7. 160 x 128 TFT color screen
8. Temperature sensor
9. Direction button x 4
10. Buzzer

11. Button A/B
12. Compatible with micro:bit's 40 PINs Goldfinger
13. USB program download port / charging port
14. SD card slot (Use for store programs or extend wireless modules)
15. Multiplayer Connector
16. mp6050 gyroscope
17. 3.7V lithium battery package interface
18. MCU
19. 2MByte SPI-flash (default download Unicode character table)
20. Signature area

▲ Meowbit具有豐富的I/O端子，最下方匯流排為相容micro:bit的40個GPIO。

注意安裝方式如右



安裝鋰電池

安裝完成



實作 Space Destroy Game

New Project

The screenshot shows the Microsoft MakeCode website interface. At the top, there is a navigation bar with the Microsoft logo and the text "Microsoft | MakeCode". Below this is a banner for a "Live Stream" with a "Watch Stream" button and several video thumbnails of people. The main content area is divided into sections: "My Projects" with a "View All" link and an "Import" button, a "New Project" button (highlighted with a red box), and two project cards: "space destroyer" (created 20 minutes ago) and "Raptor Run" (created 3 days ago). Below this is a "Skillmaps" section with a "New? Try This!" banner and three skillmap cards: "Beginner Skillmap", "Save the Forest", and "Sing 2".

Microsoft | MakeCode

Join the Live Stream

Watch Stream

My Projects [View All](#) [Import](#)

New Project

space destroyer 20 minutes ago

Raptor Run 3 days ago

Skillmaps

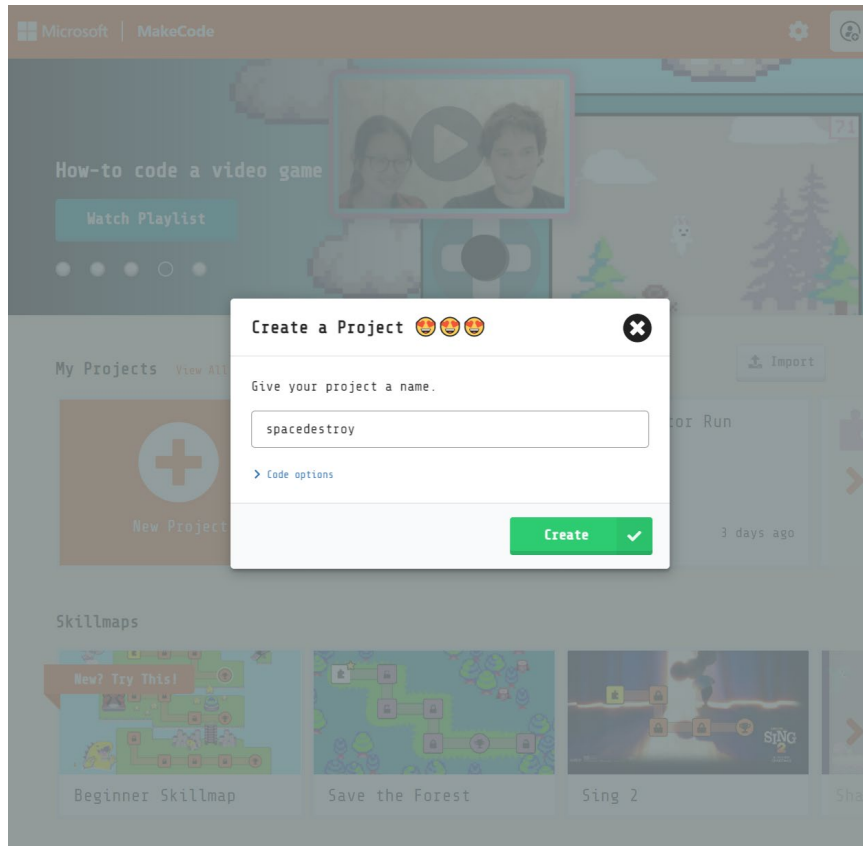
New? Try This!

Beginner Skillmap

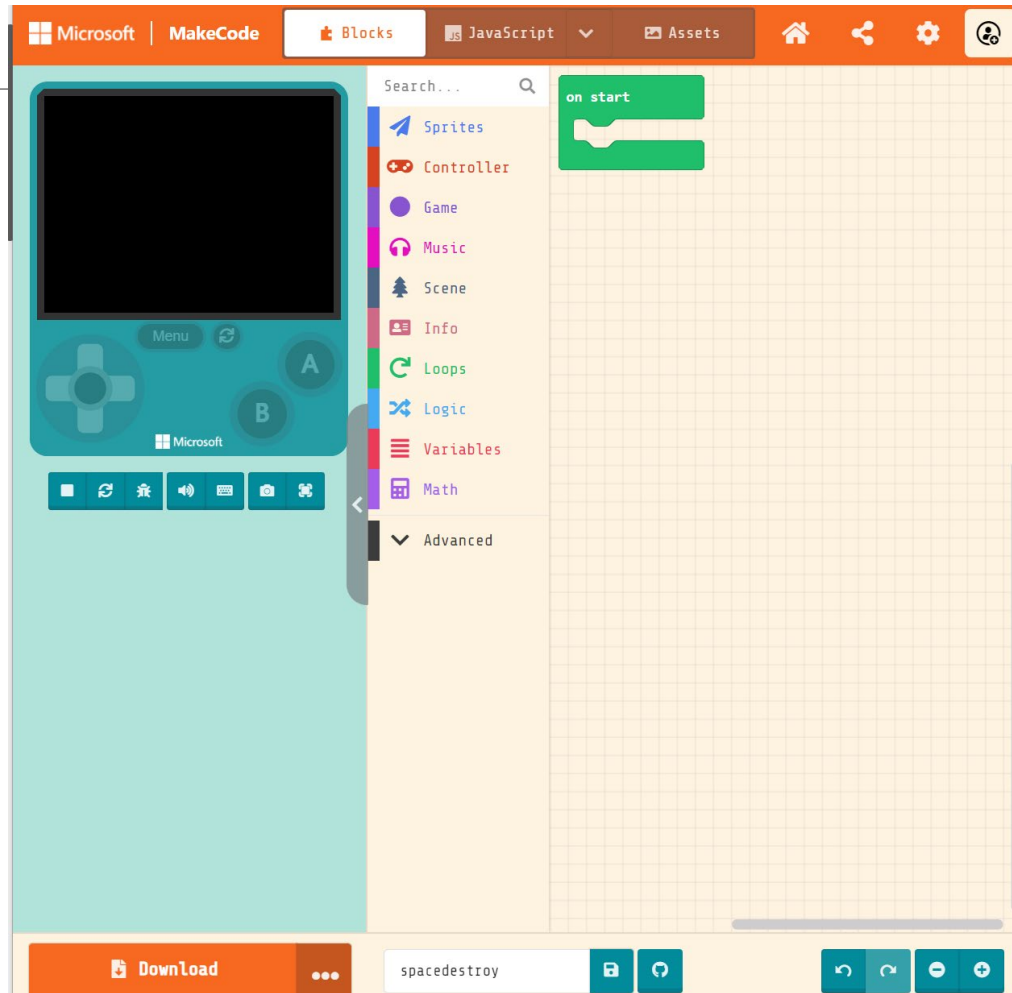
Save the Forest

Sing 2

Project name -> spacedestroy



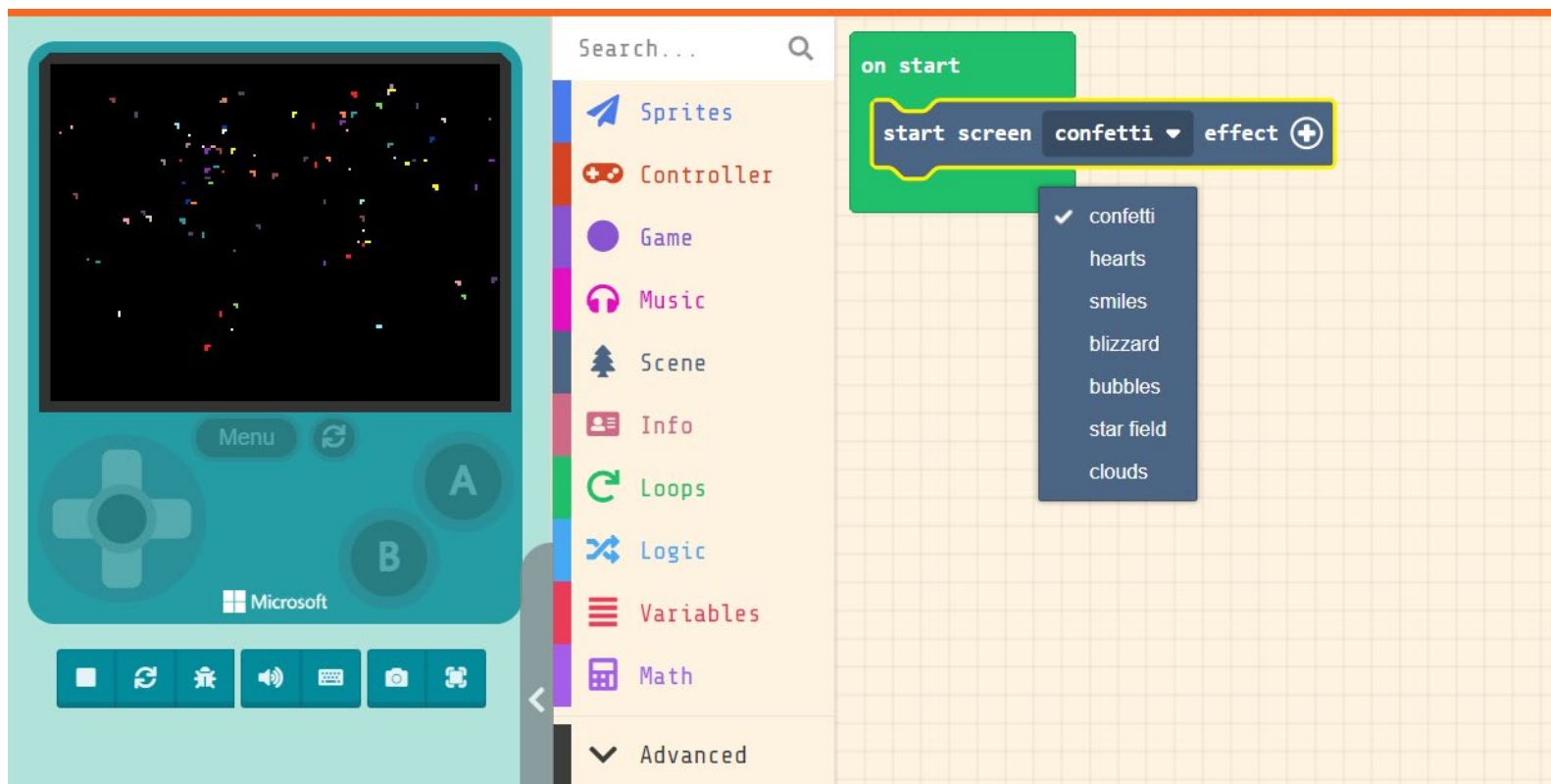
Editor



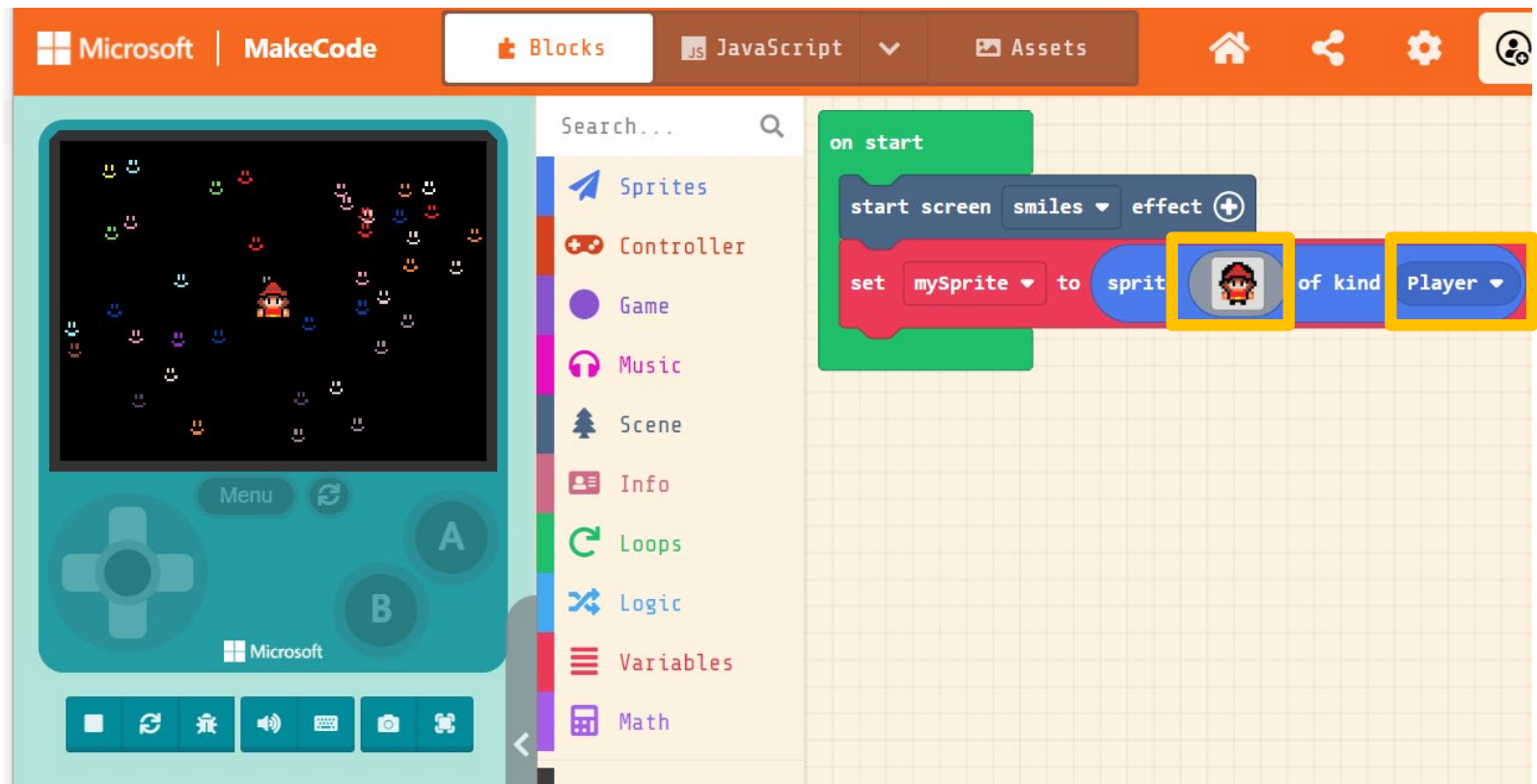
Part I.

Game start initialization

1. 設定背景效果




2. Set/design & select your sprite type




2. Set/design & select your sprite type

The codes in On start block will run immediately when the game start.



The image shows a Scratch 'on start' block containing two sub-blocks. The first is a 'start screen' block with a dropdown menu set to 'smiles' and an 'effect' button with a plus sign. The second is a 'set' block with a dropdown menu set to 'mySprite', followed by 'to', a 'sprite' block containing a Mario character image, 'of kind', and a dropdown menu set to 'Player'. Three callout boxes point to these elements: 'Sprite name' points to 'mySprite', 'Sprite image' points to the Mario image, and 'Sprite type such as Player, Enemy, ...' points to the 'Player' dropdown.

```
on start
  start screen smiles effect +
  set mySprite to sprite  of kind Player
```

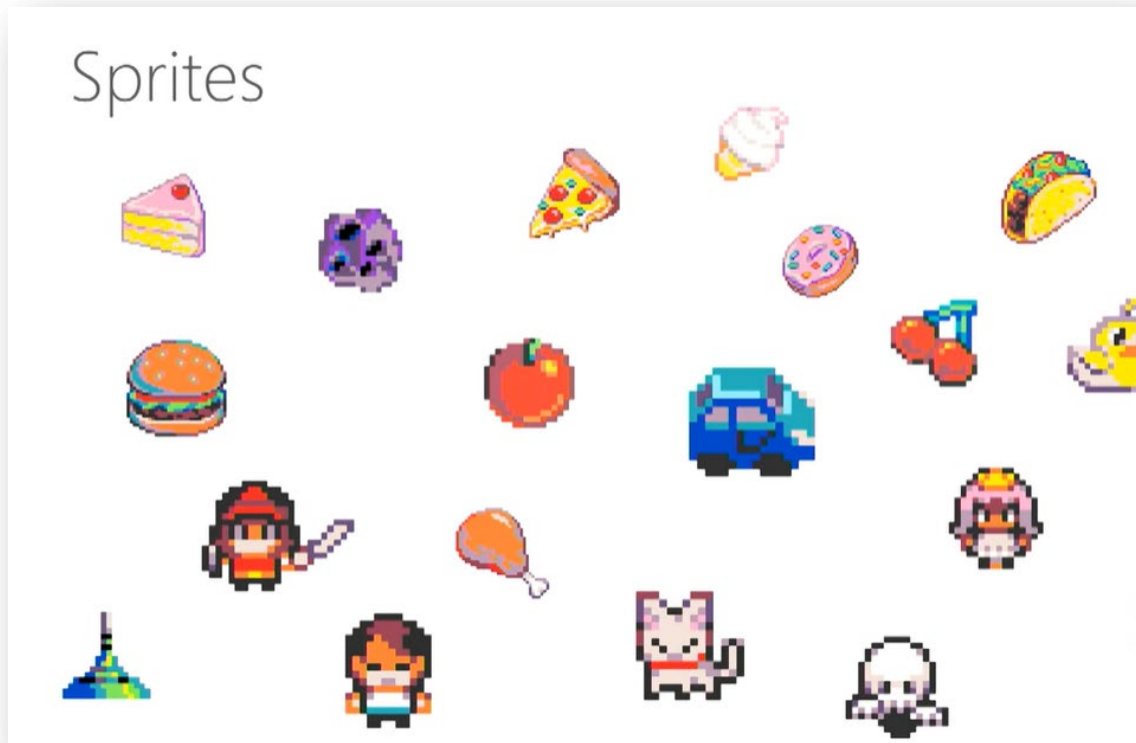
Sprite name

Sprite image

Sprite type such as Player, Enemy, ...

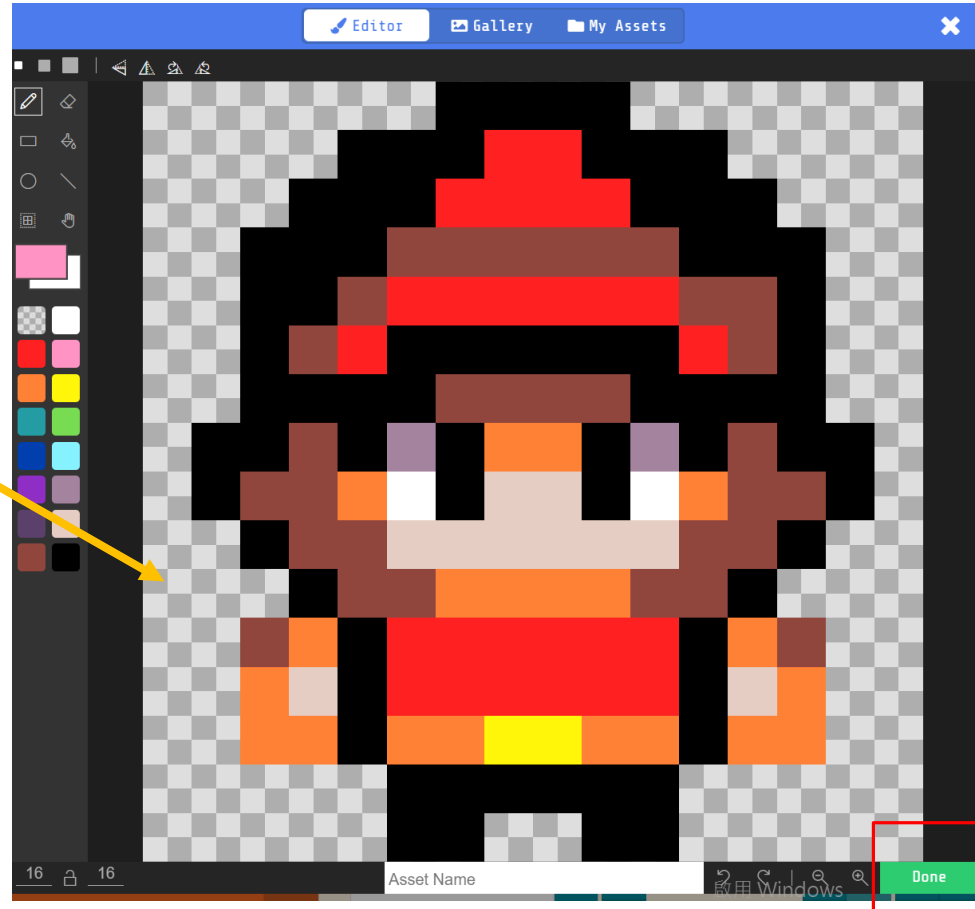
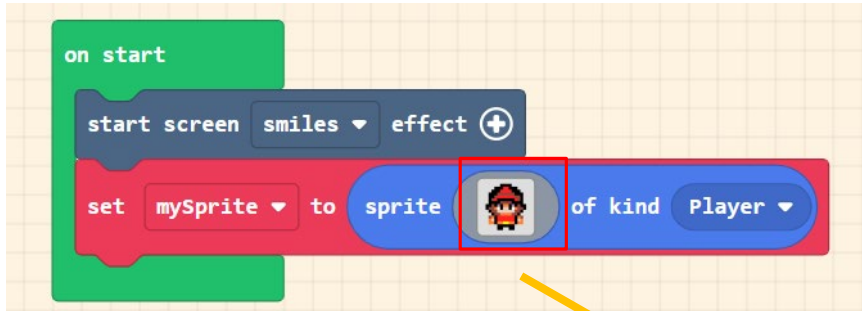
What is sprite

The object in the game such as player, enemy.
遊戲裡面的物件，例如主角、敵人



Build-in
Sprite image
In Makecode

Create/design your own Sprite



3. Set sprite position (x,y)->(77,111)

The image displays a game development software interface. On the left, a game scene is shown with a black background and various colorful characters. A red box highlights a character in the scene, and a red arrow points from this box to the code blocks on the right. The code blocks are arranged in a vertical stack:

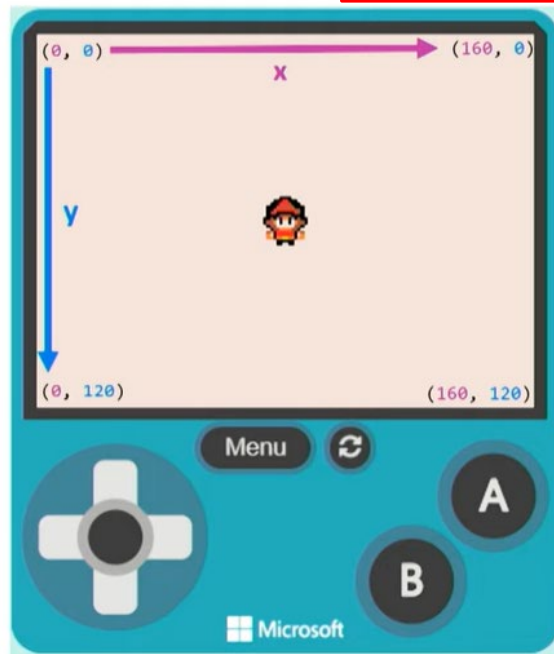
- on start** (green block)
- start screen smiles effect** (blue block)
- set mySprite to sprite of kind Player** (red block)
- set mySprite position to x 77 y 111** (blue block)

The code blocks are connected by a red line, indicating they are part of a single sequence of actions. The 'set mySprite position to x 77 y 111' block is highlighted with a red box, and a red arrow points from this box to the character in the game scene.

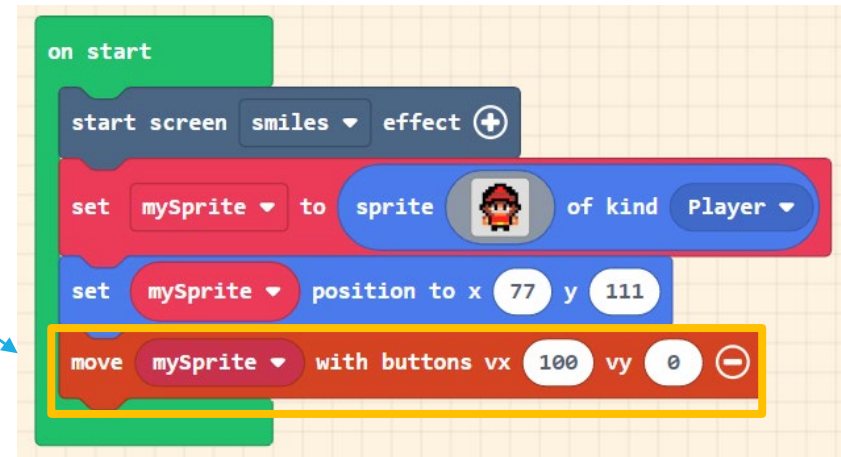
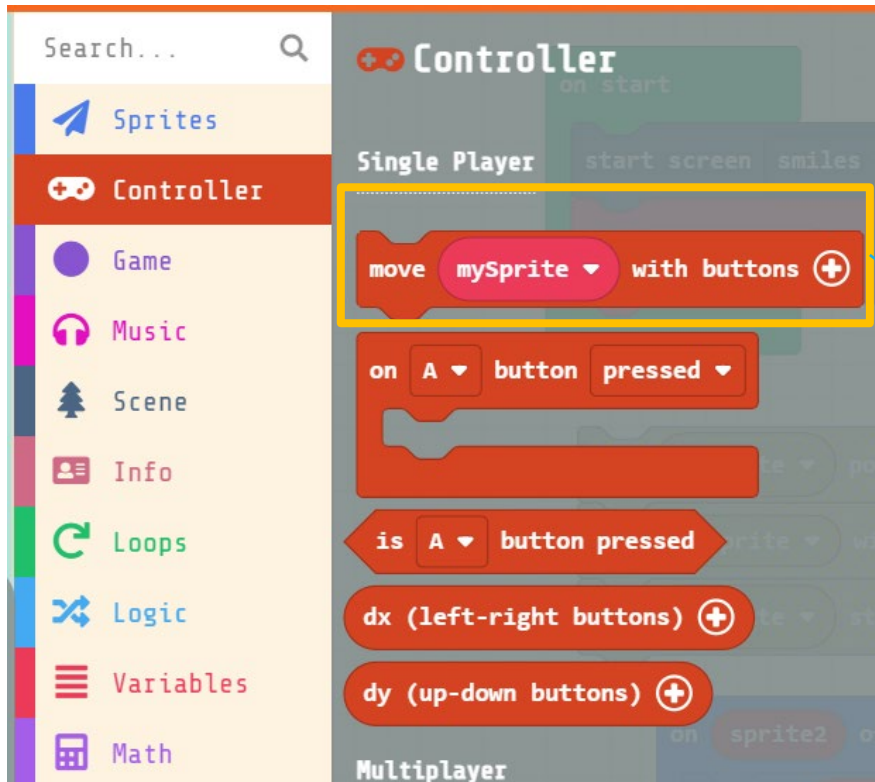
Coordinates in Arcade (座標系統)

Coordinates

The Arcade game screen dimensions are 160 width x 120 height



4. Control the movement of spaceship



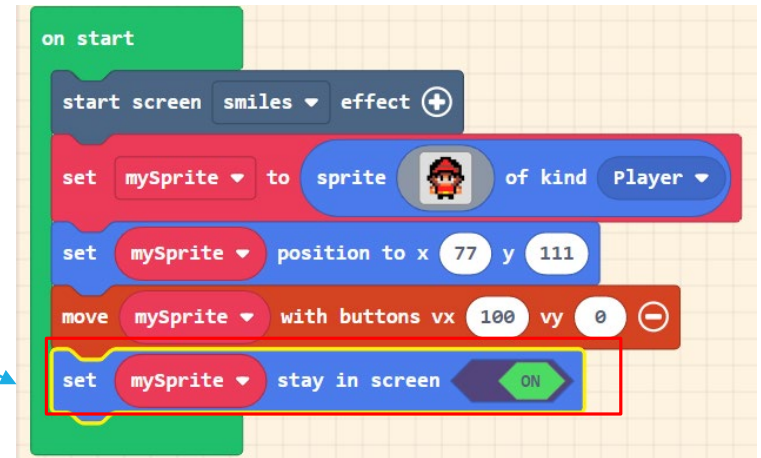
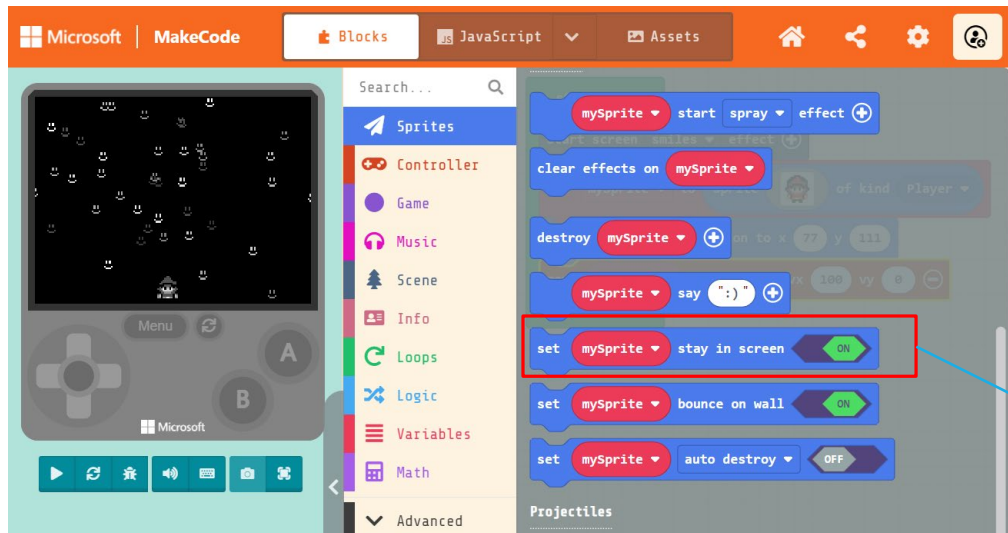
4. Set my sprite movement vx: 100, vy: 0

The screenshot displays the Microsoft MakeCode editor interface. On the left, a preview window shows a game scene with a character sprite on a black background. Below the preview is a virtual game controller with a directional pad and buttons labeled 'A' and 'B'. The main workspace is divided into a left sidebar with a search bar and a list of categories (Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, Variables, Math, Advanced), and a right workspace for code blocks. The code blocks are as follows:

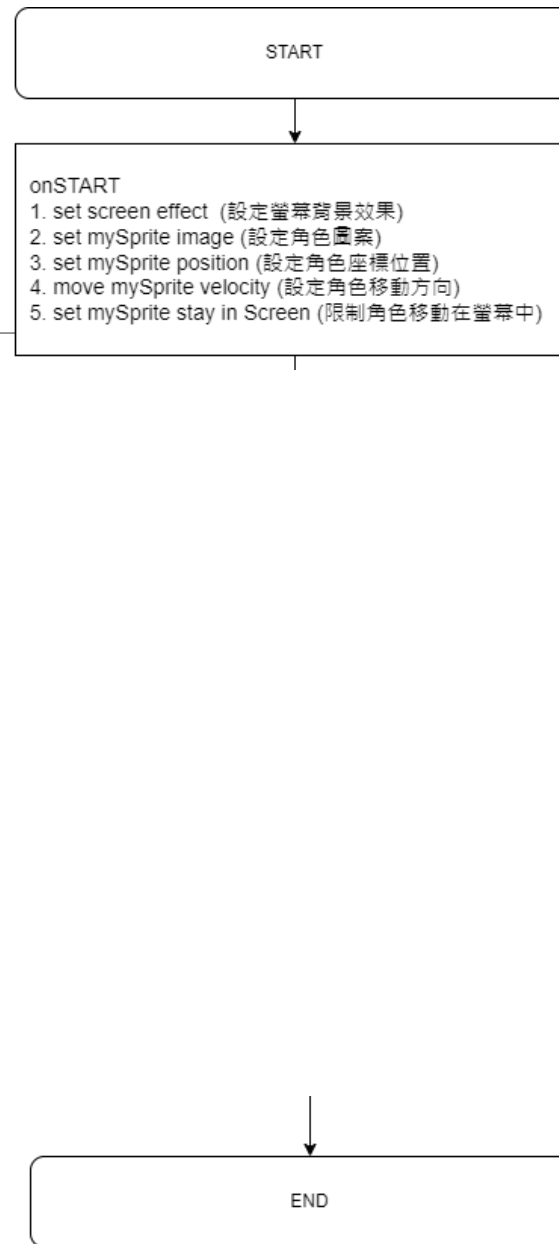
- on start** (green block)
- start screen smiles effect** (blue block)
- set mySprite to sprite of kind Player** (red block)
- set mySprite position to x 77 y 111** (blue block)
- move mySprite with buttons vx: 100 vy: 0** (red block, highlighted with a red box)

Below the code blocks, a speedometer widget is visible, showing a needle pointing to 0 and the text "0pix/s".

5. Keep your spaceship on the screen



flowchart



Part II

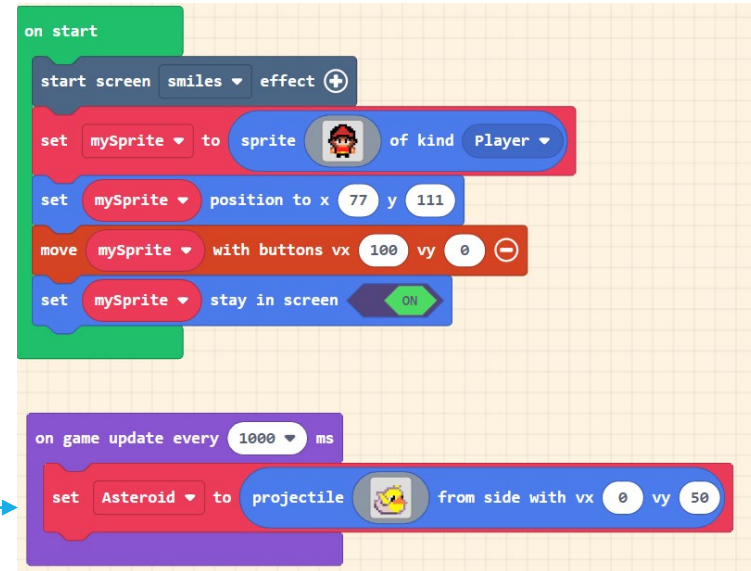
Game update event

6. Make an Asteroid fall every 1 second

The image shows a Scratch IDE interface. On the left is a sidebar with categories: Sprites, Controller, Game, Music, Scene, Info, and Loops. The 'Game' category is selected. The main workspace is divided into 'Gameplay' and 'Scripts' areas. In the 'Gameplay' area, there is a purple 'on game update' block and a purple 'on game update every 500 ms' block. A red box highlights the 'on game update every 500 ms' block. A blue arrow points from this block to the 'Scripts' area. In the 'Scripts' area, there is a green 'on start' block containing several other blocks: 'start screen smiles effect', 'set mySprite to sprite of kind Player', 'set mySprite position to x 77 y 111', 'move mySprite with buttons vx 100 vy 0', and 'set mySprite stay in screen ON'. A red box highlights the 'on game update every 500 ms' block being dragged into the 'Scripts' area.

7. Set projectile

Sprites->set projectile -> on game update block



The **projectile** type is the object can move by itself such as 'Enemy' in the game.

Set projectile & rename to 'Asteroid'

Search...

- Sprites
- Controller
- Game
- Music
- Scene
- Info
- Loops
- Logic
- Variables
- Math
- Advanced

on start

- start screen smiles effect
- set mySprite to sprite of kind Player
- set mySprite position to x 77 y 111
- move mySprite with buttons vx 100 vy 0
- set mySprite stay in screen ON

on game update every 1000 ms

- set projectile to projectile from side with vx 50 vy 50


Asteroid
mySprite
✓ projectile
projectile2
New variable...
Rename variable...
Delete the "projectile" variable


Rename all 'projectile' variables to: ✕

Asteroid

Ok ✓

Create your Asteroid Image

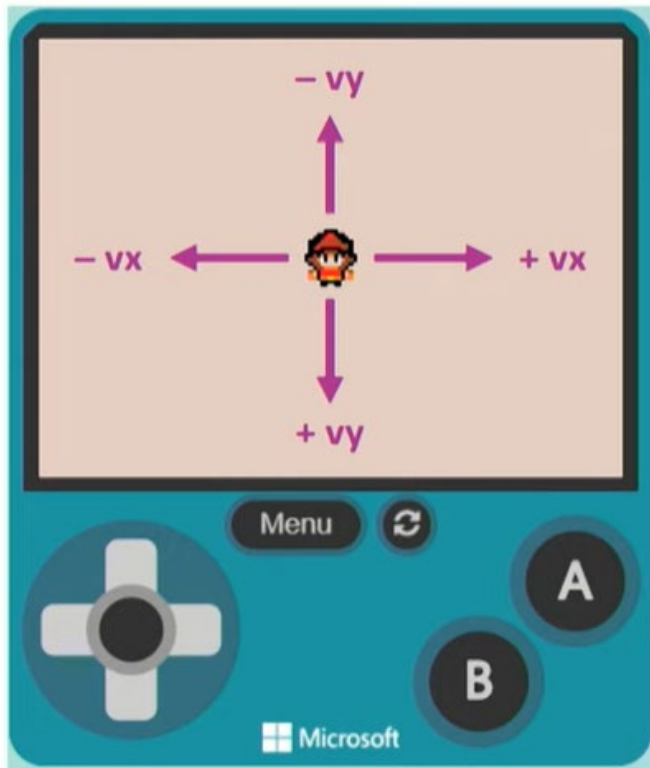
```
on start
  start screen smiles effect +
  set mySprite to sprite  of kind Player
  set mySprite position to x 77 y 111
  move mySprite with buttons vx 100 vy 0
  set mySprite stay in screen ON

on game update every 1000 ms
  set Asteroid to projectile  from side with vx 50 vy 50
```



Set Velocity = speed and direction

-vx: move to left + vx: move to right
-vy: move up + vy: move down

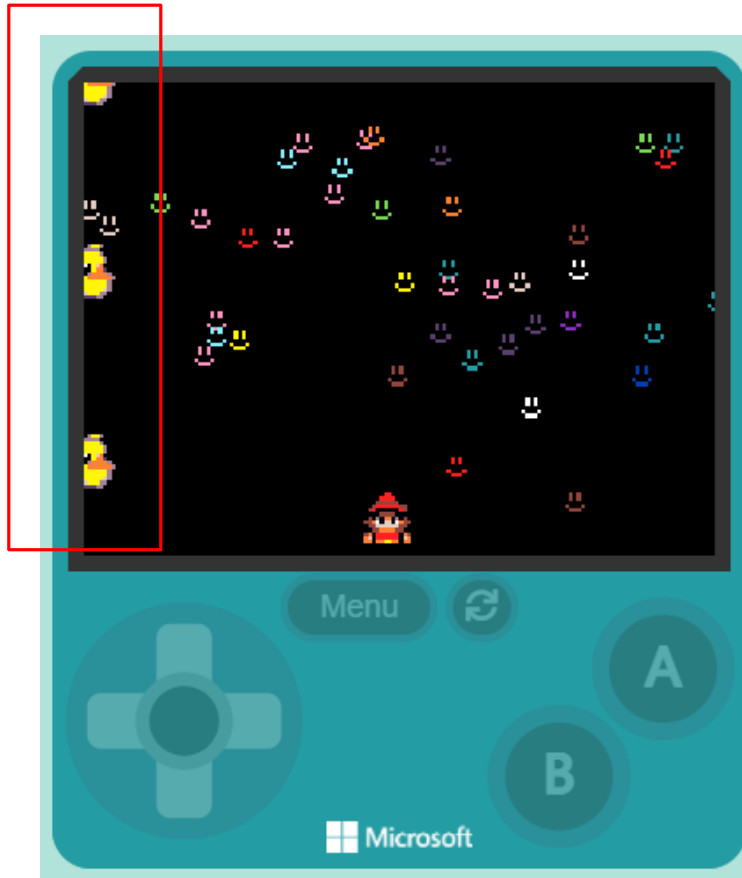


Scratch-style code blocks for game initialization and update:

- on start** (green flag):
 - start screen smiles effect
 - set mySprite to sprite of kind Player
 - set mySprite position to x 77 y 111
 - move mySprite with buttons vx 100 vy 0
 - set mySprite stay in screen ON
- on game update every 1000 ms** (purple block):
 - set Asteroid to projectile from side with vx 0 vy 50

A speedometer widget at the bottom right shows 0 pix/s.

Result: The projectile is always move down in the left side



8. Set the Asteroid to fall from random x locations

The image shows a Scratch code editor with a sidebar on the left containing categories: Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, Variables, Math, and Advanced. The main workspace is divided into two script areas. The left area, titled 'Sprites', contains code for creating and moving a player sprite. The right area, titled 'on start', contains code for creating and moving a player sprite, and an 'on game update every' loop for creating and moving an asteroid.

Left Script Area (Sprites):

- set mySprite2 to sprite of kind Player
- sprite of kind Player (100 vx 0)
- set mySprite velocity to vx 50 vy 50
- set mySprite position to x 0 y 0
- set mySprite x to 0
- change mySprite x by 0

Right Script Area (on start):

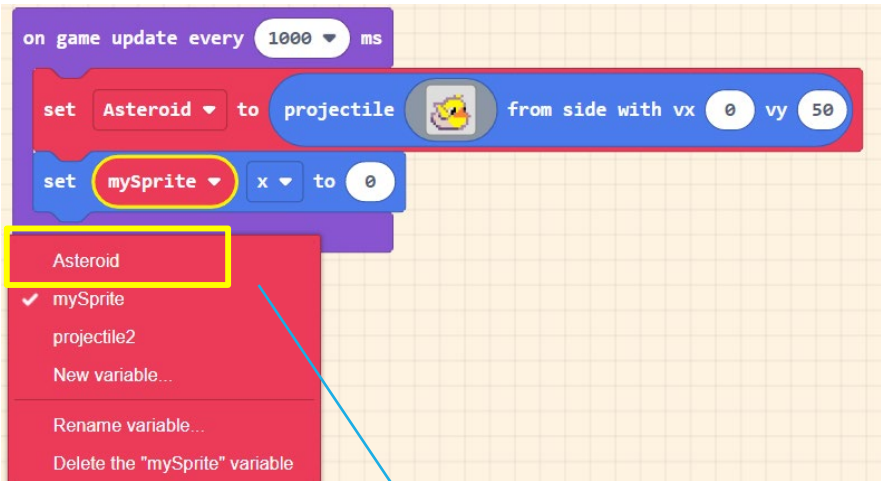
- start screen smiles effect
- set mySprite to sprite of kind Player
- set mySprite position to x 77 y 111
- move mySprite with buttons vx 100 vy 0
- set mySprite stay in screen ON

on game update every 1000 ms:

- set Asteroid to projectile from side with vx 0 vy 50
- set mySprite x to 0

A blue arrow points from the 'set mySprite x to 0' block in the left script area to the 'set mySprite x to 0' block in the 'on game update every' loop in the right script area.

9. Select mySprite -> Asteroid



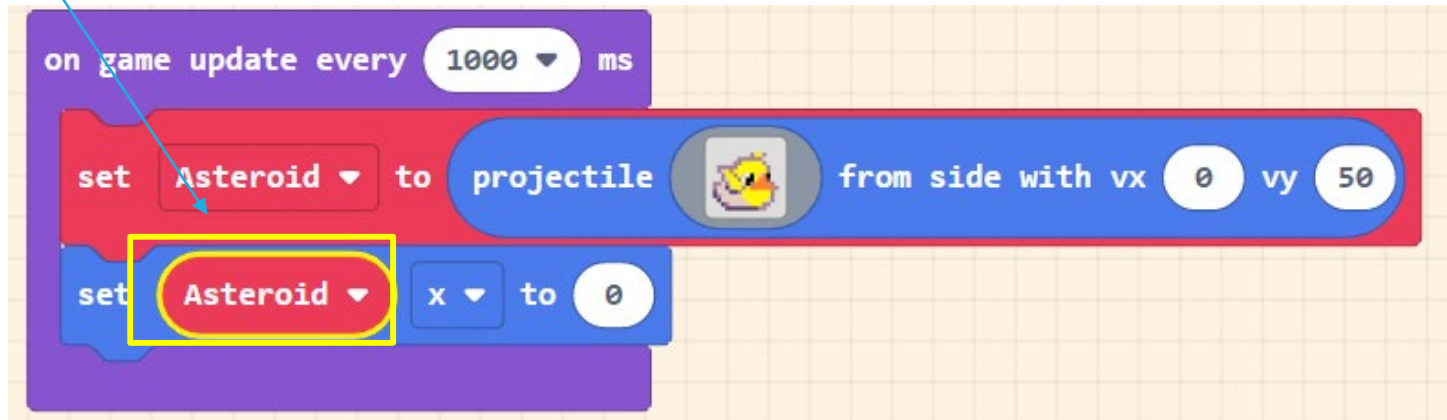
on game update every 1000 ms

set Asteroid to projectile from side with vx 0 vy 50

set mySprite x to 0

- Asteroid
- ✓ mySprite
- projectile2
- New variable...
- Rename variable...
- Delete the "mySprite" variable

The image shows a Scratch code editor with a purple 'on game update every 1000 ms' block. Inside, there are two 'set' blocks. The first 'set' block has 'Asteroid' as the variable, 'projectile' as the object, and '0' and '50' as vx and vy values. The second 'set' block has 'mySprite' as the variable, 'x' as the property, and '0' as the value. A dropdown menu is open for the 'mySprite' variable, showing a list of options: 'Asteroid', 'mySprite' (with a checkmark), 'projectile2', 'New variable...', 'Rename variable...', and 'Delete the "mySprite" variable'. A yellow box highlights the 'Asteroid' option, and a blue arrow points from it to the 'Asteroid' dropdown in the second 'set' block of the code below.



on game update every 1000 ms

set Asteroid to projectile from side with vx 0 vy 50

set Asteroid x to 0

The image shows the same Scratch code editor as above, but now the 'mySprite' variable in the second 'set' block has been replaced with 'Asteroid'. A yellow box highlights the 'Asteroid' dropdown in this block, and a blue arrow points from the 'Asteroid' option in the dropdown menu from the previous image to this box.

10. Set random x location Math ->

The image shows a Scratch code editor with a script for an Asteroid. The script is titled "on game update every 1000 ms" and contains two "set" blocks. The first block sets the Asteroid's projectile to a yellow character and its velocity to vx=0 and vy=50. The second block sets the Asteroid's x position to a random value between 0 and 10. A red box highlights the "pick random" block in the Math palette on the left, and a blue arrow points from it to the "pick random" block in the script.

Search... Q

Sprites
Controller
Game
Music
Scene
Info
Loops
Logic
Variables
Math
Advanced

Math

0 + 0
0 - 0
0 x 0
0 ÷ 0
0
remainder of 0 ÷ 1
min of 0 and 0
max of 0 and 0
absolute of 0
square root 0
round 0
pick random 0 to 10

on game update every 1000 ms

set Asteroid to projectile from side with vx 0 vy 50

set Asteroid x to pick random 0 to 10

Use screen width as maximum value of x

The image shows a Scratch code editor with two panels. The left panel displays the 'Scene' category in the 'Sprites' palette, with 'screen width' highlighted in a red box. A blue arrow points from this box to the right panel. The right panel shows a script area with two event-driven blocks. The first block is 'on start', containing: 'start screen smiles effect', 'set mySprite to sprite of kind Player', 'set mySprite position to x 77 y 111', 'move mySprite with buttons vx 100 vy 0', and 'set mySprite stay in screen ON'. The second block is 'on game update every 1000 ms', containing: 'set Asteroid to projectile from side with vx 0 vy 50' and 'set Asteroid x to pick random 0 to screen width'. The 'screen width' block in the second script is highlighted with a red box and a yellow border. A blue arrow also points from the 'screen width' block in the second script back to the 'screen width' block in the first panel.

Result:
All projectiles are falling down randomly
in x location every one second



11. Set the type of Sprite

The image displays two screenshots from the Scratch code editor. The left screenshot shows a search bar at the top left with the text "Search...". Below it is a sidebar menu with categories: Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, and Variables. The main workspace shows a script area with a "set projectile to projectile from side with vx 50 vy 50" block. Below that is an "Overlaps" section with a "set mySprite to sprite of kind Player" block. A "mySprite overlaps with otherSprite" block is also visible. A red box highlights the "set mySprite kind to Player" block. A blue arrow points from this box to the right screenshot.

The right screenshot shows a script starting with "on start" and "start screen smiles effect". It includes a "set mySprite to sprite of kind Player" block, a "set mySprite position to x 77 y 111" block, a "move mySprite with buttons vx 100 vy 0" block, and a "set mySprite stay in screen ON" block. Below this is an "on game update every 1000 ms" section with a "set Asteroid to projectile from side with vx 0 vy 50" block, a "set Asteroid x to pick random 0 to screen width" block, and a "set mySprite kind to Player" block highlighted with a red box.

Set Asteroid -> enemy type

on game update every 1000 ms

- set Asteroid to projectile from side with vx 0 vy 50
- set Asteroid x to pick random 0 to screen width
- set mySprite kind to Player

mySprite dropdown menu:

- Asteroid
- ✓ mySprite
- projectile2
- New variable...
- Rename variable...
- Delete the "mySprite" variable

on game update every 1000 ms

- set Asteroid to projectile from side with vx 0 vy 50
- set Asteroid x to pick random 0 to screen width
- set Asteroid kind to Enemy

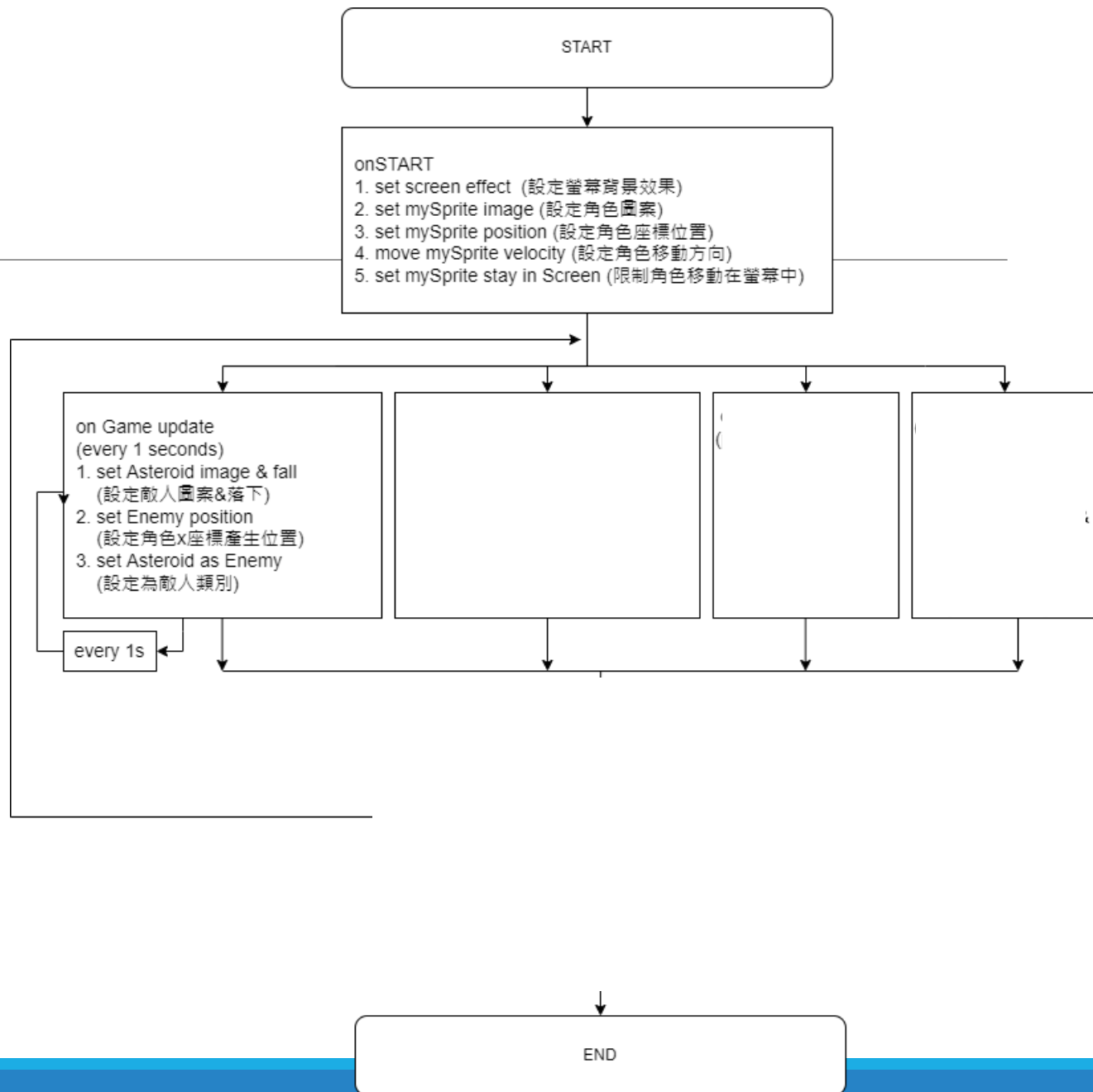
Asteroid dropdown menu:

- Player
- Projectile
- Food
- ✓ Enemy
- Add a new kind...

Exercise#2

- Try to increase the difficulty of game
- Speed up the projectiles falling down

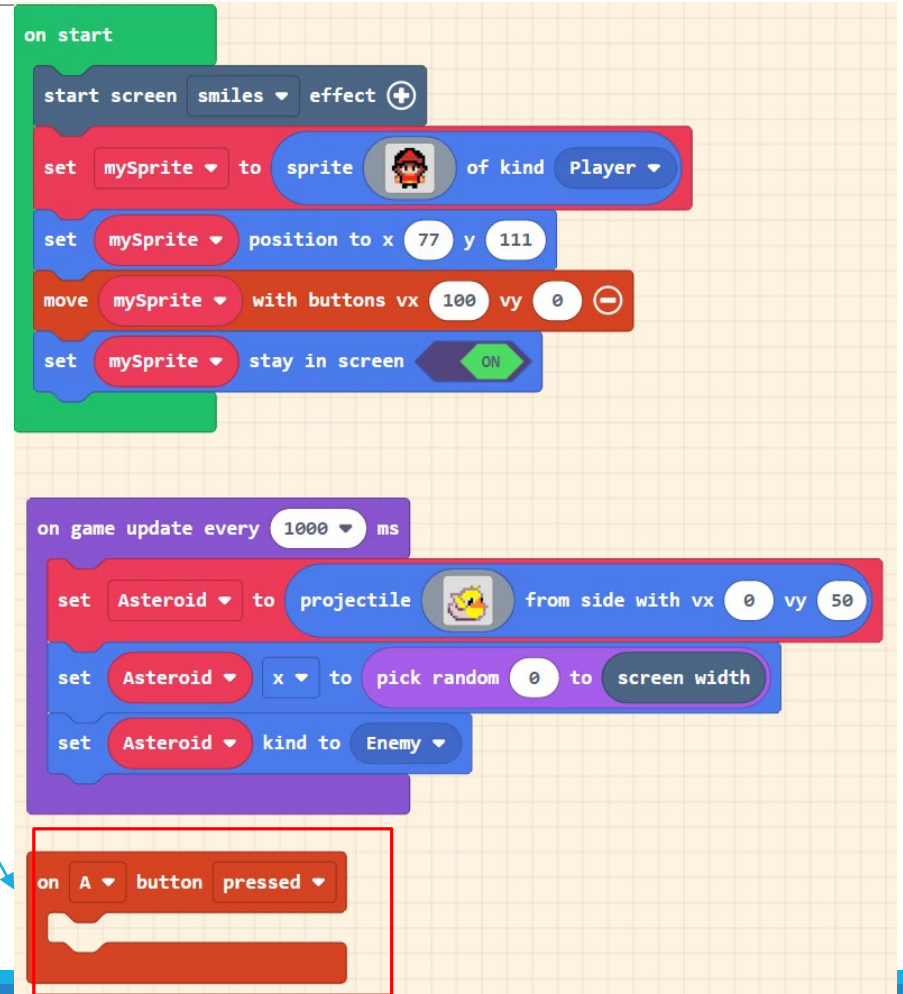
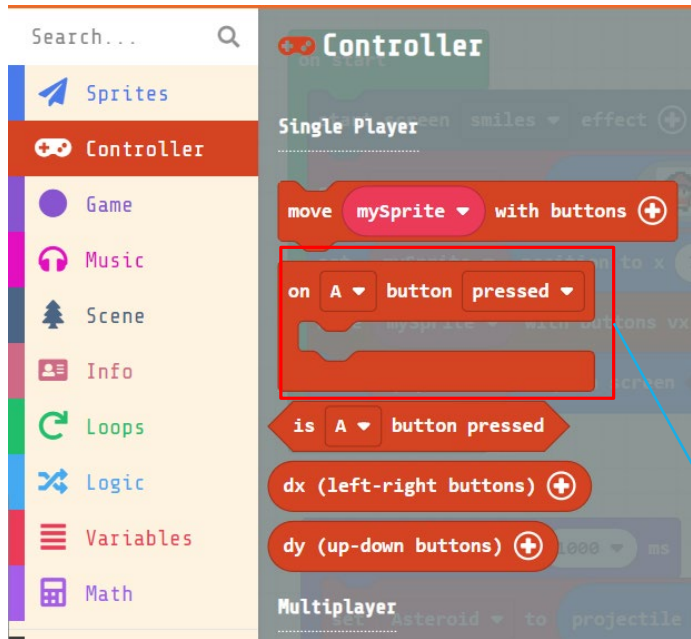
flowchart



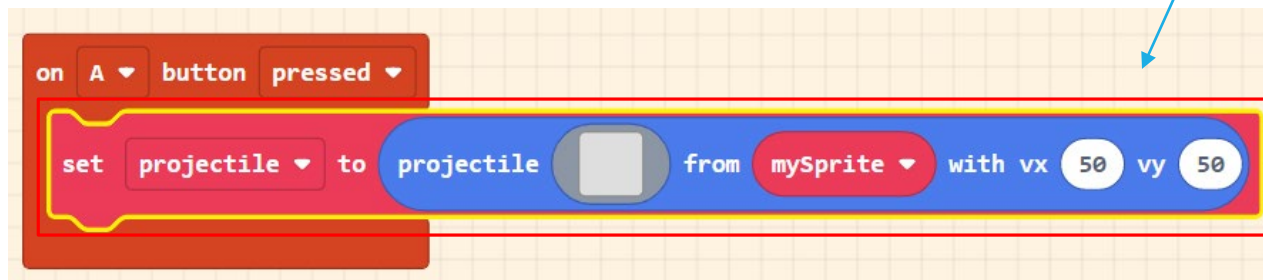
Part III

Button Controller

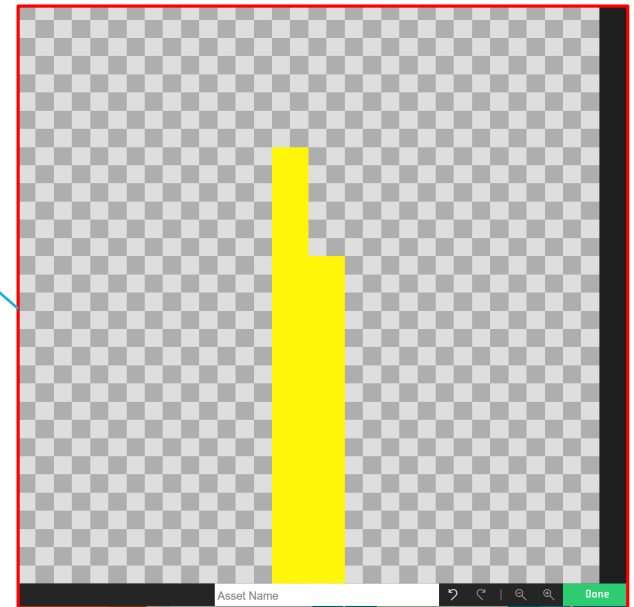
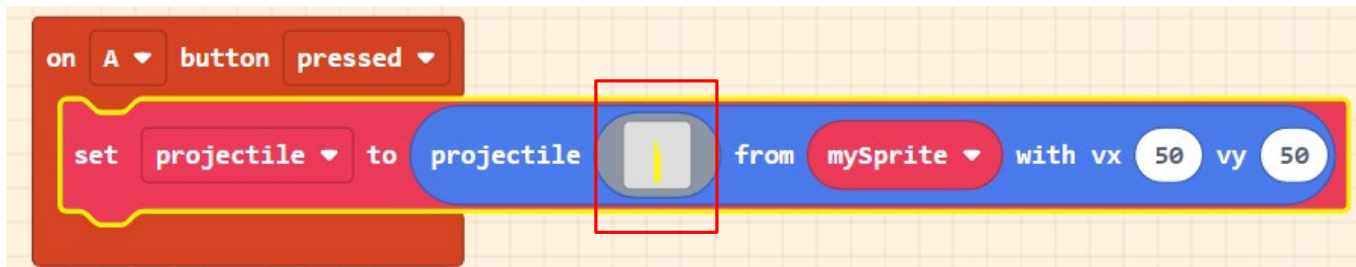
12. Shoot Lasers when you press a button



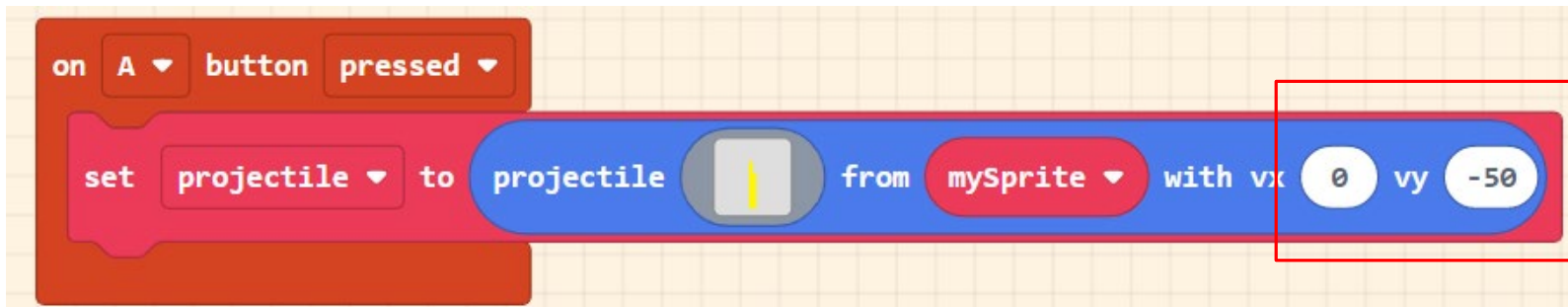
13. Set your laser sprite



13. Design your laser sprite



14. Set Laster velocity



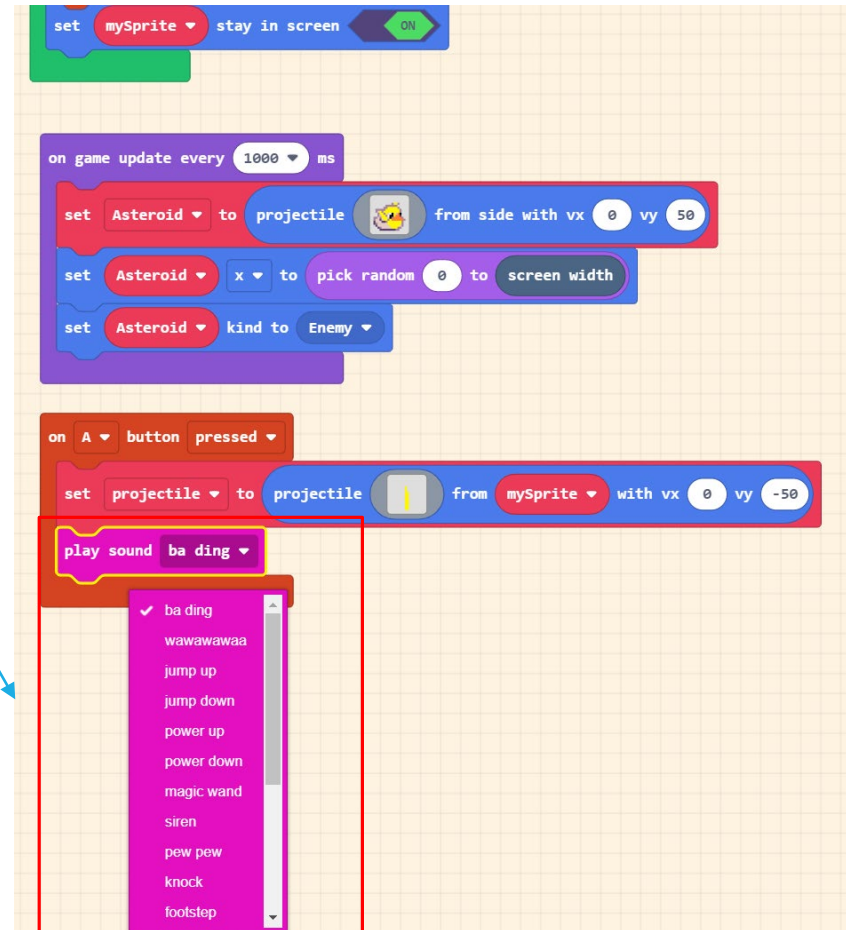
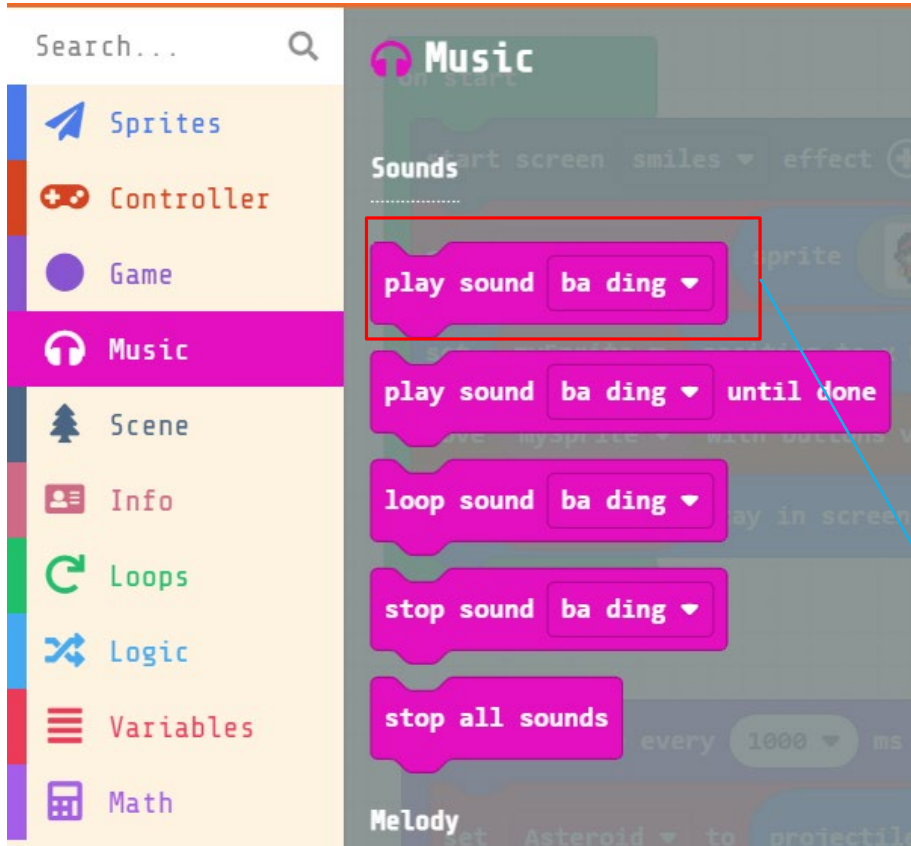
Set
vx: 0 vy: -50

Result

You can shoot the laster



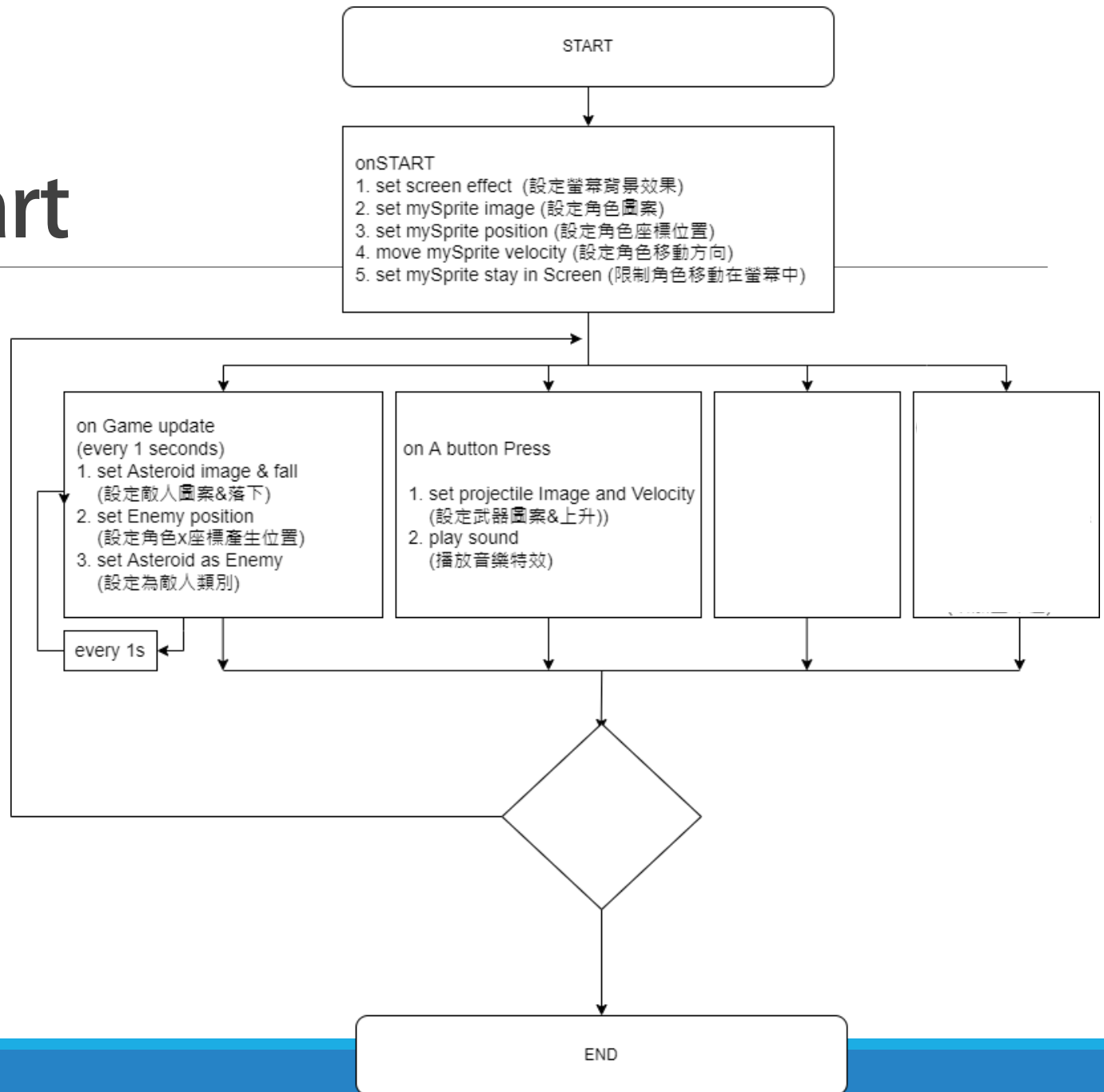
15. Add Sound Effect



Exercise#3

Select a your favorite sound effect and try it on.

flowchart



Part IV.

Overlaps detection

16. Add overlaps block sprites->overlaps

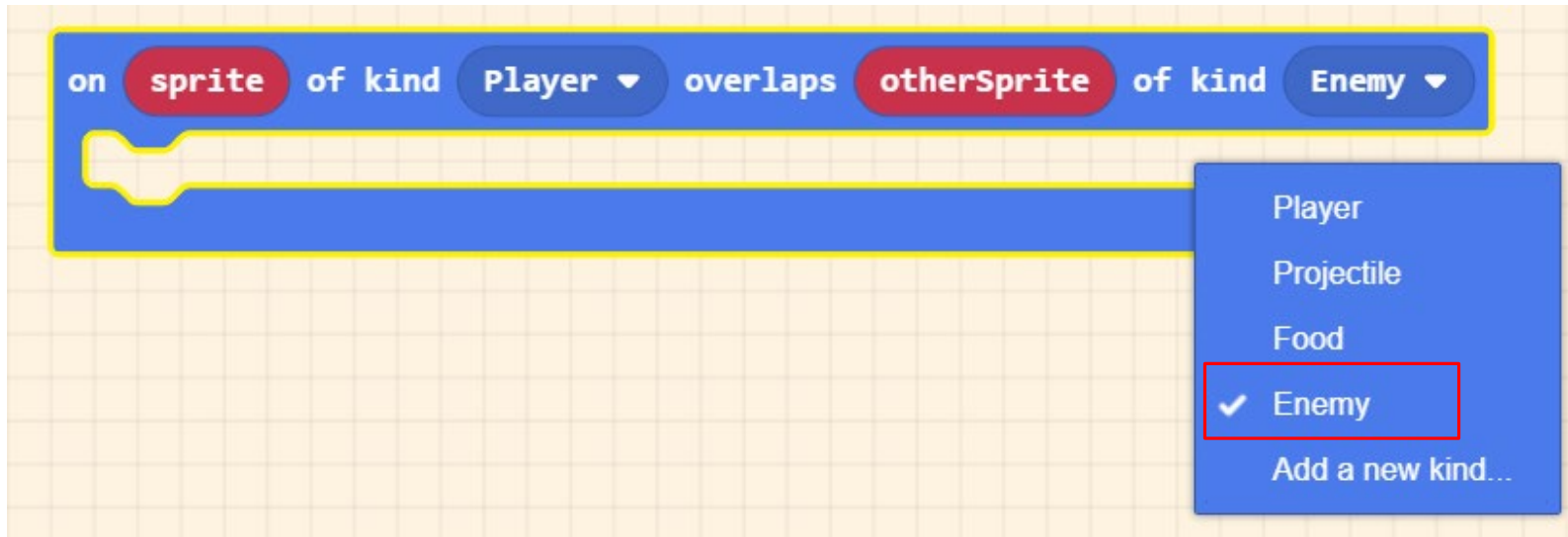
The screenshot shows the Scratch code editor interface. On the left is a sidebar with categories: Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, and Variables. The main workspace is titled 'Overlaps'. A search bar is at the top left. The code contains several blocks: an 'on sprite overlaps' block (highlighted with a red border), a 'mySprite overlaps with otherSprite' block, a 'set mySprite kind to Player' block, and a 'mySprite kind' block. Below these is a 'Lifecycle' section with an 'on created sprite' block.

A close-up view of the 'on sprite overlaps' block. The block is blue with a white outline and contains the text: 'on sprite of kind Player overlaps otherSprite of kind Player'. The 'Player' dropdown menus are currently open, showing a downward arrow.

When an asteroid crashes into your Spaceship

Click on the otherSprite of kind 'Player' -> 'Enemy'

Setup when any asteroid overlaps your spaceship



17. Destroy Asteroid

This screenshot shows the Scratch Effects palette. The 'Advanced' section is expanded, and the 'destroy mySprite' block is highlighted with a red box. A blue arrow points from this block to the corresponding block in the main script area on the right.

Search... Q

Effects

- mySprite start spray effect
- clear effects on mySprite
- destroy mySprite**
- mySprite say ":"
- set mySprite stay in screen ON
- set mySprite bounce on wall ON
- set mySprite auto destroy OFF

This screenshot shows the Scratch script area. The 'on game update every 1000 ms' loop contains three blocks: 'set Asteroid to projectile from side with vx 0 vy 50', 'set Asteroid x to pick random 0 to screen width', and 'set Asteroid kind to Enemy'. Below this, the 'on A button pressed' event contains 'set projectile to projectile from mySprite with vx 0 vy -50' and 'play sound pew pew'. At the bottom, the 'on sprite of kind Player overlaps otherSprite of kind Enemy' event contains the 'destroy mySprite' block, which is highlighted with a red box and a yellow border. A blue arrow points from the 'destroy mySprite' block in the palette to this block.

Search... Q

on game update every 1000 ms

- set Asteroid to projectile from side with vx 0 vy 50
- set Asteroid x to pick random 0 to screen width
- set Asteroid kind to Enemy

on A button pressed

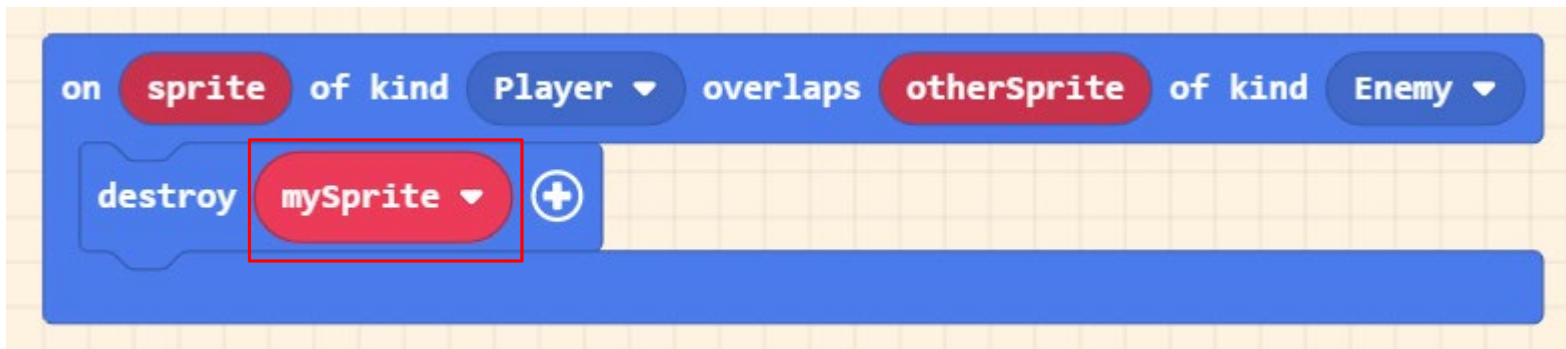
- set projectile to projectile from mySprite with vx 0 vy -50
- play sound pew pew

on sprite of kind Player overlaps otherSprite of kind Enemy

- destroy mySprite**

Set the destroy target

Original



Change to



Add an destroy effect

The image shows a sequence of three Scratch code blocks on a grid background. The top block is a blue 'when green flag clicked' block containing an 'on sprite of kind Player overlaps otherSprite of kind Enemy' trigger block and a 'destroy otherSprite' block. A red box highlights the plus sign (+) to the right of the 'destroy otherSprite' block. A blue arrow points from this plus sign to the 'with spray effect for 500 ms' block in the middle block. The middle block is a blue 'when green flag clicked' block containing the same trigger block and a 'destroy otherSprite with spray effect for 500 ms' block. A red box highlights the 'with spray effect for 500 ms' block. A blue arrow points from the 'with spray' block in the middle block to a dropdown menu. The dropdown menu is a blue list with a scroll bar, containing the following options: 'spray' (checked), 'trail', 'fountain', 'confetti', 'hearts', 'smiles', 'rings', 'fire', 'warm radial', 'cool radial', and 'halo'.

```
on sprite of kind Player overlaps otherSprite of kind Enemy
destroy otherSprite (+)

on sprite of kind Player overlaps otherSprite of kind Enemy
destroy otherSprite with spray effect for 500 ms (-)

spray
trail
fountain
confetti
hearts
smiles
rings
fire
warm radial
cool radial
halo
```

Exercise#4

Select a favor crash effect and try it on.

17. Add a Camera Shake Effect

The image shows a visual scripting interface with a left-hand sidebar and a main workspace. The sidebar contains a search bar and a list of categories: Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, Variables, Math, and Advanced. The main workspace is divided into two panels. The top panel, titled 'Camera', contains a script with three blocks: 'camera x', 'center camera at x 0 y 0', and 'camera follow sprite mySprite'. The bottom block, 'camera shake by 4 pixels for 500 ms', is highlighted with a red box. A blue arrow points from this block to a second script in the bottom panel. This second script is an 'on sprite of kind Player overlaps otherSprite of kind Enemy' event. It contains two blocks: 'destroy otherSprite with spray effect for 500 ms' and 'camera shake by 4 pixels for 500 ms', with the latter also highlighted by a red box.

18. Decrease Life of your Spaceship

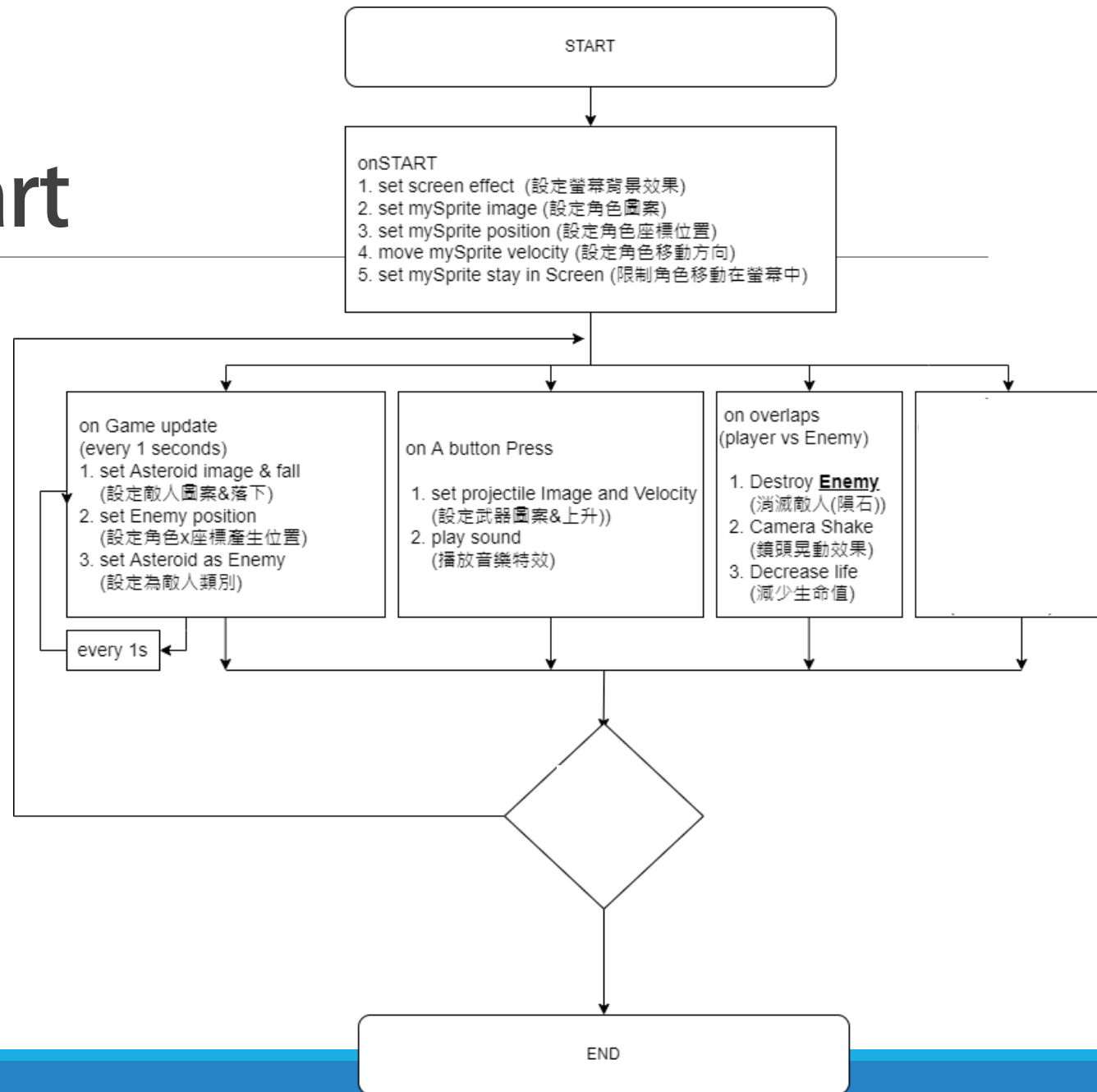
The image displays a visual programming interface for a game engine. On the left, a sidebar lists various categories: Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, Variables, and Math. The main workspace is divided into two panels. The left panel, titled 'Life', contains several blocks: 'set life to 3', 'change life by -1', 'on life zero', and 'start countdown 10 (s)'. The 'change life by -1' block is highlighted with a red box. The right panel shows a script triggered by the event 'on sprite of kind Player overlaps otherSprite of kind Enemy'. This script contains three blocks: 'destroy otherSprite with spray effect for 500 ms', 'camera shake by 4 pixels for 500 ms', and 'change life by -1'. The 'change life by -1' block in this script is also highlighted with a red box and a yellow border. A blue arrow points from the 'change life by -1' block in the left panel to the corresponding block in the right panel, indicating that this block is being dragged into the script.

Result

You can see Life & Game Over



flowchart



Part V.

Weapon (Laster) overlaps detection

19. When the laser hits an Asteroid

The image shows a screenshot of a Scratch-style programming environment. On the left is a sidebar with a search bar and a list of categories: Sprites, Controller, Game, Music, Scene, Info, and Loops. The main workspace is titled "Overlaps" and contains a script with the following blocks:

- on **sprite** of kind **Player** overlaps **otherSprite** of kind **Player**
- mySprite overlaps with otherSprite
- set mySprite kind to **Player**
- mySprite kind

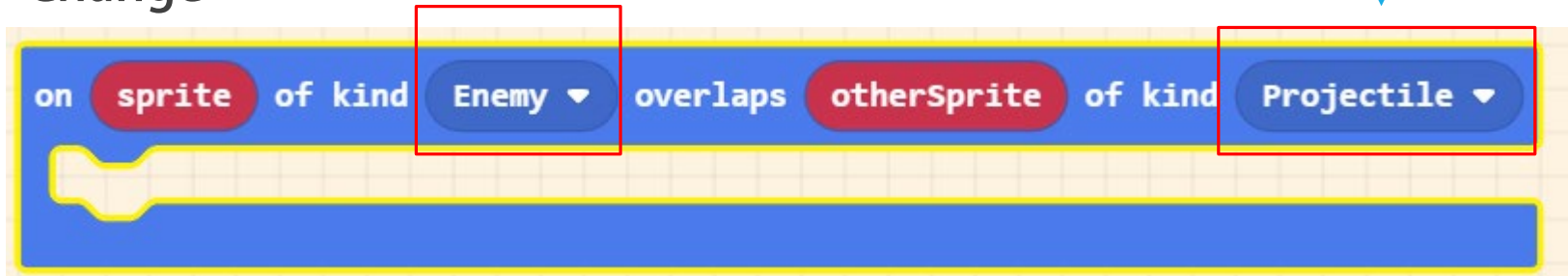
The script is designed to detect when a laser (represented as a "Player" sprite) overlaps with an "Asteroid" (represented as an "Enemy" sprite). Upon detection, the laser's kind is set to "Player" and the overlapping "otherSprite" is identified as "mySprite".

Click on the 1st Player -> Enemy Click on the 2nd Player -> Projectile

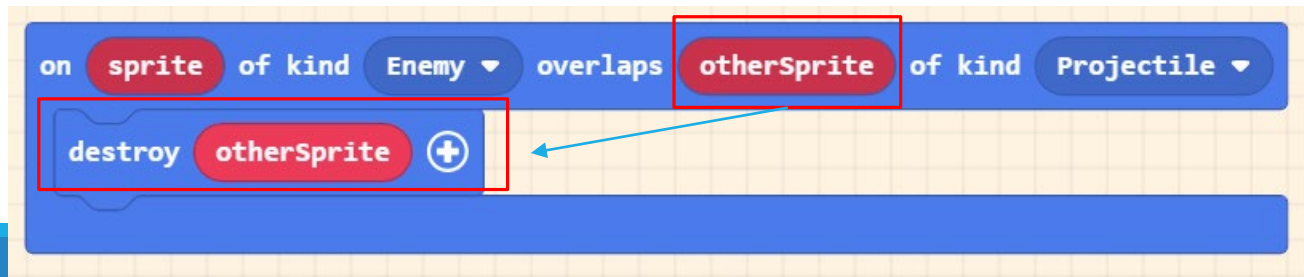
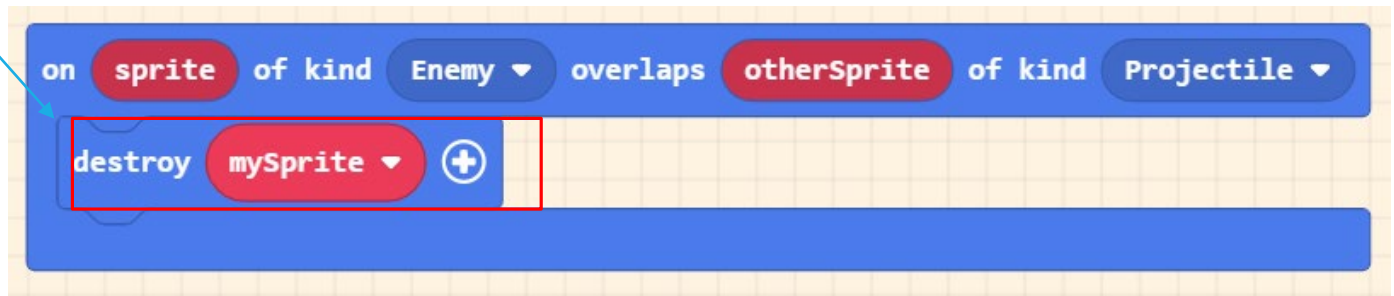
Original



Change



20. Destroy the Laster



21. Destroy the Asteroid

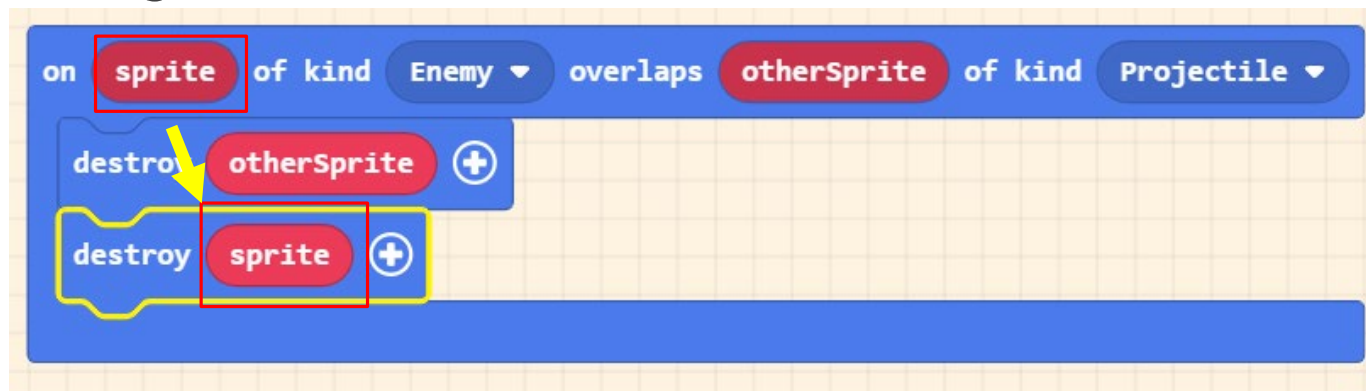
Original



```
on sprite of kind Enemy overlaps otherSprite of kind Projectile  
  destroy otherSprite  
  destroy mySprite
```

The original code block shows a blue 'when green flag clicked' block containing two 'destroy' blocks. The first 'destroy' block has 'otherSprite' as the target, and the second 'destroy' block has 'mySprite' as the target. A yellow box highlights the second 'destroy' block.

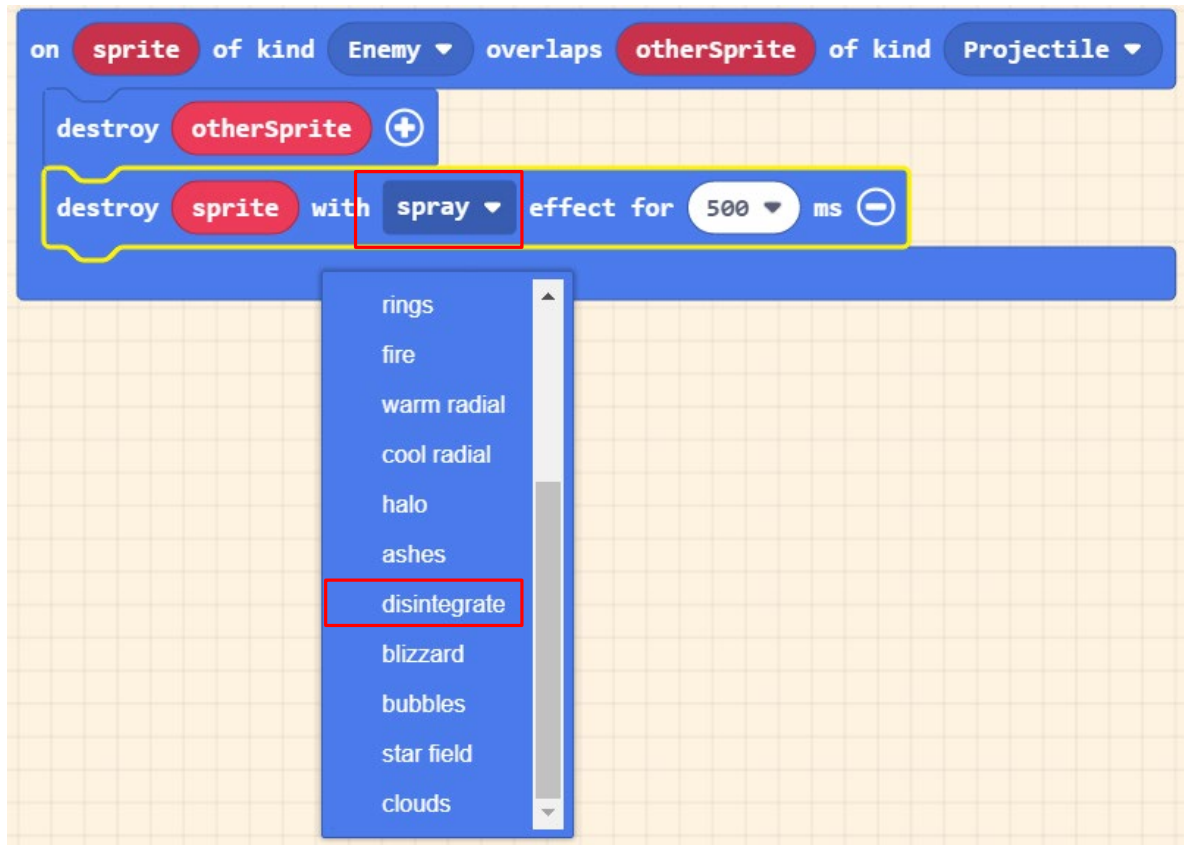
Change



```
on sprite of kind Enemy overlaps otherSprite of kind Projectile  
  destroy otherSprite  
  destroy sprite
```

The modified code block shows the same blue 'when green flag clicked' block. The first 'destroy' block remains 'otherSprite'. The second 'destroy' block now has 'sprite' as the target. A yellow box highlights the second 'destroy' block. A red box highlights the 'sprite' target, and a yellow arrow points from the 'destroy' block above to it.

22. Add an Effect when Laster destroy the Asteroid



24. Add the Score

Search...

Info

Score

- score
- high score
- set score to 0
- change score by 1

on **sprite** of kind **Enemy** overlaps **otherSprite** of kind **Projectile**

- destroy **otherSprite**
- destroy **sprite** with **spray** effect for **500** ms
- change score by **1**

Complete Code

```
on start
  start screen smiles effect +
  set mySprite to sprite of kind Player
  set mySprite position to x 77 y 111
  move mySprite with buttons vx 100 vy 0
  set mySprite stay in screen ON

on game update every 1000 ms
  set Asteroid to projectile from side with vx 0 vy 50
  set Asteroid x to pick random 0 to screen width
  set Asteroid kind to Enemy
```

```
on A button pressed
  set projectile to projectile from mySprite with vx 0 vy -50
  play sound pew pew

on sprite of kind Player overlaps otherSprite of kind Enemy
  destroy otherSprite with spray effect for 500 ms
  camera shake by 4 pixels for 500 ms
  change life by -1

on sprite of kind Enemy overlaps otherSprite of kind Projectile
  destroy otherSprite +
  destroy sprite with spray effect for 500 ms
  change score by 1
```

Python version

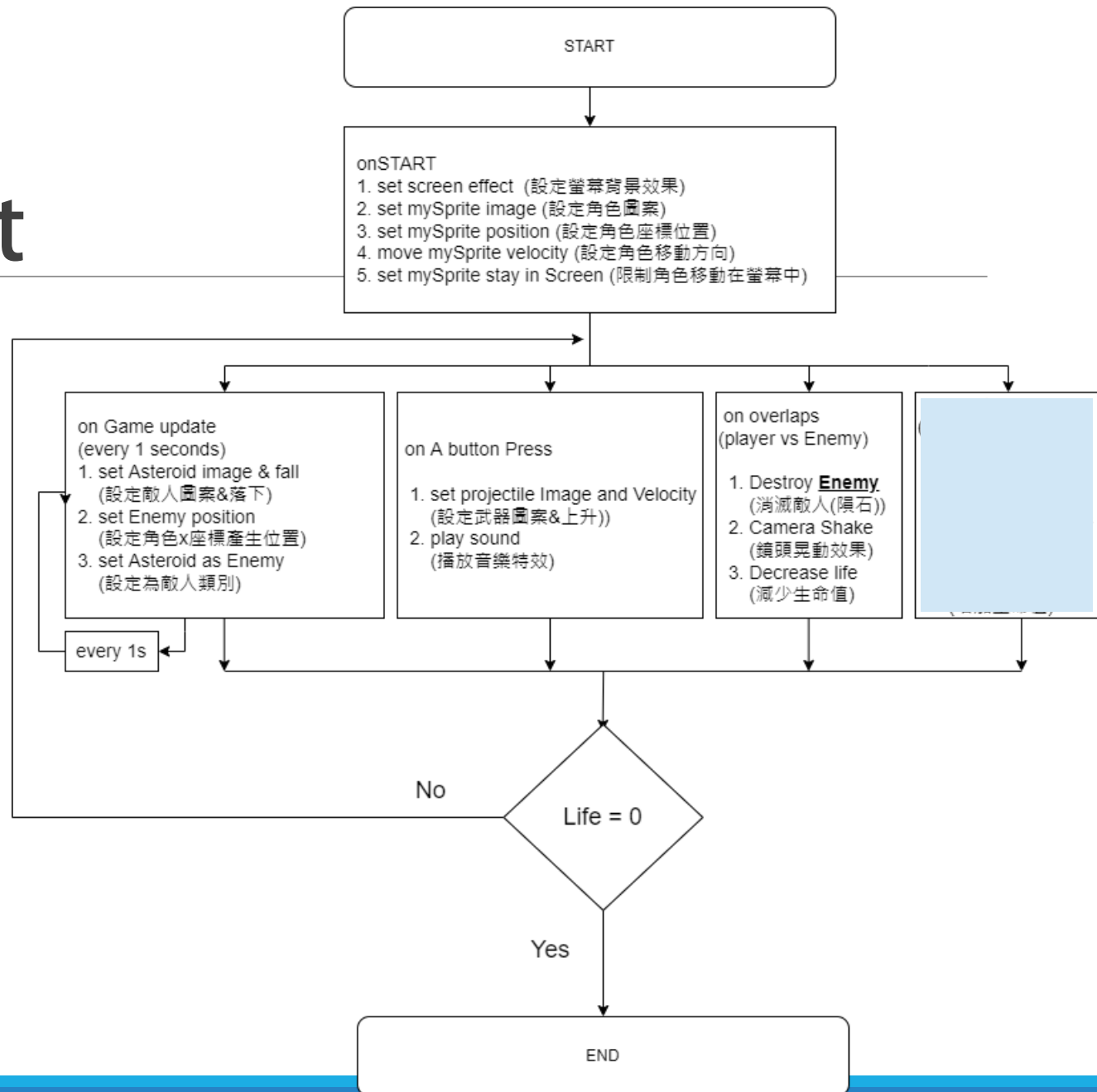
```
1 def on_a_pressed():
2     global projectile
3 > projectile = sprites.create_projectile_from_sprite(img(""" ...
20     """),
21     mySprite,
22     0,
23     -50)
24     music.pew_pew.play()
25 controller.A.on_event(ControllerButtonEvent.PRESSED, on_a_pressed)
26
27 def on_on_overlap(sprite, otherSprite):
28     otherSprite.destroy()
29     sprite.destroy(effects.spray, 500)
30     info.change_score_by(1)
31 sprites.on_overlap(SpriteKind.enemy, SpriteKind.projectile, on_on_overlap)
32
33 def on_on_overlap2(sprite2, otherSprite2):
34     otherSprite2.destroy(effects.spray, 500)
35     scene.camera_shake(4, 500)
36     info.change_life_by(-1)
37 sprites.on_overlap(SpriteKind.player, SpriteKind.enemy, on_on_overlap2)
```

```
39 Asteroid: Sprite = None
40 projectile: Sprite = None
41 mySprite: Sprite = None
42 effects.smiles.start_screen_effect()
43 > mySprite = sprites.create(img(""" ...
60     """),
61     SpriteKind.player)
62 mySprite.set_position(77, 111)
63 controller.move_sprite(mySprite, 100, 0)
64 mySprite.set_stay_in_screen(True)
65
66 def on_update_interval():
67     global Asteroid
68 > Asteroid = sprites.create_projectile_from_side(img(""" ...
85     """),
86     0,
87     50)
88     Asteroid.x = randint(0, scene.screen_width())
89     Asteroid.set_kind(SpriteKind.enemy)
90 game.on_update_interval(1000, on_update_interval)
91
```

JavaScript version

```
1 controller.A.onEvent(ControllerButtonEvent.Pressed, function on_a_pressed() {
2
3 >   projectile = sprites.createProjectileFromSprite(img` ...
20     ` , mySprite, 0, -50)
21     music.pewPew.play()
22 })
23 sprites.onOverlap(SpriteKind.Enemy, SpriteKind.Projectile, function on_on_overlap(sprite: Sprite, otherSprite: Sprite) {
24     otherSprite.destroy()
25     sprite.destroy(effects.spray, 500)
26     info.changeScoreBy(1)
27 })
28 sprites.onOverlap(SpriteKind.Player, SpriteKind.Enemy, function on_on_overlap2(sprite2: Sprite, otherSprite2: Sprite) {
29     otherSprite2.destroy(effects.spray, 500)
30     scene.cameraShake(4, 500)
31     info.changeLifeBy(-1)
32 })
33 let Asteroid : Sprite = null
34 let projectile : Sprite = null
35 let mySprite : Sprite = null
36 effects.smiles.startScreenEffect()
37 > mySprite = sprites.create(img` ...
54     ` , SpriteKind.Player)
55 mySprite.setPosition(77, 111)
56 controller.moveSprite(mySprite, 100, 0)
57 mySprite.setStayInScreen(true)
58 game.onUpdateInterval(1000, function on_update_interval() {
59
60 >   Asteroid = sprites.createProjectileFromSide(img` ...
77     ` , 0, 50)
78   Asteroid.x = randint(0, scene.screenWidth())
79   Asteroid.setKind(SpriteKind.Enemy)
80 })
```

flowchart



25. Share your game

The image shows the MakeCode Arcade editor interface. On the left, there is a preview window displaying a game scene with the text "GAME OVER!". Below the preview is a virtual game controller with a directional pad and buttons labeled "A" and "B". The main workspace is divided into a left sidebar with a search bar and a category list (Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, Variables, Math, Advanced), and a right pane containing a grid of code blocks. The code blocks are as follows:

- set mySprite position to x 77 y 111
- move mySprite with buttons vx 100 vy 0
- set on sprite2 of kind Player overlaps otherSprite2 of kind Enemy
- destroy otherSprite2 with spray effect for 500 ms
- on game update every 1000 ms is for 500 ms
- set Asteroid to projectile from side with vx 0 vy 50
- set Asteroid x to pick random 0 to screen width
- set Asteroid kind to Enemy
- on A button pressed
- set projectile to projectile from mySprite with vx 0 vy -50
- play sound pew pew

In the top right corner of the editor, there is a red rectangular box highlighting the share icon (two people), which is used to share the game.

Share Project

Share Project

Your project name. ex.
ADT110001

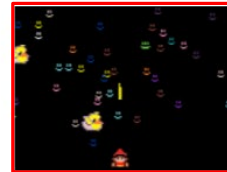


ADT110001_spacedestroy



Screen recording

Screen
Shot



You need to publish your project to share it or embed it in other web pages. You acknowledge having consent to publish this project.

Publish project



Publish your project & Share

Share Project



Your project is ready! Use the address below to share your projects.

https://makecode.com/_bu9J7101M8aX

Copy



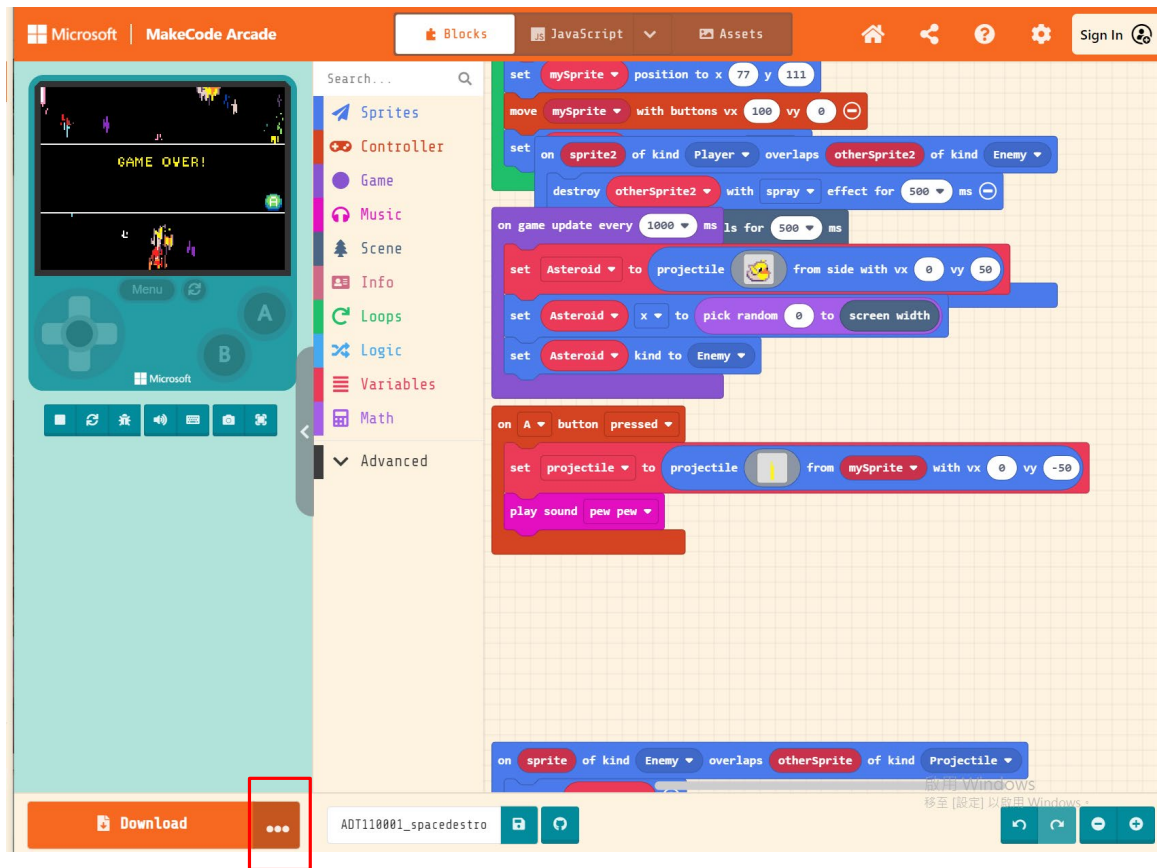
> Embed



Part VI.









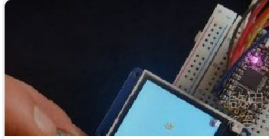
Installation of Meowbit

26. Installation & test on Meowbit



Choose your hardware-> Meowbit

Choose your hardware ✕

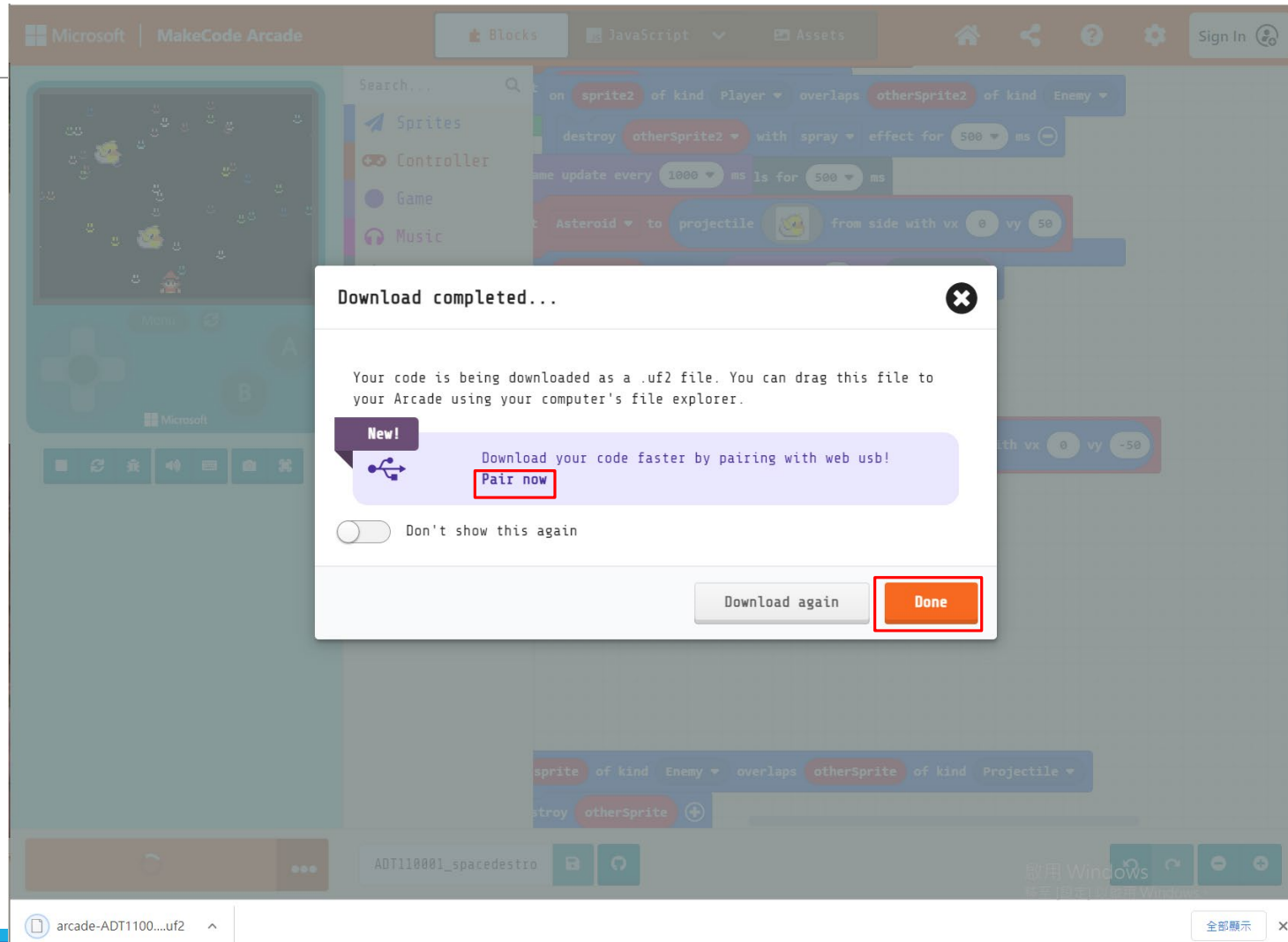
 <p>BrainPad Arcade Learn how BrainPad Arcade lets you run games on a small handheld console.</p> <p>Learn more</p>	 <p>Meowbit A retro game console for STEM education from Kittenbot team</p> <p>Learn more</p>	 <p>Adafruit PyBadge It's a badge, it's an arcade, it's a PyBadge</p> <p>Learn more</p>
 <p>Adafruit PyGamer The upgraded PyBadge</p> <p>Learn more</p>	 <p>Kitronik ARCADE ARCADE is a programmable gamepad for use with MakeCode Arcade.</p> <p>Learn more</p>	 <p>TinkerGen GameGo A fun-sized console to play the games you code.</p> <p>Learn more</p>
 <p>Ovobot Xtron Pro</p>	 <p>Adafruit EdgeBadge</p>	 <p>Adafruit M4</p>

Windows 默认以啟用 Wi

Download to Meowbit

The screenshot displays the Microsoft MakeCode Arcade editor interface. At the top, the title bar reads "Microsoft | MakeCode Arcade" and includes tabs for "Blocks", "JavaScript", and "Assets". A search bar is located on the left side of the workspace. The central workspace shows a game scene with a "GAME OVER!" message and a character. The right side of the workspace contains a grid of code blocks, including "on sprite2 of kind Player overlaps otherSprite2 of kind Enemy", "destroy otherSprite2 with spray effect for 500 ms", "game update every 1000 ms 1s for 500 ms", "Asteroid to projectile from side with vx 0 vy 50", "Asteroid x to pick random 0 to screen width", "Asteroid kind to Enemy", "button pressed", "projectile to projectile from mySprite with vx 0 vy -50", and "play sound pew pew". A "Downloaded!" notification is visible in the bottom left corner. The bottom right corner shows a Windows taskbar with a "启用 Windows 移至 [設定] 以启用 Windows" notification and a "全部顯示" button.

Plug the USB cable to Meowbit



Download process

Download completed...

Your code is being downloaded as a .uf2 file. You can drag this file to your Arcade using your computer's file explorer.

New! Download your code faster by pairing with web usb!
Pair now

Don't show this again

Download again **Done**

Connect to your Arcade...

1 Connect Arcade to your computer with a USB cable

2 Select the device in the pairing dialog

3 Press "Connect"

Connect device

The image shows two overlapping dialog boxes. The top dialog, titled 'Download completed...', contains a 'New!' notification about pairing with web USB, a 'Pair now' button, a 'Don't show this again' toggle, and 'Download again' and 'Done' buttons. The bottom dialog, titled 'Connect to your Arcade...', provides three numbered steps: 1. Connect Arcade to your computer with a USB cable; 2. Select the device in the pairing dialog; 3. Press 'Connect'. A 'Connect device' button is at the bottom right. Red boxes highlight the 'Pair now' button in the first dialog and the 'Done' button in the second. Blue callout bubbles with numbers 1, 2, and 3 point to the 'Pair now' button, the 'Done' button, and the 'Connect device' button respectively.

Success install in Meowbit



Save & Import Project

Download save project

The image shows the Microsoft MakeCode Arcade editor interface. The top bar includes the Microsoft logo, the text "MakeCode Arcade", and tabs for "Blocks", "JavaScript", and "Assets". On the left, there is a preview window showing a game scene with a character and several asteroids. Below the preview is a virtual controller with a directional pad and buttons labeled "A" and "B". A search bar is located above the left sidebar, which contains categories like Sprites, Controller, Game, Music, Scene, Info, Loops, Logic, Variables, Math, and Advanced. The main workspace on the right contains a block-based script. The script starts with a "set Asteroid kind to Enemy" block. This is followed by an "on A button pressed" event block containing three actions: "set projectile to projectile from mySprite with vx 0 vy -50", "play sound pew pew", and "destroy otherSprite" (with a plus sign icon). Below this is another "on sprite of kind Enemy overlaps otherSprite of kind Projectile" event block containing three actions: "destroy otherSprite" (with a plus sign icon), "destroy sprite with spray effect for 500 ms", and "change score by 1". At the bottom of the editor, there is a "Download" button, a text field containing "ADT110001_spacedestro", and two circular icons: a lock icon and a refresh icon. The lock icon is highlighted with a red square.

Project will saved in the image as png format

Project Saved!



Your project is saved in this image.
Import or drag it into the editor to reload it.

Got it!



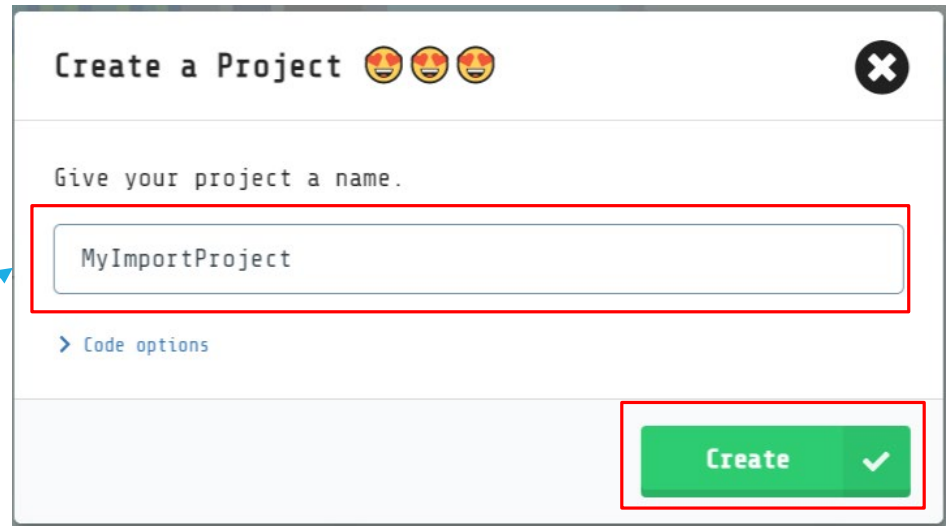
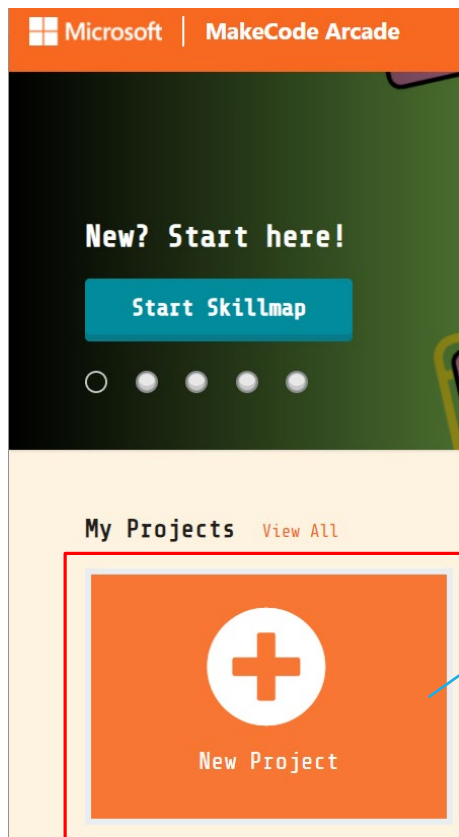
Saved project in PNG format

Ex. Xxx.png

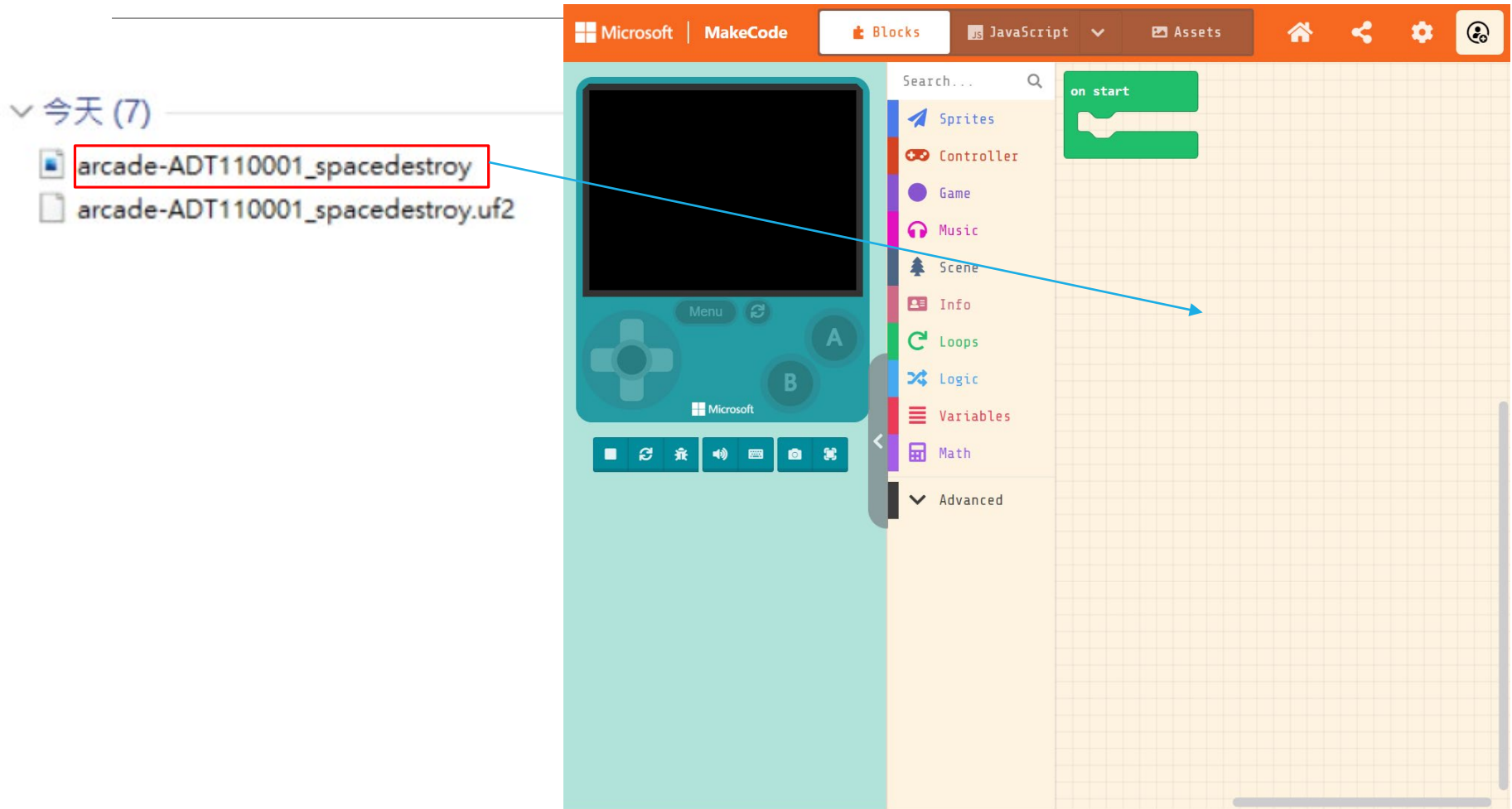


Import saved project

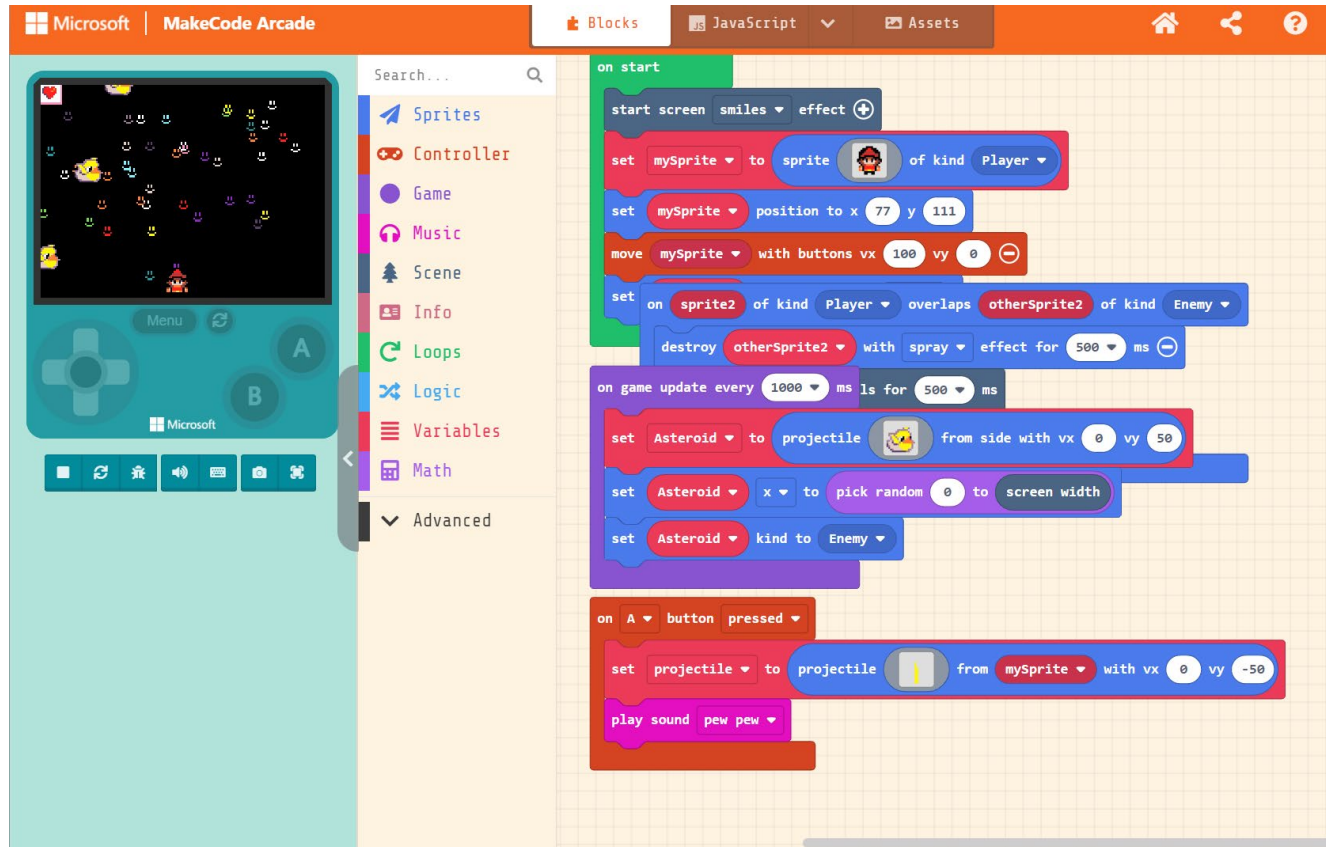
New project



Drag the png to the Editor



Successful import the project



Homework

Homework

1. [課堂活動] 完成makecode arcade平台上的space destroy遊戲。並發揮你的創意設計角色。

分享你的作品在FB社團上。

學號: 姓名:

人數: X 人 (可1人1組, 或2人1組)

主題:

基礎 (完成基本功能) or 進階 (完成其他功能, 需描述)

[進階版]其他功能或特色 (ex. 設計B按鈕、有status bar...)

功能1:

功能2:

網址連結

2. 完成學習單 繪製流程圖

Homework#1 Demonstration



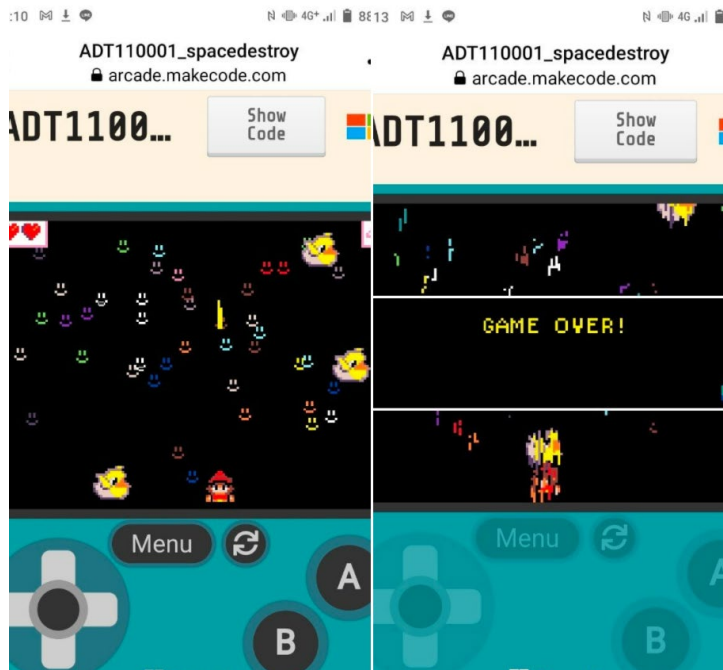
Chih-Hung Wu

29 分鐘 · 2 人

計算機概論課程 實作單元

Makecode自製小遊戲

https://makecode.com/_bu9J7101M8aX



Hoemwork#2

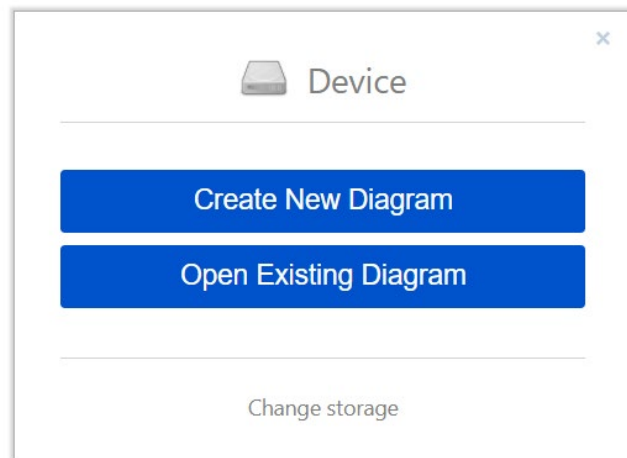
FlowChart

Online flowchart website

Use draw.io to draw the flowchart

Draw.io

<https://app.diagrams.net/>



Select Flowchart

The screenshot shows a web-based interface for selecting a diagram template. At the top, there is a filename field containing "Untitled Diagram.drawio" and a file type dropdown menu set to "XML File (.drawio)". Below this is a search bar and a list of categories on the left, including "Basic (9)", "Business (15)", "Charts (5)", "Cloud (41)", "Engineering (3)", "Flowcharts (9)", "Maps (5)", "Network (13)", "Other (11)", "Software (12)", "Tables (4)", "UML (8)", "Venn (8)", and "Wireframes (5)". The main area displays several diagram templates: "Blank Diagram", "Class Diagram", "Flowchart", "Org Chart", "Swimlane Diagram", "Entity Relationship Diagram", "Sequence", "Simple", and "Cross-". The "Flowchart" template, which features a flow diagram with decision diamonds and process rectangles, is highlighted with a red border. At the bottom, there are four buttons: "Help", "Cancel", "From Template URL", and "Create".

Filename: XML File (.drawio) ?

Search

- Basic (9)
- Business (15)
- Charts (5)
- Cloud (41)
- Engineering (3)
- Flowcharts (9)
- Maps (5)
- Network (13)
- Other (11)
- Software (12)
- Tables (4)
- UML (8)
- Venn (8)
- Wireframes (5)

Blank Diagram

Class Diagram

Flowchart

Org Chart

Swimlane Diagram

Entity Relationship Diagram

Sequence

Simple

Cross-

Help Cancel From Template URL Create

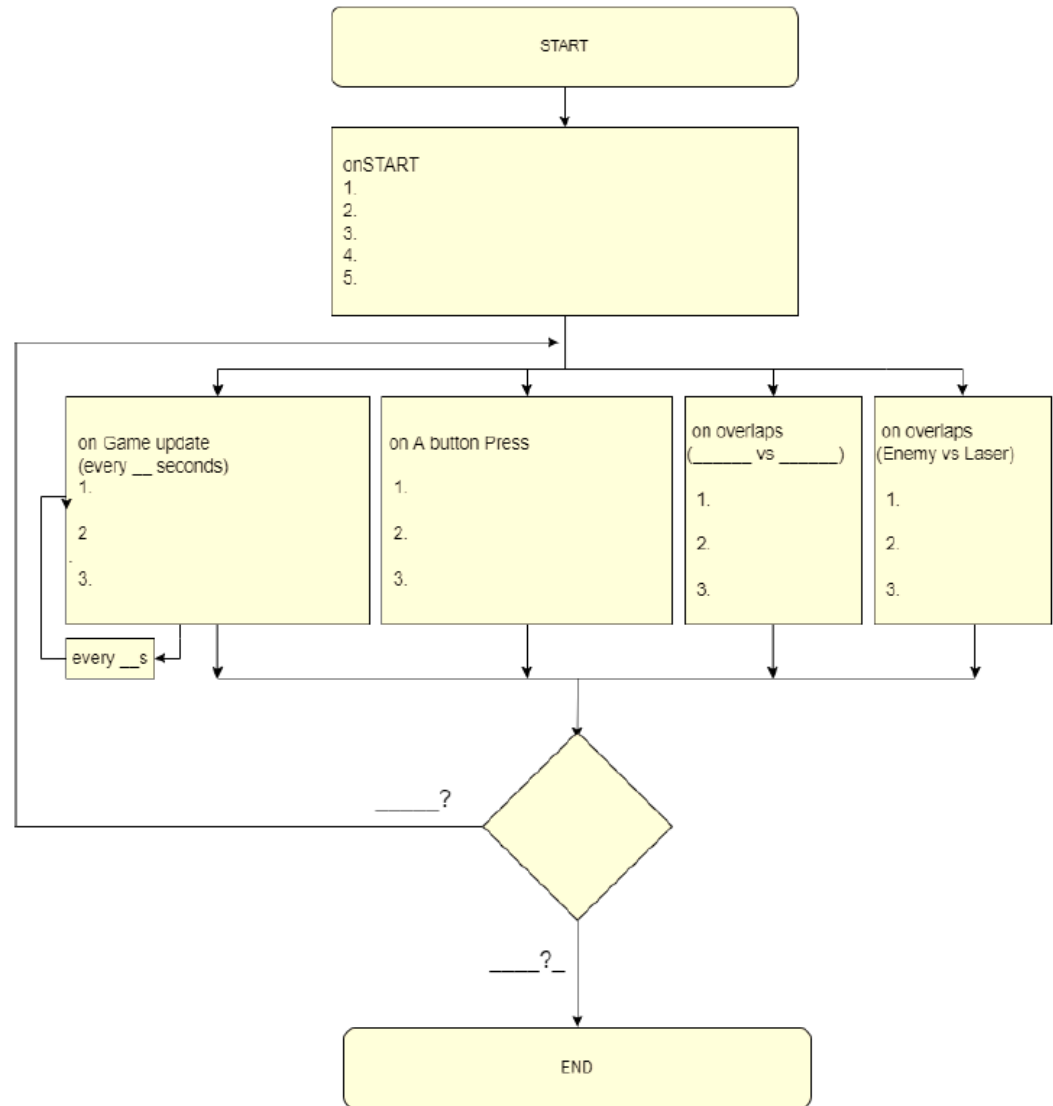
Learning task

FlowChart

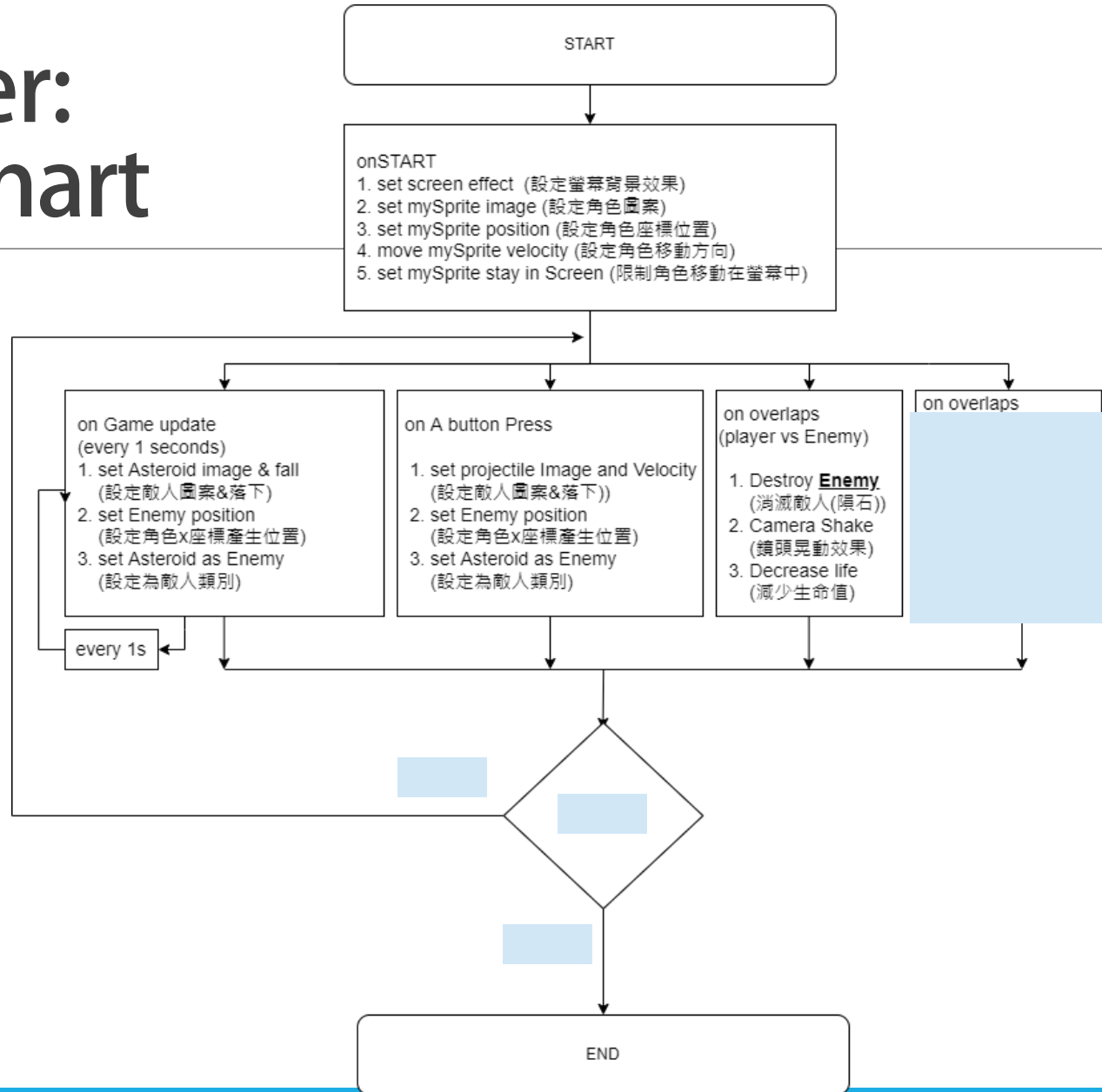
Try the SpaceDestroy game and complete the following game design flowchart.

(試著以 SpaceDestroy 遊戲，完成以下遊戲設計流程圖)

Flowchart

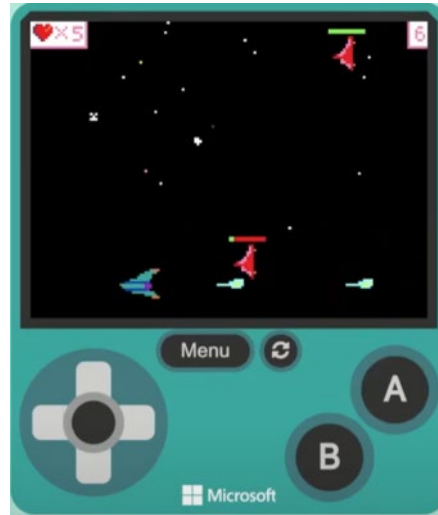


Answer: Flowchart



Extension

MakeCode進階功能



STATUS BAR

Step

Advance

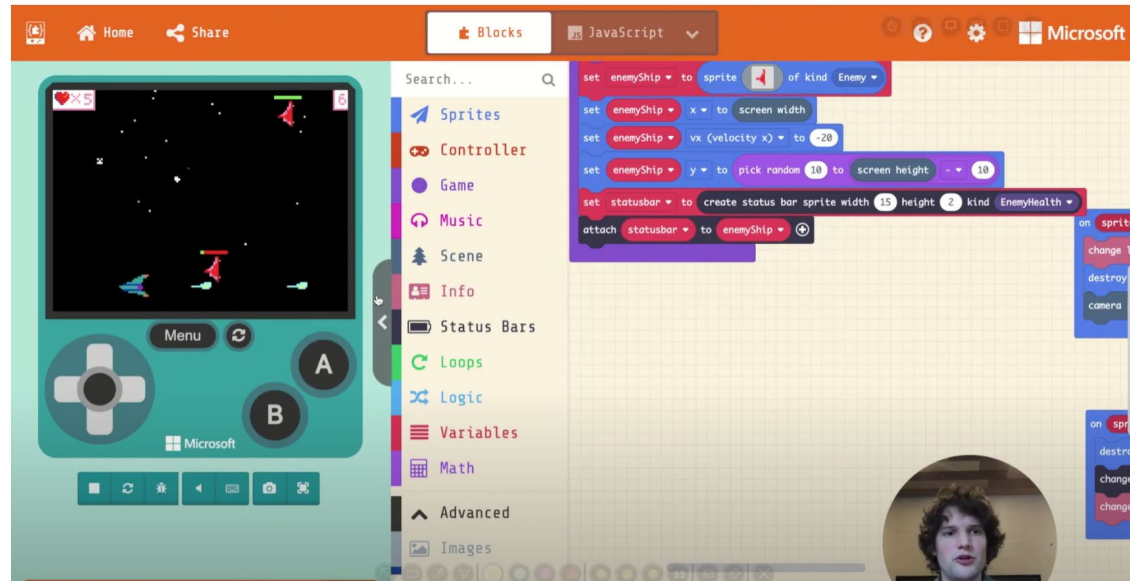
- Extension-> Status Bar

設定status bar步驟

- 附加至敵人
- 設定最大值
- 設定外觀、大小、顏色
- 設定減少數量
- 設定0時destroy敵人

Tutorial Video

- <https://www.youtube.com/watch?v=m7avrQrLP3M>




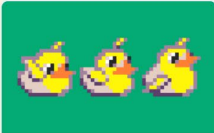


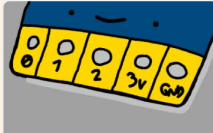
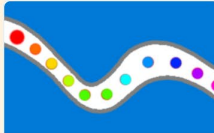

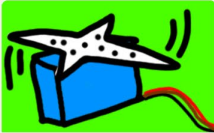

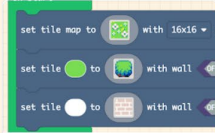
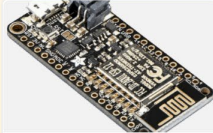







Advanced-> Extension

Search...

- Sprites
- Controller
- Game
- Music
- Scene
- Info
- Loops
- Logic
- Variables
- Math
- Advanced
- Animation
- Images
- Functions
- Arrays
- Text
- Console
- Extensions**

← Go back Extensions

Search or enter project URL.

 <p>controller Extra game controller functionalities</p>	 <p>animation Advanced state based animations for sprites</p>	 <p>corgio A Corgi platformer</p>	 <p>darts A sprite with path projection</p>	 <p>edge-connector 20 pin Edge Connector</p>	 <p>Light The programmable LED (WS2812B, APA102) driver.</p>
 <p>radio-broadcast Adds new blocks for message communication in the radio</p>	 <p>servo A micro-servo library</p>	 <p>sevenseg Seven segment digit display</p>	 <p>color-coded-tilemap Blocks for the color-coded tilemap</p>	 <p>feather Adafruit Feather pinout</p>	 <p>circuit-playground-ch... Images from Adafruit</p> <p>Learn more</p>
					

Status-bar



status-bar

Create status bar sprites for your game

[Learn more](#)

Watch status-bar (health bar) video

<https://www.youtube.com/watch?v=m7avrQrLP3M>

Add status-bar to Enemy

on game update every 1000 ms

set Asteroid to projectile from side with vx 0 vy 50

set Asteroid x to pick random 0 to screen width

set Asteroid kind to Enemy

set statusbar to create status bar sprite width 20 height 4 kind EnemyHealth

attach statusbar to Asteroid

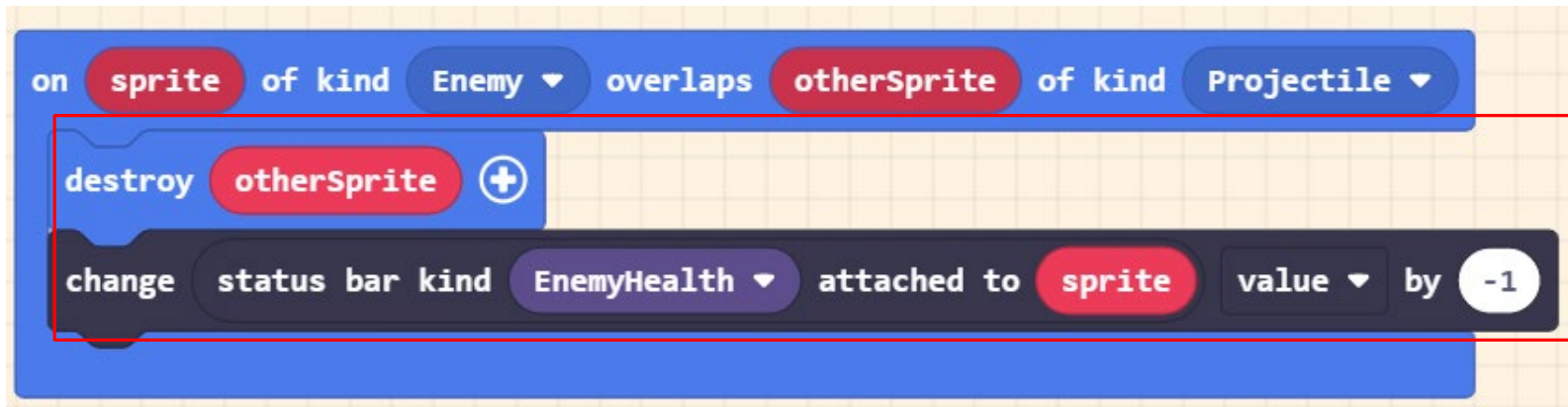
Enemy
Health



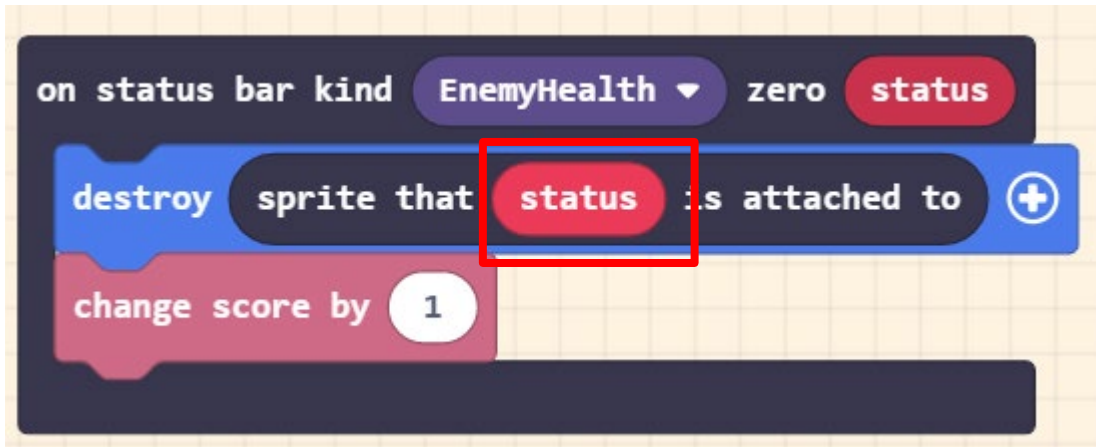
Set status-bar

```
on game update every 1000 ms
  set Asteroid to projectile from side with vx 0 vy 50
  set Asteroid x to pick random 0 to screen width
  set Asteroid kind to Enemy
  set statusbar to create status bar sprite width 20 height 4 kind EnemyHealth
  set statusbar fill green background purple
  set statusbar max to 50
  attach statusbar to Asteroid
```

Decrease status-bar (health)



Add change score & destroy status -bar



Completed Code for reference

```
on start
  start screen confetti effect +
  set mySprite to sprite of kind Player
  set mySprite position to x 77 y 111
  move mySprite with buttons vx 100 vy 0 -
```

```
on game update every 500 ms
  set Astroid to projectile from side with vx 0 vy 50
  set Astroid x to pick random 0 to screen width
  set Astroid kind to Enemy
```

```
set statusbar to create status bar sprite width 20 height 4 kind EnemyHealth
set statusbar fill background +
set statusbar max to 50
attach statusbar to Astroid +
```

New add

```
on A button pressed
  set projectile to projectile from mySprite with vx 0 vy -50
  play sound ba ding until done
```

```
on sprite of kind Player overlaps otherSprite of kind Enemy
  destroy otherSprite with spray effect for 500 ms
  camera shake by 4 pixels for 500 ms
  change life by -1
```

```
on sprite of kind Enemy overlaps otherSprite of kind Projectile
  destroy otherSprite +
  change status bar kind EnemyHealth attached to sprite value by -25
```

New add

```
on status bar kind EnemyHealth zero status
  destroy sprite that status is attached to with disintegrate effect for 500 ms
  change score by 1
```

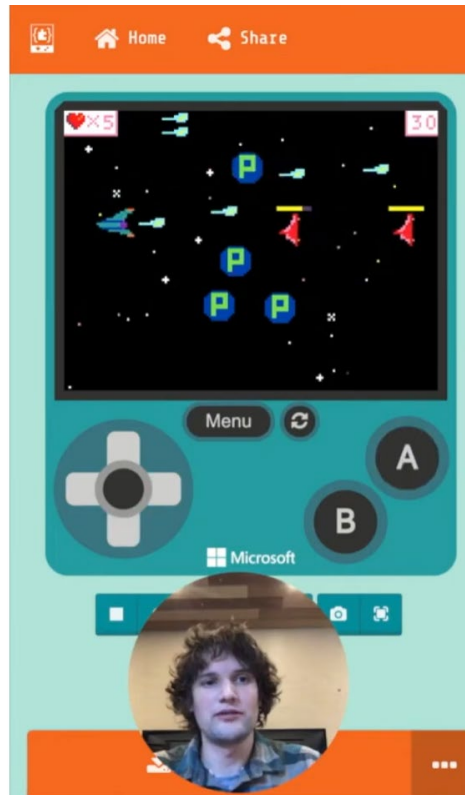
New add

進階功能#2

PowerUp

Watch the power ups video

<https://www.youtube.com/watch?v=S-WMUIwQ7uM>



Reference

[Arcade Beginner Live, Microsoft MakeCode39/39](#)

<https://www.techbang.com/posts/69473-meowbit-ultra-mini-earth-gun-game-console-can-also-be-used-as-a-development-board>

PowerUp

```
on start
  start screen blizzard effect
  set mySprite to sprite of kind Player
  set mySprite position to x 79 y 107
  move mySprite with buttons vx 100 vy 100
  set mySprite stay in screen ON

on game update every 1000 ms
  set asteroid to projectile from side with vx 0 vy 23
  set asteroid x to pick random 0 to screen width
  set asteroid kind to Enemy
  set statusbar to create status bar sprite width 20 height 4 kind EnemyHealth
  set statusbar fill background
  set statusbar max to 50
  attach statusbar to asteroid

on sprite of kind Enemy overlaps otherSprite of kind Projectile
  destroy otherSprite
  change status bar kind EnemyHealth attached to sprite value by -25
```

```
on status bar kind EnemyHealth zero status
  call enemyDeath sprite that status is attached to
  change score by 1

function enemyDeath enemy
  destroy enemy with disintegrate effect for 500 ms
  if 80 % chance then
    set Powerup to sprite of kind PowerUp
    set Powerup x to enemy x
    set Powerup y to enemy y

on sprite of kind Player overlaps otherSprite of kind Enemy
  camera shake by 4 pixels for 500 ms
  change life by -1
  call enemyDeath otherSprite

on sprite of kind Player overlaps otherSprite of kind PowerUp
  destroy otherSprite
  set doublefireMode to sprite of kind Player
  set doublefireMode position to x 75 y 5
  set doublefireMode lifespan to 2000

on A button pressed
  set projectile to projectile from mySprite with vx 0 vy -50
  if doublefireMode and doublefireMode lifespan > 0 then
    change projectile x by -5
    set projectile to projectile from mySprite with vx 0 vy -50
    change projectile x by 5
  play sound ba ding until done
```