



Explorathon 2015

Exploring Computer Science
Through Game Maker



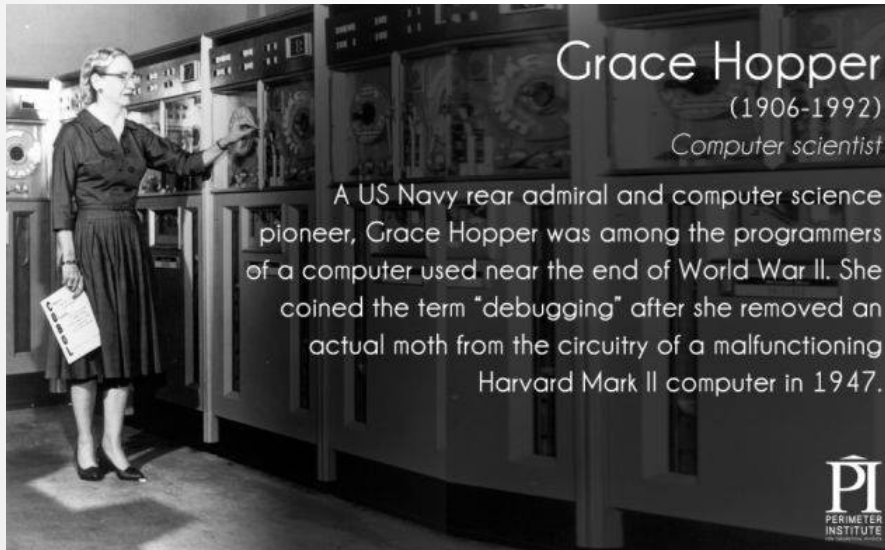
Women in Computer Science

In 1844 a paper was released by an "A.A.L." that discussed a theoretical machine being worked on by mathematician Charles Babbage.

A.A.L. theorized that this machine could one day be able to perform all sorts of complex equations and even create music. A.A.L. wrote a set of commands for the still-incomplete machine that would allow it to generate Bernoulli numbers.

It wasn't until 20 years after her death that A.A.L. was revealed to be Augusta Ada Lovelace.

Today she is considered the world's first computer programmer.



Grace Hopper
(1906-1992)
Computer scientist

A US Navy rear admiral and computer science pioneer, Grace Hopper was among the programmers of a computer used near the end of World War II. She coined the term "debugging" after she removed an actual moth from the circuitry of a malfunctioning Harvard Mark II computer in 1947.



This is computer scientist Margaret Hamilton with the results of the self-testing code her team wrote for the Apollo 11 Moon landing. She's credited with coining the term "software engineer".

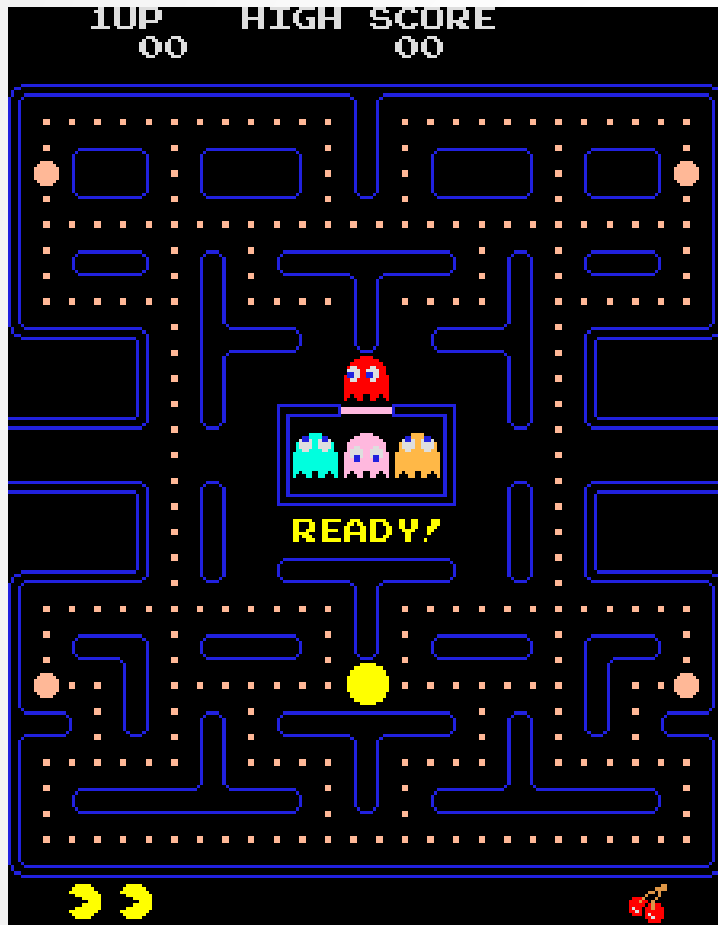


Careers in Computer Science

- Software Engineer
- Web Application Developer
- Mobile Application Developer
- Video Game Developer
- ...and so much more!
- Today we will show you what its like to develop a video game and write real code!



Our Inspiration



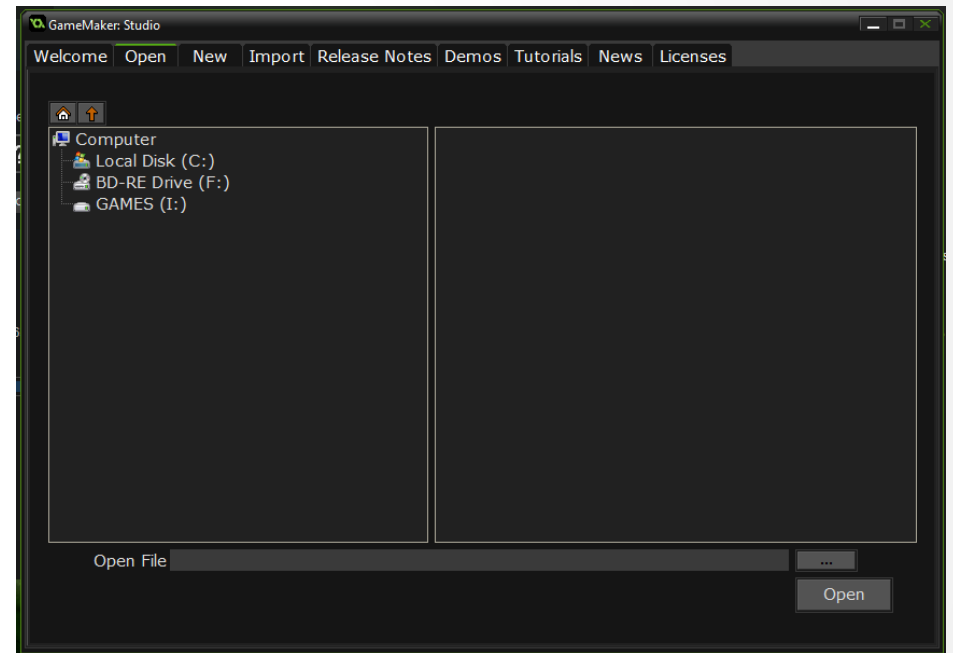
The game we will create today is based on the classic arcade game Pacman. We have changed the images and sounds, but the heart of Pacman remains.

We have also supplied a finished version of our game.



Open the starter project

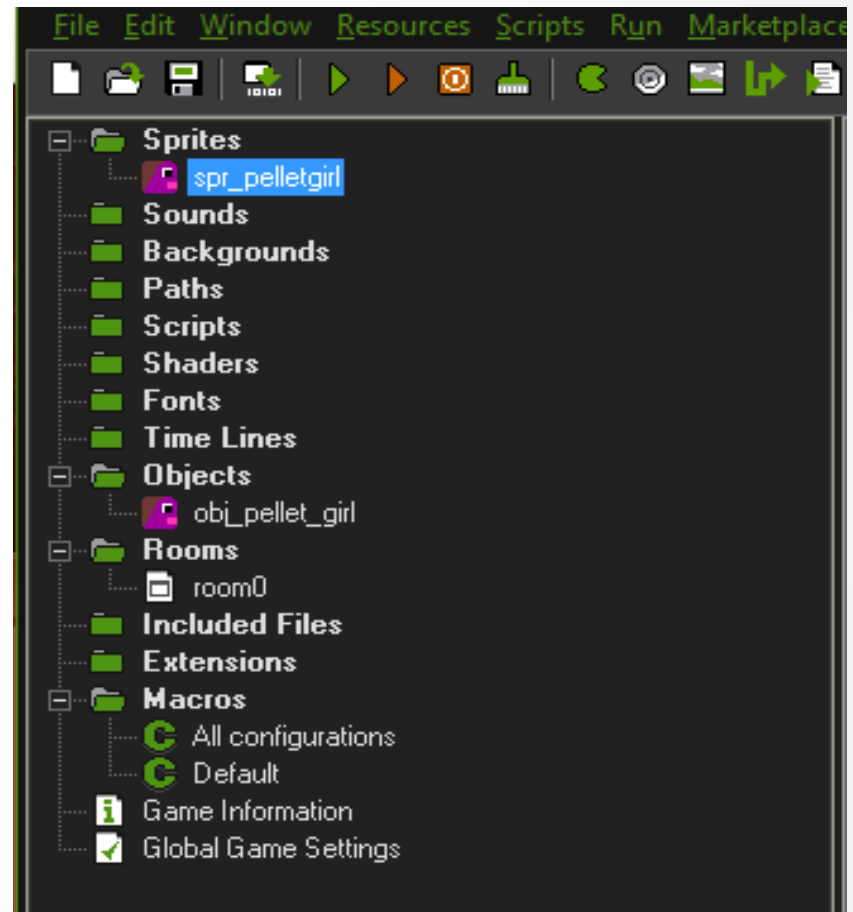
- Open up Game Maker
- Click the Open tab
- Choose the project (PelletGirl - Start) by navigating to it on your flash drive and opening the .gmx file





Project Basics

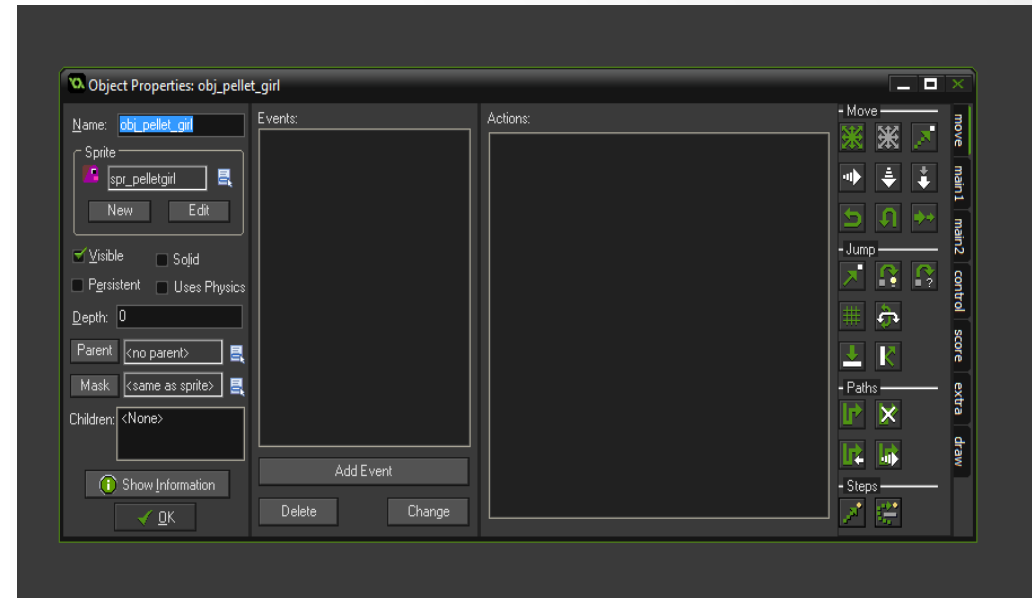
- The initial setup of the project comes with:
 - The pellet girl sprite
 - The pellet girl object
 - A room with pellet girl placed in it
 - You can view these assets in the resource tree, which can be opened by double clicking them
 - Press F5 at any time to run the game





Make Pellet Girl Move

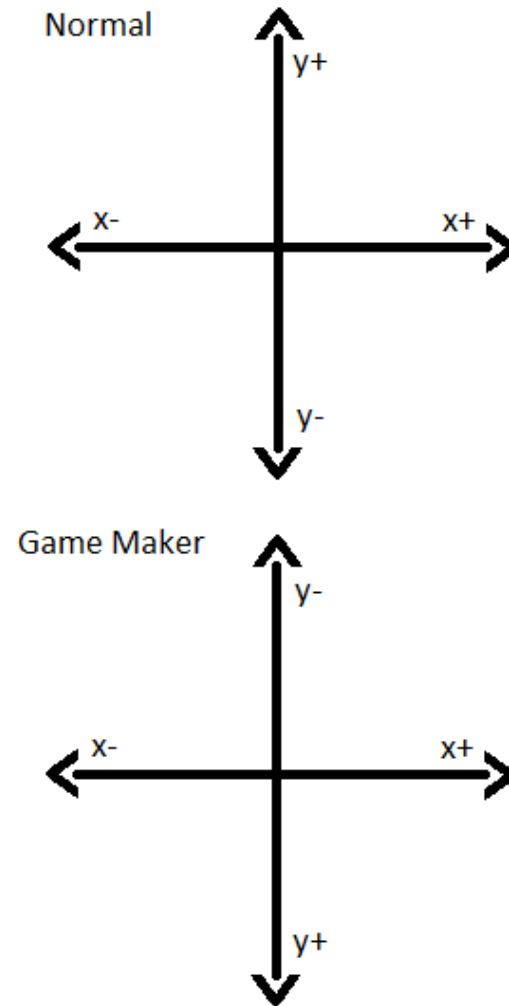
- Edit the Pellet Girl object (obj_pellet_girl) by double clicking in the resource tree
- Add a Step Event by clicking the Add Event button and choosing Step
- Under the control tab on the right side, drag a code block into the step event





Coordinates – A Quick Review

- Game Maker moves characters around in the screen according to x and y positions
- Normally positive x is to the right and positive y is up
- However, in Game Maker, positive y is down
- So, when we want our character to go up, our vertical speed is negative





Make Pellet Girl Move

- We don't want pellet girl to move unless we are pressing a button, so we set both hspeed and vspeed variables to 0
- keyboard_check() allows us to see whether a button is being pressed
- Every non-character key on the keyboard will start with “vk_” followed by the key name
- Test pellet girl by pressing F5

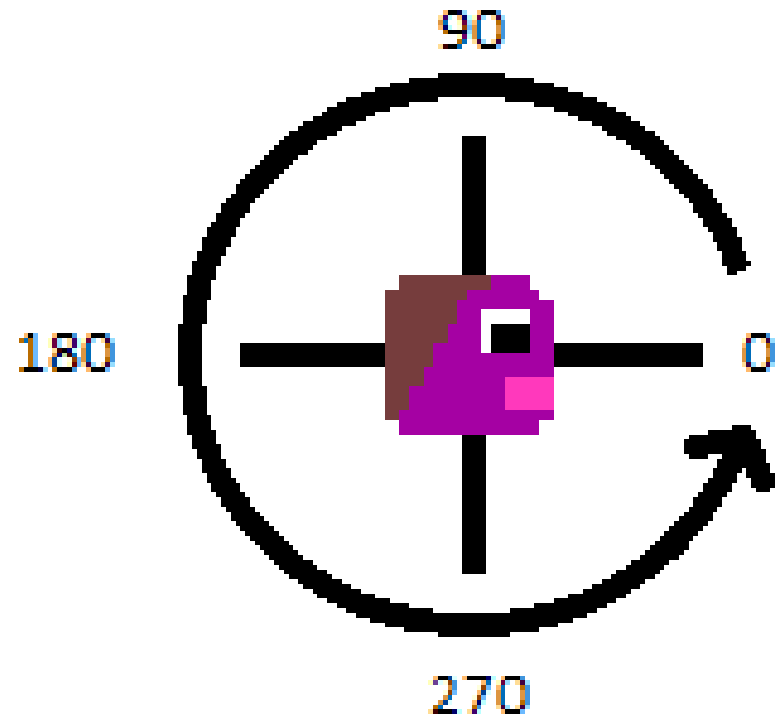
```
hspeed = 0;      hspeed = horizontal  
vspeed = 0;      vspeed = vertical
```

```
if (keyboard_check(vk_up)) {  
    hspeed = 0;  
    vspeed = -1;  
}  
else if (keyboard_check(vk_down)) {  
    hspeed = 0;  
    vspeed = 1;  
}  
else if (keyboard_check(vk_right)) {  
    hspeed = 1;  
    vspeed = 0;  
}  
else if (keyboard_check(vk_left)) {  
    hspeed = -1;  
    vspeed = 0;  
}
```



Rotation – A Quick Review

- Right now Pellet Girl is facing right, but we want her to face whatever direction she is currently going
- Game Maker lets us change the direction of our sprite
- Game maker starts with characters at zero degrees, with positive angles rotating the character counter clockwise





Pellet Girl Faces the Wrong Way!

- Edit the Pellet Girl object by double clicking in the left panel
- Double click on the event code to edit
- Now we use a Game Maker variable called `image_angle` to change the direction pellet girl faces
- We want to rotate her 90 degrees to face up
- 180 degrees to face left
- 270 degrees to face down
- Test with F5

```
hspeed = 0;
vspeed = 0;

if (keyboard_check(vk_up)) {
    hspeed = 0;
    vspeed = -1;
    image_angle = 90;
}
else if (keyboard_check(vk_down)) {
    hspeed = 0;
    vspeed = 1;
    image_angle = 270;
}
else if (keyboard_check(vk_right)) {
    hspeed = 1;
    vspeed = 0;
    image_angle = 0;
}
else if (keyboard_check(vk_left)) {
    hspeed = -1;
    vspeed = 0;
    image_angle = 180;
}
```



Now She's Upside Down!

- We don't want to rotate Pellet Girl to face left
- Instead, we want her mirror image
- We need to change her `image_angle` to 0 when facing left
- We can use a variable called `image_xscale` and set it to -1 to mirror her
- Test with F5

```
hspeed = 0;
vspeed = 0;

if (keyboard_check(vk_up)) {
    hspeed = 0;
    vspeed = -1;
    image_angle = 90;
    image_xscale = 1;
}
else if (keyboard_check(vk_down)) {
    hspeed = 0;
    vspeed = 1;
    image_angle = 270;
    image_xscale = 1;
}
else if (keyboard_check(vk_right)) {
    hspeed = 1;
    vspeed = 0;
    image_angle = 0;
    image_xscale = 1;
}
else if (keyboard_check(vk_left)) {
    hspeed = -1;
    vspeed = 0;
    image_angle = 0;
    image_xscale = -1;
}
```

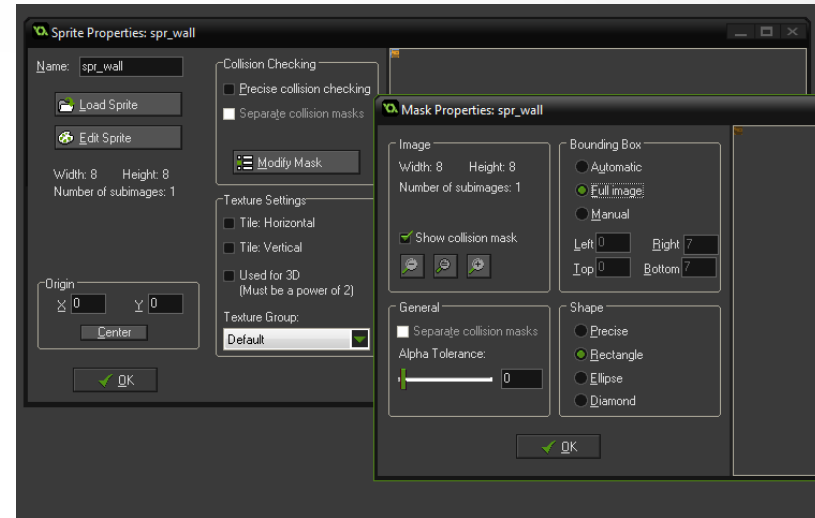
We need to set the `image_xscale` variable for all of the directions to make sure she is facing the way we want



Create a Wall Sprite

- Now that we have Pellet Girl moving, its time to start creating our maze!
- Right click in Sprites and choose Create Sprite
- Name it “spr_wall”
- Click on “Load Sprite”
- Navigate to the assets/sprites directory and choose the image named “wood_wall.png”
 - We have given you a whole folder full of wall images
 - When the maze become more complicated, we can make walls with corner angles

We name it spr_wall so that we can tell sprites apart from objects in code

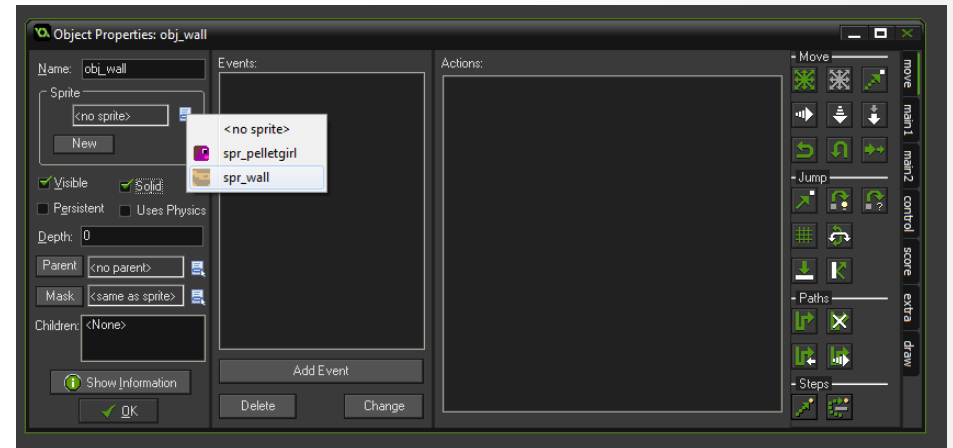


- Click on Modify Mask under Collision Checking
- Click on Full Image under Bounding Box
- Click OK twice, now we have defined the “bounding box” of the sprite



Create Wall Object

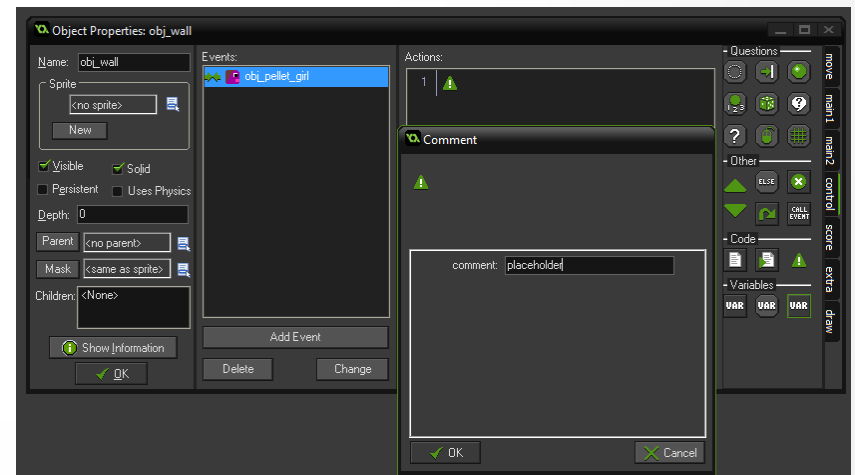
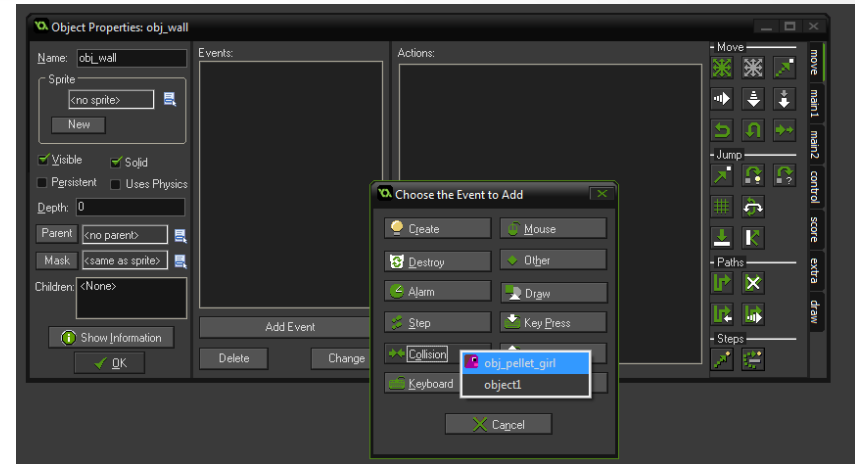
- Right click in Objects
- Choose Create Object
- Name it “obj_wall”
- Choose spr_wall sprite by clicking on the icon under Sprite
- Click the checkbox for Solid
- Click the checkbox for Persistent





Make Pellet Girl Stop When She Touches the Wall

- In the wall object, click Add Event
- Click Collision
- Choose object “obj_pellet_girl”
- Under control on the right, drag a comment block into the event area
- Add the word “placeholder” to the comment

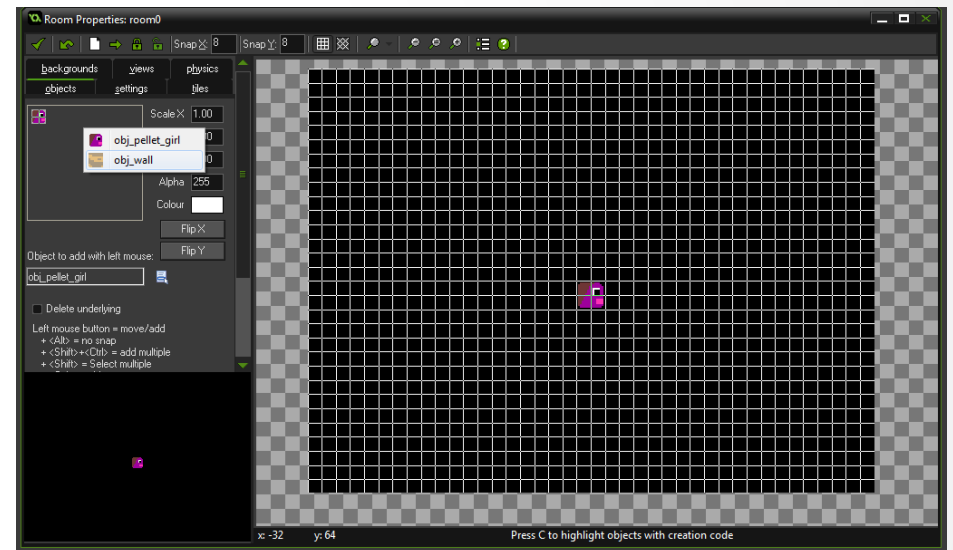


Game Maker doesn't like empty events, but we don't need any code for the wall, so we just add a comment to make Game Maker happy.



Add Walls to Your Room!

- Under Rooms, in the asset tree, double click room0
- On the left panel, choose the objects tab
- Click on the area with pellet girl and choose “obj_wall”
- Change Snap Y to 8 and Snap X to 8
- Use Left click to lay a single piece of wall, or Ctrl + Shift + Left Click to put down multiple pieces while dragging
- Create a square wall around Pellet Girl
- Click the checkmark in top left corner to save
- Test by pressing F5 - your character should stop when they encounter a wall.





Speed Up Pellet Girl and Don't Let Her Stop!

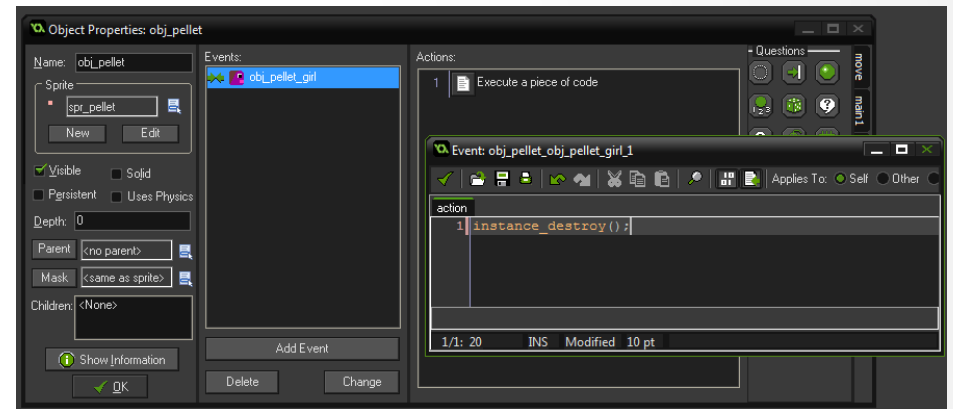
- To mimic Pacman's continuous movement we need to change the code
- Edit pellet girl by double clicking in the asset tree, then edit her step event
- Where hspeed and vspeed are -1 or 1, change to -2 or 2
- Remove beginning hspeed = 0 and vspeed = 0;
- Save the change by checking the checkmark
- Test with F5

```
if (keyboard_check(vk_up)) {  
    hspeed = 0;  
    vspeed = -2;  
    image_angle = 90;  
    image_xscale = 1;  
}  
else if (keyboard_check(vk_down)) {  
    hspeed = 0;  
    vspeed = 2;  
    image_angle = 270;  
    image_xscale = 1;  
}  
else if (keyboard_check(vk_right)) {  
    hspeed = 2;  
    vspeed = 0;  
    image_angle = 0;  
    image_xscale = 1;  
}  
else if (keyboard_check(vk_left)) {  
    hspeed = -2;  
    vspeed = 0;  
    image_angle = 0;  
    image_xscale = -1;  
}
```



Add a Pellet

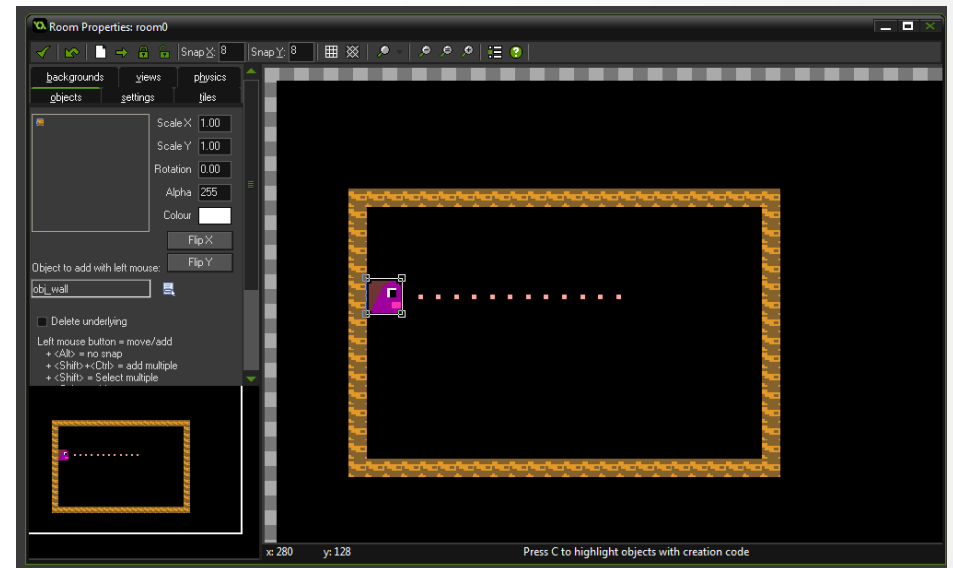
- Create a new sprite named “spr_pellet” with the dot.png image
 - Modify Mask to Automatic, click OK
 - Click Center button under Origin
- Create a new object named “obj_pellet”
 - Choose the pellet sprite
 - Add Event → Collision with Pellet Girl
 - Drag Code block to Event area
 - Add line “instance_destroy();”
 - Click OK





Add Pellets to Room

- Edit room0 by double clicking in the left panel
- Choose pellet object in the object tab and add many pellets to the room
- Save
- Test by pressing F5



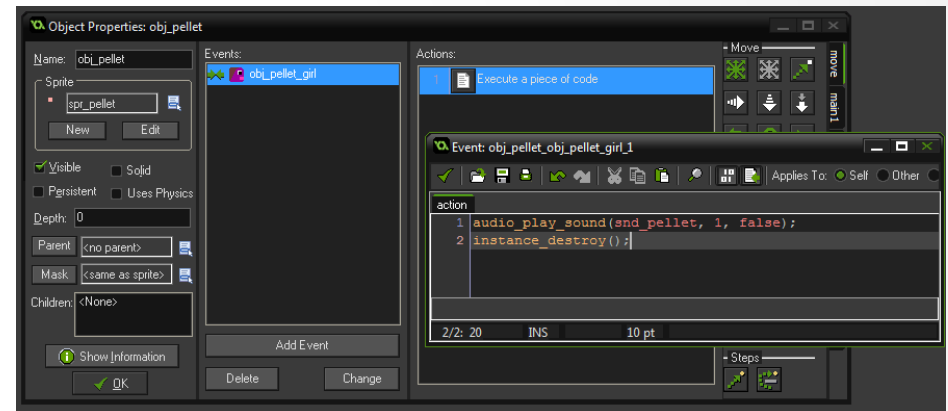


Add a Sound to Eating Pellets

- Right click on sounds and choose Create Sound
- Name the sound “snd_pellet” and choose the pellet.wav file from the assets/sounds folder
- Edit the pellet object's collision event
- Change the code block to

```
audio_play_sound(snd_pellet, 1, false);  
instance_destroy();
```

- Save and press F5 to test





Make a Maze in Your Room!

- Edit your room0
- Use the wall object to create a maze around Pellet Girl
- Be sure to give her enough room to walk in between the walls



Steps to Finish Your Game

- Create sprites and objects for all of your zombie enemies
- Add logic for the zombies to travel the maze and chase Pellet Girl
- Add zombie sprays to your maze
- Create make the zombies blink when they are destroyable by spray
- Create a score board and keep track of the score
- Please keep an eye on <https://github.com/originalgrego/PelletGirl> for additions to this tutorial



Thank you!

- Included on your flash drive are the following programs
 - Game Maker – A free to evaluate game engine
 - Gimp – A free and open source image editor
 - Audacity – A free sound editing program
 - Reaper – A digital audio workstation program providing convenient licensing
 - Blender – A free and open source 3d modeling tool
 - Tiled – A free and open source Tile Map editing tool, used for creating complex levels
- Please visit <https://github.com/originalgrego/PelletGirl> for future updates to this project or to help in its development. Pellet Girl is a GPL'd open source project that anyone can contribute to!
- We hope you enjoyed Pellet Girl!