

Programming a mini shooter



Start code

• main.py

```
import pygame, os

def main():

    # Load
    pygame.init()
    screen = pygame.display.set_mode((800, 600))
    font = pygame.font.Font(None, 24)
    path = os.path.abspath('.') + '/'
    quit_game = False

    while not(quit_game):
        # Inputs
        for event in pygame.event.get():
            if event.type == pygame.QUIT:
                quit_game = True
            if event.type == pygame.KEYDOWN:
                if event.key == pygame.K_ESCAPE:
                    quit_game = True

        # Update

        # Draw
        screen.fill((0, 0, 0))
        pygame.display.update()

if __name__ == "__main__":
    main()
```

Player

Display player

- main.py

```
import pygame, sys

# Load
...
player = pygame.image.load(path+'player.png').convert_alpha()
...
while not(quit_game):
    ...
    # Draw
    screen.fill((0, 0, 0))
    screen.blit(player, (0, 200))
    pygame.display.update()
```

- `pygame.image.load(...)` has one argument, which is the path to the image on your hard drive
- `path + "player.png"` concatenate the content of the path variable and "player.png"
- `convert_alpha()` function change the pixel format of the image, to give the display surface format

Move player

• main.py

```
import pygame, sys

# Load
...
key_up = False
key_down = False
player_x = 0
player_y = 200
...
while not(quit_game):
    # Inputs
    for event in pygame.event.get():
        if event.type == pygame.QUIT:
            quit_game = True

        if event.type == pygame.KEYDOWN:
            if event.key == pygame.K_ESCAPE:
                quit_game = True
            if event.key == pygame.K_UP:
                key_up = True
            if event.key == pygame.K_DOWN:
                key_down = True

        if event.type == pygame.KEYUP:
            if event.key == pygame.K_UP:
                key_up = False
            if event.key == pygame.K_DOWN:
                key_down = False

    # Update
    if key_up:
        player_y = player_y - 5
    if key_down:
        player_y = player_y + 5

    # Draw
    ...
    screen.blit(player, (player_x, player_y))
    ...
```

Limit player move

- We want the player to stay at position 0 if position become inferior to 0
- Same if position go over screen height (- player height)

Limit player move

- main.py

```
# Load
player_y = 200
player_height = 120

screen_height = 720
screen_width = 1280

...

# Update
...
if player_y < 0:
    player_y = 0
if player_y > screen_height - player_height:
    player_y = screen_height - player_height
```

Shots

Make the player shoot

- Player will shot projectiles. We want a function to create shots, and an other to draw shots.
- Projectiles are fired when the player presses Space.
- We will store projectile's variables in a map :

```
bullet = { 'x': 120, 'y': y, 'speed': 5, 'image': pygame.image.load(path+'bullet.png').convert_alpha() }
```

- We should have a list of projectiles

Make the player shoot

• main.py

```
# Load
key_space = False
bullets = []

def create_bullet(y):
    bullet = { 'x': 120, 'y': y, 'speed': 5, 'image': pygame.image.load(path+'bullet.png').convert_alpha() }
    bullets.append(bullet)

def draw_bullets():
    for bullet in bullets:
        screen.blit(bullet['image'], (bullet['x'], bullet['y']))

...

# Inputs
if event.type == pygame.KEYDOWN:
    ...
    if event.key == pygame.K_SPACE:
        key_space = True

    if event.type == pygame.KEYUP:
        ...
        if event.key == pygame.K_SPACE:
            key_space = False

# Update
...
if key_space:
    create_bullet(player_y)

# Draw
...
draw_bullets()
```

...

Make the shots move

- Now we want bullets to move from the left to the right
- We create a function that would move each bullet of the bullet list

Make the shots move

- main.py

```
# Load
def move_bullets():
    for bullet in bullets:
        bullet['x'] = bullet['x'] + bullet['speed']

# Update
...
move_bullets()
```

```
...
```

One press one shot

- Our player shoots every frame when space bar is pressed
- We want the player to shoot only once when space bare is hit
- Use a boolean to implement this behaviour

One press one shoot

• main.py

```
# Load
...
already_shoot = False
...
def create_bullet(y):
    nonlocal already_shoot
    bullet = {'x': 120, 'y': y, 'speed': 5, 'image': pygame.image.load(path+'bullet.png').convert_alpha()}
    bullets.append(bullet)
    already_shoot = True
...

# Inputs
if event.type == pygame.KEYDOWN:
    ...
    if event.key == pygame.K_SPACE:
        key_space = True
        already_shoot = False

# Update
...
if key_space and not already_shoot:
    create_bullet(player_y + 50)
    move_bullets()
...
```

Erase shots to free memory

- If our code is left like that, we would manage a growing number of shots
- We want to erase shots when they get out the screen
- We cannot erase shots while we are going through them
- So we will register in a list the indexes of the shots we want to erase, then delete the shots with those indexes

Erase unused shots

• main.py

```
# Load
...
tirs_a_effacer = []
...
def deplacer_tirs():
    for index, tir in enumerate(liste_tir):
        tir['x'] = tir['x'] + tir['vitesse']
        if tir['x'] > ecran_largeur:
            tirs_a_effacer.append(index)

def effacer_tirs(tirs_a_effacer):
    for index in tirs_a_effacer:
        del liste_tir[index]
    tirs_a_effacer[:] = []

...

# Update
...
effacer_tirs(tirs_a_effacer)

...
```


Enemies

Create, draw, move and erase enemies

- You can use the shot algorithm to create enemies
- Use a counter variable to trigger enemy spawn: increment it by 1 each frame, when it exceeds 500, create an enemy
- Enemies go from right to left

Create, draw, move and erase enemies

• main.py

```
# Load
...
enemies = []
enemies_to_erase = []

def create_enemy(y):
    enemy = {'x': screen_width, 'y': y, 'speed': -3, 'image': pygame.image.load(path+'enemy.png').convert_alpha()}
    enemies.append(enemy)

def draw_enemies():
    for enemy in enemies:
        screen.blit(enemy['image'], (enemy['x'], enemy['y']))

def move_enemies():
    for index, enemy in enumerate(enemies):
        enemy['x'] = enemy['x'] + enemy['speed']
        if enemy['x'] < 0:
            enemies_to_erase.append(index)

def erase_enemies(to_erase):
    for index in to_erase:
        del enemies[index]
    to_erase[:] = []

enemy_counter = 0

...

# Update
...
# Enemies
move_enemies()
erase_enemies(enemies_to_erase)
enemy_counter = enemy_counter + 1
if enemy_counter > 500:
    create_enemy(300)
    enemy_counter = 0

...
```

Create enemy at random position

- Import random package and use random.seed() to generate a random series of number
- random.randint(min, max) give a random integer between min and max
- Make enemies appear at a random position

Create, draw, move and erase enemies

• main.py

```
import random

...

# Load

...

random.seed()

...

# Update

...

if enemy_counter > 500:
    create_enemies(random.randint(0, screen_height - 120))

...
```

Detect player colliding with enemy

- Here is a code to detect collisions and trigger game over when there is a collision:

```
game_over = False

def collision_player_enemies():
    nonlocal game_over
    for i_enemy, enemy in enumerate(liste_enemis):
        x1, y1, w1, h1 = player_x, player_y, player_width, player_height
        x2, y2, w2, h2 = enemy['x'], enemy['y'], enemy['image'].get_width(), enemy['image'].get_height()
        if(not(x1 + w1 < x2 or x2 + w2 < x1 or y1 + h1 < y2 or y2 + h2 < y1)):
            destroy_enemy(i_enemy)
            game_over = True
```

- Display a game over text when game is over

Display game over

• main.py

```
import random

...

# Update
...
if not game_over:
    ...
    collision_player_enemies()
else:
    if key_space:
        game_over = False

# Draw
if not game_over:
    ...
else:
    screen.blit(game_over_text, (600, 300))
```

Fixes

- We don't want the player to shoot when he or she restarts game
- We want all enemies to be erased after game restart

Fixes

• main.py

```
import random

# Load
def erase_all_enemies():
    enemies[:] = []
    enemies_to_erase[:] = []

def collision_player_enemies():
    ...
    erase_all_enemies()
...
# Update
...
if not game_over:
    ...
else:
    if key_space:
        game_over = False
        already_shot = True
```