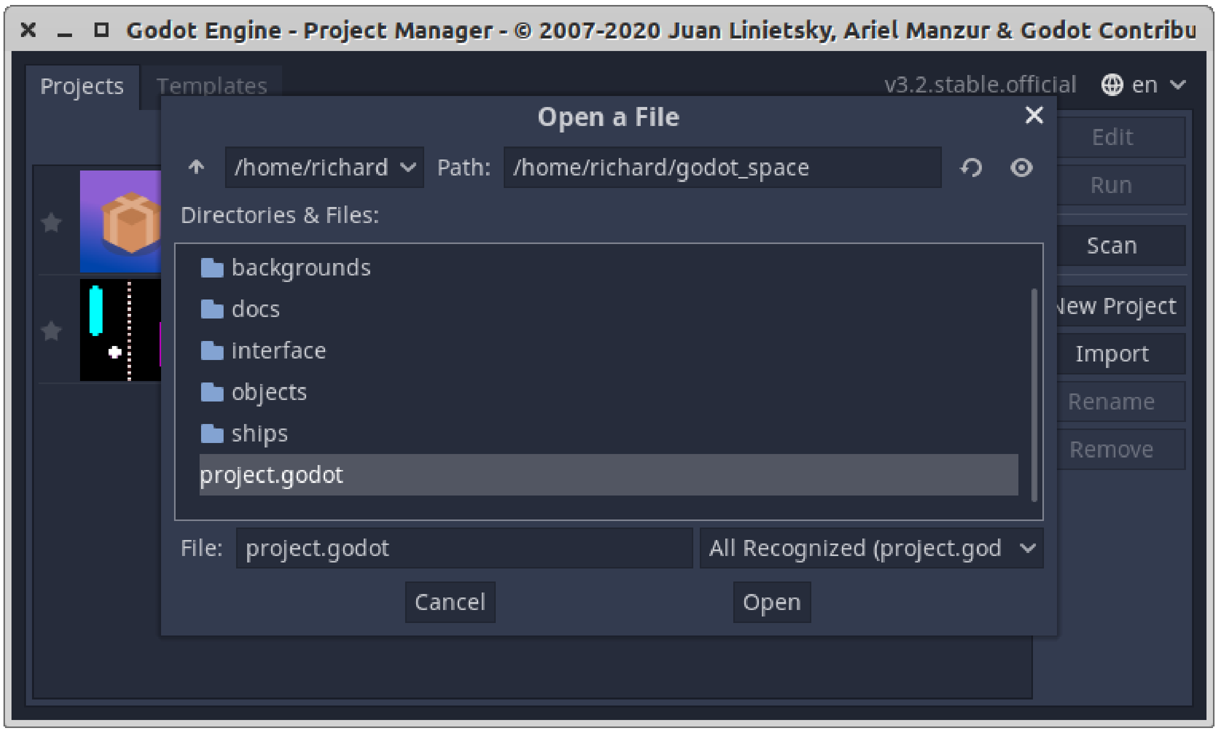
Contents

1 Space Shooter Tutorial

Download the starter project from https://electronstudio.github.io/godot_space/godot_space1.zip.

Unzip it. Open Godot. `Import` the `project.godot` file.



Run the game. You should have a spaceship sprite that can turn left and right.

There is also lighting and a HUD.

1.1 Player movement

This code is in `player.gd`. **You do not need to type this, it has already been typed for you!** Make sure you understand it before you continue.

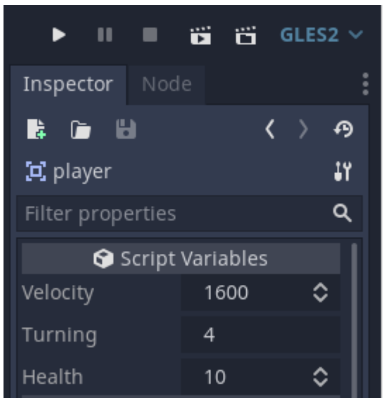
Which line moves the player?

What is `delta`?

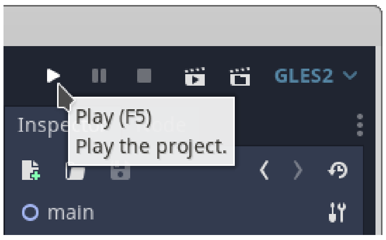
How many times per second does the code run?

```
extends Area2D

export var velocity = 0
export var turning = 4.0
export var health = 10

var Bullet = preload("res://player_bullet.tscn")
var score = 0

func _process(delta):
    if Input.is_action_pressed("turn_left"):
        rotation -= turning * delta
    if Input.is_action_pressed("turn_right"):
        rotation += turning * delta
    if Input.is_action_just_pressed("fire"):
        Bullet.instance().init(self, 4000)

    position += Vector2.RIGHT.rotated(rotation) * velocity * delta
```

1.2 Velocity



Velocity	1600
Turning	4
Health	10

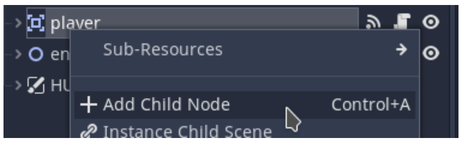


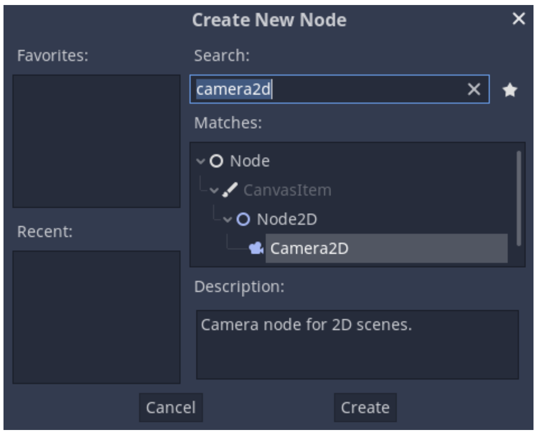
When a script `exports` a variable we can change the value using the Inspector without editing the script.

Change the `velocity` of the `player` to 1600 in the node inspector. Run the game.

1.3 Camera

We need a camera to track the player. Add a `Camera2D` node to the `player` node.





Search: camera2d

Camera node for 2D scenes.

In the node inspector set:

- Current: On
- Zoom x: 6
- Zoom y: 6
- Drag Margin:
  - Left: 0
  - Right: 0
  - Top: 0
  - Bottom: 0

What happens if you change these values?

1.4 Background

We would like to add another layer to the scrolling background.

1. Add a child node to the `ParallaxBackground` node. The child node should be a `ParallaxLayer` .
2. Click on the `ParallaxLayer2`.
3. In the node inspector, set:
   - Motion: Mirroring x: 15360
   - Motion: Mirroring y: 15360
4. Find `backgrounds/stars_big_1024.png` in the filesystem (Bottom left of screen).
5. Drag into the scene in the centre of the screen.

6. Click on the `stars_big_1024` sprite node.
7. In the node inspector, under `Node2D Transform` set:
    - Position x: 7680
    - Position y: 7680
    - Scale x: 15
    - Scale y: 15

Run the game to verify it works.

1.5 Particle effect

The player already has a `CPUParticles2D` node made for you. Click on it. In the Inspector, set:

- Emitting: On
- Amount: 50

Experiment with changing these settings. *What do they do?*

- Lifetime
- Spread
- Gravity
- Velocity
- Color
- Anything else you like

1.6 Make enemy move

Open the `enemy.tscn` scene file by double clicking it.

Right click on the `enemy` node and attach a script. Replace the contents of the script with:

```
extends Area2D

export var VELOCITY = 1000.0
export var TURNING = 0.7
export var FIRE_RATE = 0.01

var Bullet = preload("res://enemy_bullet.tscn")
onready var player = get_node("/root/main/player")

func _process(delta):
    var d = player.position.angle_to_point(position)
    rotation = Util.rotate_toward(rotation, d, TURNING*delta)
    position += Vector2.RIGHT.rotated(rotation) * VELOCITY * delta

    if position.distance_to(player.position) > 7000:
        queue_free()

    if randf()<FIRE_RATE:
        Bullet.instance().init(self, 3000)
```

1.7 Add more enemies

NOTE: The `Light2D` node under `HUD` covers the whole screen with an invisible object (the light) and that makes it difficult to select other sprites because you always accidently select the light. I suggest you click the eye icon next to `Light2D` to hide it. But don't forget to unhide it once you have finished positioning your sprites!

In the `main` scene, duplicate (ctrl-D) the enemy node a few times and try changing the exported variables in the node inspector so they move at different velocities. *Can you make a more deadly enemy this way?*

Also try changing `Node2D Transform Rotation`.

Test the game again.

1.8 Make bullets move

Try pressing space to shoot bullets. *What happens? Why?*

We already have scene files for the bullets: `player_bullet.tscn` and `enemy_bullet.tscn`.

They are both attached to the same script file, `bullet.gd`. Double click the file to edit the script and add this function:

```
func _process(delta):
    position += Vector2.RIGHT.rotated(rotation) * velocity * delta
    if position.distance_to(player.position) > 5000:
        queue_free()
```

Test the game again. *Why are we testing the distance from the player?*

1.9 Make bullets collide

1. Open the `player_bullet.tscn` scene file by double clicking it.
2. Click `bullet` node.
3. In the inspector click `Node` at the top to view the signals.
4. Double click the `area_entered` signal.
5. Select `bullet` from the list of nodes to connect to.
6. Click `connect`.
7. Godot will create an empty function for you. Replace it with this:

```
func _on_bullet_area_entered(area):
    queue_free()
```

7. Repeat steps 1-5 for `enemy_bullet.tscn` scene. (No need to edit the script and add the function again, since it's the same script and you already did it.)
8. Test the game again.

1.10 Make enemy collide

1. Open the `enemy.tscn` scene file by double clicking it.
2. Click `enemy` node.
3. In the inspector click `Node` at the top to view the signals.
4. Double click the `area_entered` signal.
5. Select `enemy` from the list of nodes to connect to.
6. Click `connect`.
7. Godot will create an empty function for you. Replace it with this:

```
func _on_enemy_area_entered(area):
    $explosion.play()
    $AnimationPlayer.play("fade")
    $CollisionPolygon2D.queue_free()
    $CPUParticles2D.emitting = true
    $CPUParticles2D.show()
    player.score += 1
    get_node("/root/main/HUD/score").text = str(player.score)
    yield(get_tree().create_timer(1.0), "timeout")
    queue_free()
```

Test the game again.

1.11 Make player collide

1. Go back to the `main.tscn` scene (should be open as a tab).
2. Click `player` node.
3. In the inspector click `Node` at the top to view the signals.
4. Double click the `area_entered` signal.
5. Select `player` from the list of nodes to connect to.
6. Click `connect`.
7. Godot will create an empty function for you. Replace it with this:

```
func _on_player_area_entered(area):
    health -= 1
    get_node("../HUD/health").value = health
    if health <= 0:
        get_tree().reload_current_scene()
    $crash_sound.play()
    modulate = Color(1000, 0, 0, 255)
    yield(get_tree().create_timer(1.0), "timeout")
    modulate = Color(1, 1, 1, 255)
```

Test the game again.

1.12 Gamepad controls (optional)

This is only required if you want to play to play with a gamepad.

Open `player.gd` script. Delete the `gamepad` function and replace it with this:

```
var virtual_stick_direction = Vector2.ZERO

func gamepad(delta):
    var input = Vector2(Input.get_joy_axis(0, 0), Input.get_joy_axis(0, 1)) + virtual_stick_direction
    if input.length() > 0.2:
        var direction = input.angle()
        rotation = Util.rotate_toward(rotation, direction, turning * delta)
```

1.13 Touch screen controls (optional)

This requires the gamepad code above to have been added. If you have a mobile phone or tablet this will allow you to play on the touch screen.

Add to `player.gd` script:

```
var virtual_stick_origin = Vector2.ZERO

func _input(event):
    if event is InputEventScreenTouch:
        if event.position.x < get_viewport().size.x/2.0:
            if event.pressed:
                virtual_stick_origin = event.position
        else:
            if event.pressed:
                Input.action_press("fire")
            else:
                Input.action_release("fire")
    elif event is InputEventScreenDrag and event.position.x < get_viewport().size.x/2.0:
        virtual_stick_direction =  (event.position - virtual_stick_origin).normalized()
```

1.14 More types of enemies

1.15 Enemy spawner

```
extends Timer

export (PackedScene) var  Enemy
export var MAX_ENEMIES = 10
export var MAX_SCORE = 999999
export var MIN_SCORE = 0
onready var player = get_node("/root/main/player")

func _on_enemy_spawner_timeout():
    if get_child_count() < MAX_ENEMIES && player.score <= MAX_SCORE &&
        player.score >= MIN_SCORE:
        var enemy = Enemy.instance()
        add_child(enemy)
```

1.16 Enemy randomize

Add this to `enemy.gd` to randomize the position of the enemies when they spawn.

```
func _ready():
    position = player.position + Vector2.RIGHT.rotated(rand_range(0, PI
        *2)) * 5000
    rotation = player.position.angle_to_point(position)
```

1.17 Charge laser

Note this laser only has two states and so could have been done more simply using a boolean, but I wanted to demonstrate use of `enum` because in future you might have more than two states.

```
extends Area2D

var charge = 0.0

enum  {CHARGING, DISCHARGING}
var laser = DISCHARGING

func _process(delta):
    if Input.is_action_just_pressed("fire") and charge < 0.01:
        laser = CHARGING
    if Input.is_action_just_released("fire"):
        laser = DISCHARGING
    if laser == CHARGING:
        charge += delta
    elif laser == DISCHARGING:
        charge -= delta
        if charge > 0.3:
            show()
            monitorable = true
        else:
            hide()
            monitorable = false
    charge = clamp(charge, 0.0, 3.0)
    get_node("/root/main/HUD/charge").value = charge
```

1.18 Title screen

Can you add a title screen to the game? Here are some hints.

Create a new scene called `title.tscn`. Put your title screen text and graphics here.

Attach this script to the root node to start the game when player presses space.

```
extends Node2D

func _process(delta):
    if Input.is_action_just_pressed("fire"):
        get_tree().change_scene("res://main.tscn")
```

When the player dies, execute this code to switch to the title screen:

```
get_tree().change_scene("res://title.tscn")
```