SE 3XA3: Module Interface Specification
Mario Level X

Group 210, Group 210
Edward Liu, liuz150
Connor Czarnuch, czarnucc
Ahmad Gharib, ghariba

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This document shows the complete specification for additional/modified modules used in Mario Level X. Many modules used rely heavily on pygame, specifically the pygame.sprite module.

Table 1: Revision History

Date	**Developer(s)**	**Change**
March 13, 2020	All members	Rev0
April 6, 2020	All members	Rev1

Pipe Module

Module

Pipe

Uses

pygame.sprite.Sprite

Syntax

Exported Constants

None

Exported Types

Pipe

Exported Access Programs

Routine name	In	Out	Exceptions
Pipe	$\mathbb{Z}, \mathbb{Z}$	Pipe	invalid_coordinates
serialize		dict	

Semantics

State Variables

$x : \mathbb{Z}$
Represents number of pixel to the right of the map.

$height : \mathbb{Z}$
Height of the pipe

Environment Variables

None

State Invariant

$x > 0$
$height > 0$

Assumptions

None

Access Routine Semantics

Pipe($p1, p2$):

- transition: $x, height := p1, p2$
- output: out :=A Pipe object with x,height set to p1, p2
- exception $exc := (x \leq 0 \vee height \leq 0) \Rightarrow invalid\_coordinates$

serialize():

- transition: $None$
- output: $out :=$ dictionary with x and height
- exception $None$

Ground Module

Module

Ground

Uses

pygame.sprite.Sprite

Syntax

Exported Constants

None

Exported Types

Ground

Exported Access Programs

Routine name	In	Out	Exceptions
Ground	$\mathbb{Z}, \mathbb{Z}$	Ground	invalid_coordinates
serialize		dict	

Semantics

State Variables

$x : \mathbb{Z}$
Pixel X-coordinate of the ground.

$width : \mathbb{Z}$
Pixel width of ground.

Environment Variables

None

State Invariant

$x > 0$
$width > 0$

Assumptions

None

Access Routine Semantics

Ground($p1, p2$):

- transition: $x, width := p1, p2$
- output: out :=A Ground object with x,width set to p1, p2
- exception $exc := (x \leq 0 \vee width \leq 0) \Rightarrow invalid\_coordinates$

serialize():

- transition: $None$
- output: out := dictionary with p1 and p2
- exception $None$

Step Module

Module

Step

Uses

pygame.sprite.Sprite

Syntax

Exported Constants

None

Exported Types

Step

Exported Access Programs

Routine name	In	Out	Exceptions
Step	$\mathbb{Z}, \mathbb{Z}$	Step	invalid_coordinates
serialize		dict	

Semantics

State Variables

$x : \mathbb{Z}$
Pixel X-coordinate of the step

$y : \mathbb{Z}$
Pixel Y-coordinate of the ground

Environment Variables

None

State Invariant

$x > 0$
$y > 0$

Assumptions

None

Access Routine Semantics

Step($p1, p2$):

- transition: $x, y := p1, p2$
- output: *out* :=A Ground object with x,y set to p1, p2
- exception $exc := (x \leq 0 \vee y \leq 0) \Rightarrow invalid\_coordinates$

serialize():

- transition: $None$
- output: *out* := dictionary with x and y
- exception $None$

Constants Module

Module

Constants

Uses

None

Syntax

Exported Constants

SCREEN_HEIGHT = 600
SCREEN_WIDTH = 800
SCREEN_SIZE = (SCREEN_WIDTH,SCREEN_HEIGHT)
BRICK_SIZE_MULTIPLIER = 2.69
BACKGROUND_MULTIPLER = 2.679
GROUND_HEIGHT = SCREEN_HEIGHT - 62
WALK_ACCEL = .15
RUN_ACCEL = 20
SMALL_TURNAROUND = .35
GRAVITY = 1.01
JUMP_GRAVITY = .31
JUMP_VEL = -10.5
FAST_JUMP_VEL = -12.5
MAX_Y_VEL = 11
MAX_RUN_SPEED = 800
MAX_WALK_SPEED = 6

Exported Types

None

Exported Access Programs

None

Semantics

State Variables

None

State Invariant

None

Enemy

Module

Enemy

Uses

pygame.sprite.Sprite

Syntax

Exported Types

Enemy

Exported Constants

None

Exported Access Programs

Routine name	In	Out	Exceptions
Enemy		Enemy	
setup_enemy	$\mathbb{Z}, \mathbb{Z}, \{LEFT, RIGHT\}$		
set_image	*pygame.image*		
set_velocity			
jumped_on			
update			

Semantics

State Variables

$x : \mathbb{Z}$
Pixel X-coordinate of spawn point

$y : \mathbb{Z}$
Pixel Y-coordinate of spawn point

$direction : \{LEFT, RIGHT\}$

Direction monster is travelling. Either left or right

$x\_vel : \mathbb{Z}$
Horizontal velocity of Monster. Positive is to the right, negative to left. $y\_vel : \mathbb{Z}$
Vertical velocity of Monster. Positive is downwards.

$image : pygame.image$
Image of the monster.

$state : \{WALKING, FALLING\}$
State of the monster.

Environment Variables

None

State Invariant

$y\_vel >= 0$

Assumptions

- The **setup_monster()** routine is called after **Enemy()** but before other routines.

Access Routine Semantics

Enemy():

- transition: $x, y, direction, x\_vel, y\_vel := 0, 0, NULL, 0, 0$
- output: $out :=$ An enemy object.
- exception: None

setup_enemy(p1,p2,p3):

- transition: $x, y, direction :=$ p1,p2,p3.
- ouput : None

- exception: None

set_image(p1):

- transition: $image := p1$
- output: None
- exception: None

set_velocity():

- transition:
  $(direction = LEFT) \Rightarrow x\_vel := -2$
  $(direction = RIGHT) \Rightarrow x\_vel := 2$
- output: None
- exception: None

jumped_on():

- transition: $y\_vel < 10 \Rightarrow y\_vel = y\_vel + 10$
- output: None
- exception: None

update():
Called externally every frame by pygame framework.

- transition:
  $state = FALLING \Rightarrow image := (monsterFallingImage)$
  $state = WALKING \Rightarrow image := monsterWalkingImage$
- output: None
- exception: None

Local Functions

None