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A L I E N

1. Introduction

In this game, you are driving a spacecraft and your main objective is to protect the earth from the aliens who want to invade the earth by surviving and eliminating them. The earth will be saved if you can defeat their boss.

2. Game Controls

Main Menu is the first page of the game. To start the game, click on the button “Start”. To end the game, click on the button “Exit”.

Figure 1: Main Menu

When the game starts, you can control your spacecraft by pressing ←, ↑, →, or ↓ on the keyboard. Your bullets are fired spontaneously.

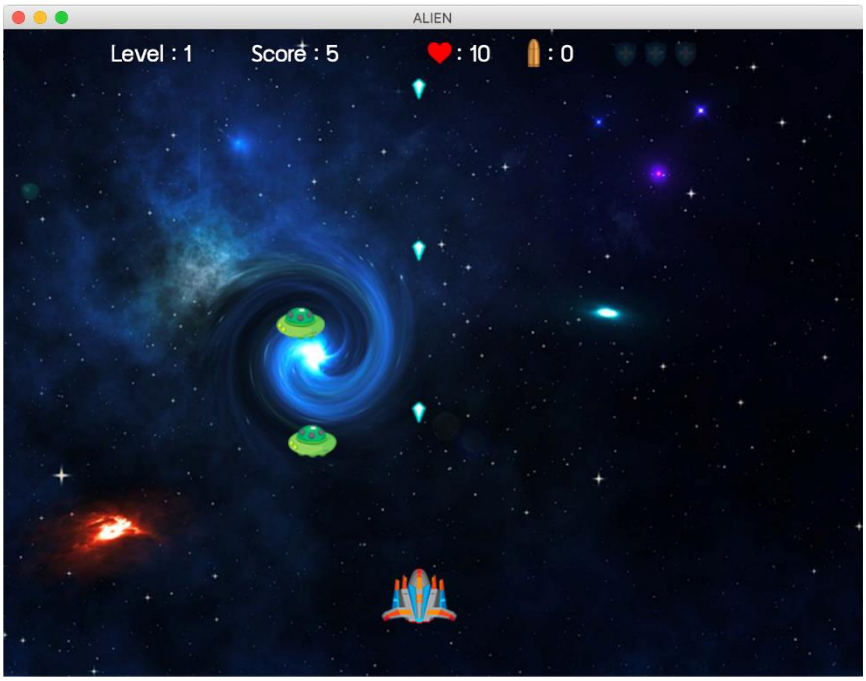


Figure 2: Game Screen

There are four types of aliens : Alien Type A, Alien Type B, Alien Type C and the boss. Eliminating Alien Type A, B, and C, the score increases 5, 10, 15 points respectively. When the boss is eliminated, you win the game. Each of the aliens has different speed of their moving.

Figure 3: Alien Type A, Alien Type B, Alien Type C, and the boss

During the game, there will be four types of special items affecting you if you collect them : shield, first aid kit box, bomb, and bullet box.

Figure 4: Shield, first aid kit box, bomb, and bullet box

Shield : When the aliens hit you, your life will not decrease for three times and it can protect you from the bomb.

First aid kit box : You will get one more life.

Bomb : The game will end and you lose.

Bullet box : You can fire eight-direction bullets for five times per one bullet box.

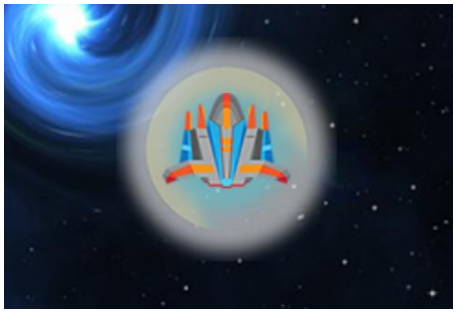


Figure 5: When you get the shield

In the top part of the game screen, your level, your score, your life, the number of eight-direction bullets, and the number of shields are displayed.

Figure 6: The top part of the game screen

There are six levels in this game, when you reach the sixth level, there will be the warning that the boss is coming, and if you can defeat the boss, there will be the message from the boss before the screen will change into the winner screen and display your score. However, if you lose, the screen will change into the game over screen and also display your score.

Figure 7: The warning from the boss

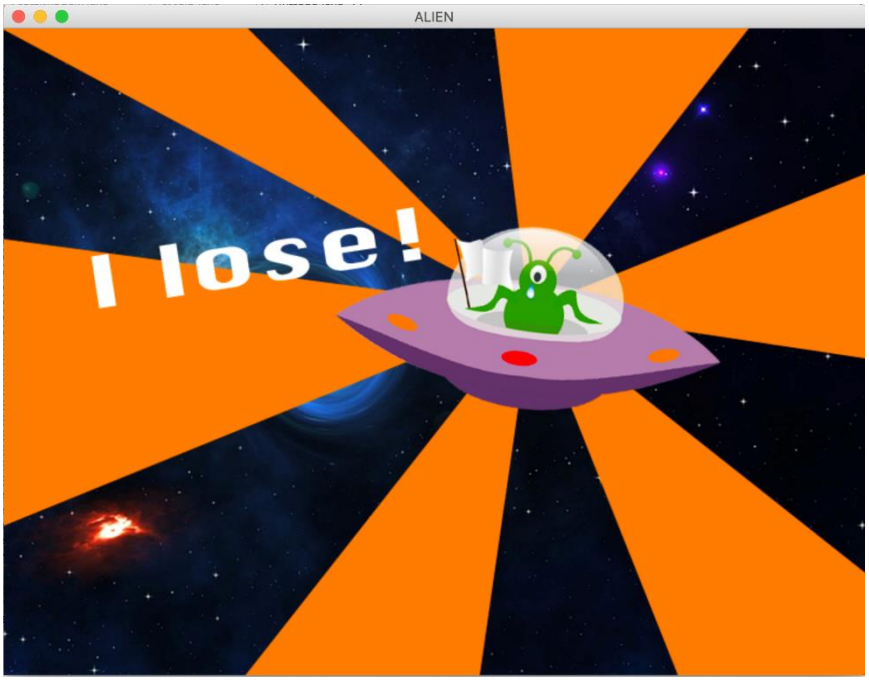


Figure 8: The message from the boss if you win

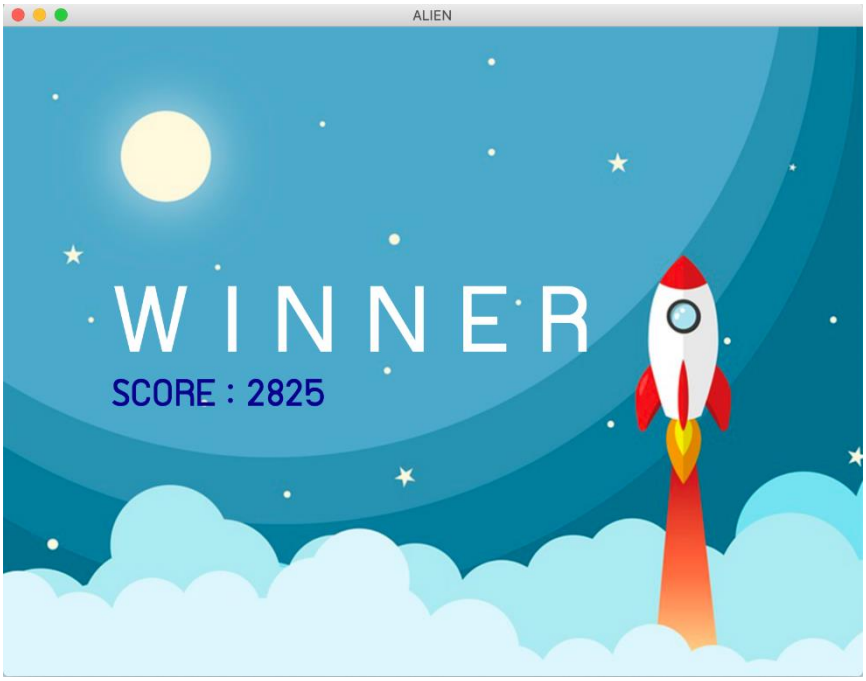


Figure 9: Winner screen

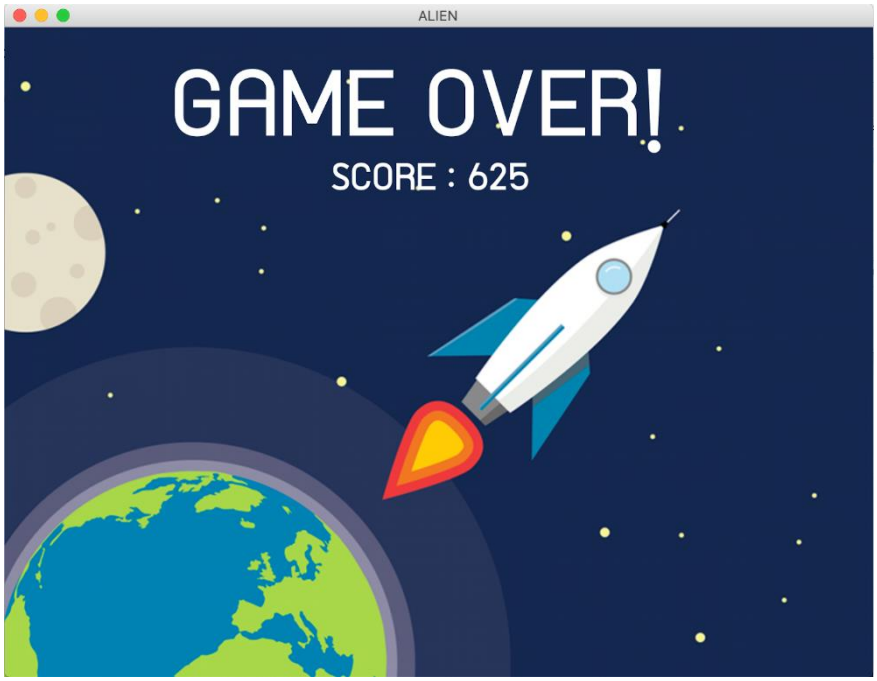
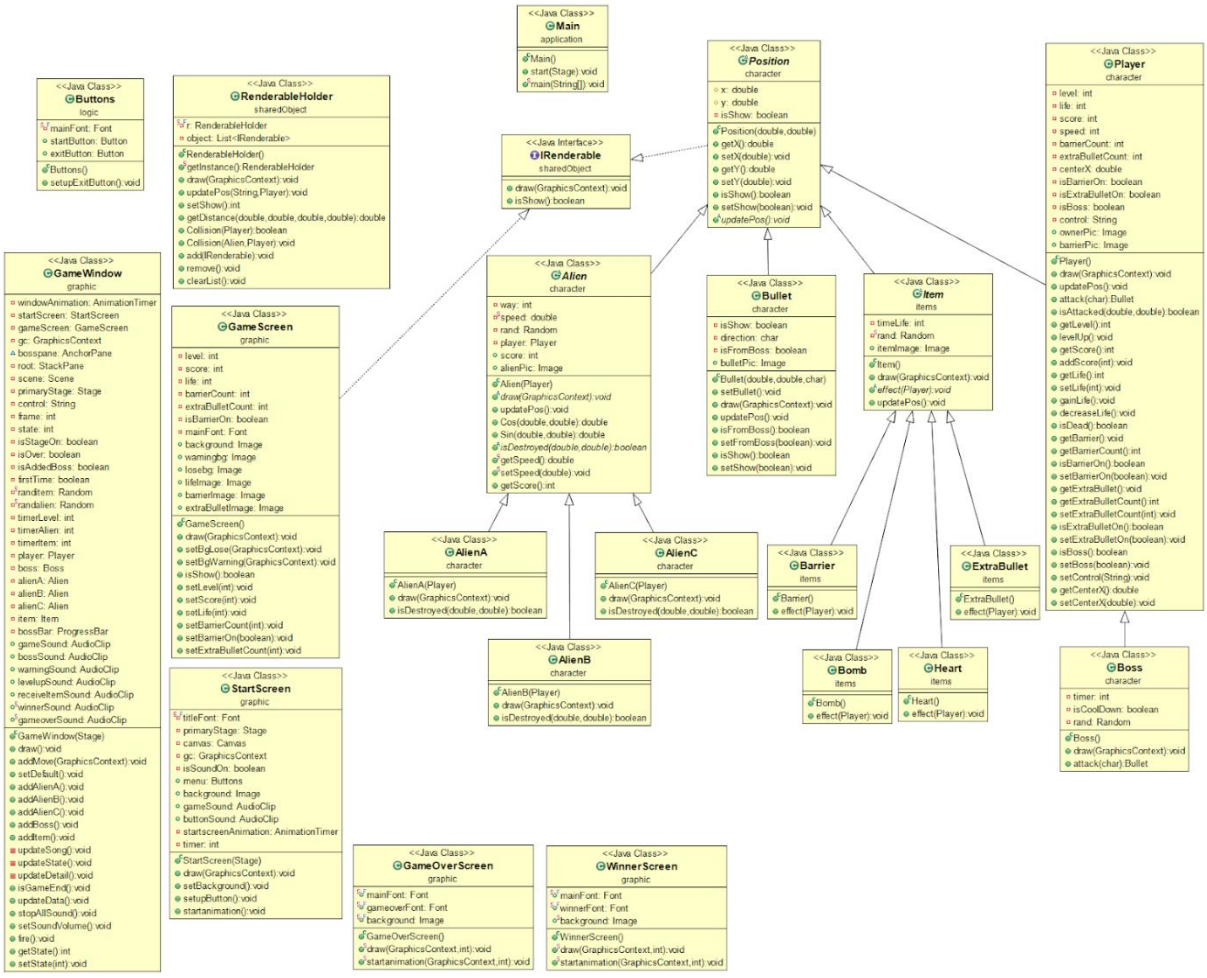


Figure 10: Game over screen

3. Key Controls

Key	Explanation
←	To move your spacecraft left.
↑	To move your spacecraft up.
→	To move your spacecraft right.
↓	To move your spacecraft down.
Spacebar	To fire eight-direction bullets.
ESC	To close the game.

4. UML Diagram



5. Class Details – Fields – Constructor – Methods

5.1 Package application

5.1.1 Class Main extends Application

5.1.1.1 Method

+ void start (Stage primaryStage)	The main entry point of the JavaFX Application
+ void main (String [] args)	The main entry point of the application

5.2 Package character

5.2.1 Class Alien (Abstract) extends Position

5.2.1.1 Field

- int way	Indicate where the alien came out.
- double speed	Speed of the alien, initialize to 1.
- Random rand	Create random instance
- Player player	Instance of Player
+ int score	Bounty of the alien
+ Image alienPic	Image of the alien

5.2.1.2 Constructor

+ Alien (Player player)	Initialize field which is position x, y and player.

5.2.1.3 Method

+ void draw (GraphicsContext gc)	/*Abstract method*/

+ void updatePos ()	Update the current position of the alien
+ boolean isDestroyed (double x, double y)	/*Abstract method*/
+ double cos (double player, double playery)	Calculate cos value of the angle of the distance between alien and player
+ double sin (double player, double playery)	Calculate sin value of the angle of the distance between alien and player
Getter for Score field.	
Getter and Setter for Speed field.	

5.2.2 Class AlienA extends Alien

5.2.2.1 Constructor

+ AlienA (Player player)	Set the alien's speed to 2, score to 5. Initialize the image of the alien.

5.2.2.2 Method

+ void draw (GraphicsContext gc)	Draw the alienPic on its current position
+ boolean isDestroyed (double x, double y)	Checked the alien show on the screen

5.2.3 Class AlienB extends Alien

5.2.3.1 Constructor

+ AlienB (Player player)	Set the alien's speed to 3, score to 10. Initialize the image of the alien.

5.2.3.2 Method

+ void draw (GraphicsContext gc)	Draw the alienPic on its current position
+ boolean isDestroyed (double x, double y)	Checked the alien show on the screen

5.2.4 Class AlienC extends Alien

5.2.4.1 Constructor

+ AlienC (Player player)	Set the alien's speed to 4, score to 20. Initialize the image of the alien.

5.2.4.2 Method

+ void draw (GraphicsContext gc)	Draw the alienPic on its current position
+ boolean isDestroyed (double x, double y)	Checked the alien show on the screen

5.2.5 Class Boss extends Player

5.2.5.1 Field

- int timer	Indicate when the boss spawn the bullet.
- boolean isCoolDown	Checked whether the boss is cool down.
- Random rand	Create random instance

5.2.5.2 Constructor

+ Boss ()	Set position (x,y) to (400,100) and the center in x-axis is 135. Set life to 80, isBoss to be true and its image.

5.2.5.3 Method

+ void draw (GraphicsContext gc)	Draw the boss on its current position and consider the timer whether the boss is cool down.

+ void attack (char c)	Create from-boss bullet and add it to RenderableHolder

5.2.6 Class Bullet extends Position

5.2.6.1 Field

- boolean isShow	True when the bullet shows on the screen
- char direction	The bullet's direction
- boolean isFromBoss	True when the owner bullet is Boss
+ Image bulletPic	Image of the bullet

5.2.6.2 Constructor

+ Bullet (double x, double y, char direction)	Initialize position x, y and its direction.

5.2.6.3 Method

+ void setBullet ()	Initialize the bullet's image.
+ void draw (GraphicsContext gc)	Draw the bulletPic on its current position
+ void updatePos ()	Update its current position
Getter and Setter methods for isShow, isFromBoss.	

5.2.7 Class Player extends Position

5.2.7.1 Field

- int level	Player's level. Initialize to 1
- int life	Player's life. Initialize to 10

- int score	Player's score. Initialize to 0
- int speed	Player's speed. Initialize to 12
- int barrierCount	Count of Player's barrier. Initialize to 0
- int extraBulletCount	Count of Player's special bullet. Initialize to 0
- double centerX	Center in x-axis of its image. Initialize to 25
- boolean isBarrierOn	True when Player has some barrier. Initialize to be false
- boolean isBoss	True when it is a Boss. Initialize to be false
- String control	String which contains the direction of Player moving.
+ Image ownerPic	Image of the Player
+ Image barrierPic	Image of the Player's barier

5.2.7.2 Constructor

+ Player ()	Initialize the position (x, y) to (400, 500)

5.2.7.3 Method

+ void draw (GraphicsContext gc)	Draw the ownerPic on its current position. if Player has the barrier, draw the barrierPic also.
+ void updatePos ()	Update its current position
+ Bullet attack (char c)	Create not-from-boss bullet and add it to RenderableHolder

+ boolean isAttacked (double x, double y)	If the Player collision with alien called decreaseLife() and return true. Else, return false.
+ void levelUp ()	Increase level by 1
+ int addScore (int score)	Add score parameter to Player's score
+ void gainLife ()	Increase life by 1
+ void decreaseLife ()	If it has a barier, reduce barrierCount. else, reduce life.
+ boolean isDead ()	True if life is less than zero.
+ void getBarrier ()	Set isBarrierOn to be true and BarrierCount to 3.
+ void getExtraBullet ()	Increase extraBulletCount by 5.
Getter methods for level, score, barrierCount and extraBulletCount.	
Setter method for control.	
Getter and Setter methods for life, isBarrierOn, isBoss, centerX.	

5.2.8 Class Position (Abstract)

5.2.8.1 Field

# double x	Position in x-axis of an entity
# double y	Position in y-axis of an entity
- boolean isShow	Tell whether this entity is drawn on screen. Initialize to be true.

5.2.8.2 Constructor

+ Position (double x, double y)	Initialize x and y

5.2.8.3 Method

+ void updatePos ()	/* Abstract method */
Getter and Setter methods for every field	

5.3 Package graphic

5.3.1 Class GameOverScreen

5.3.1.1 Field

+ Font mainFont	Font use for showing the score
+ Font gameoverFont	Font use for the title
+ Image background	Background of this class

5.3.1.2 Method

+ void draw (GraphicsContext gc, int score)	Draw the title “GAMEOVER” and text “SCORE : ” followed by the score parameter.
+ void startanimation (GraphicsContext gc, int score)	Call the method draw() to start the animation

5.3.2 Class GameScreen implements IRenderable

5.3.2.1 Field

- int level	player’s level. Initialize to 1.
- int score	player’s score. Initialize to 0.

- int life	player’s life. Initialize to 10.
- int barrierCount	player’s barrier count. Initialize to 0.
- int extraBulletCount	player’s special bullet count. Initialize to 0.
- boolean isBarrierOn	True when player’s has barrier. Initialize to be false.
- Font mainFont	Font for player’s data
+ Image background	Background of this class
+ Image warningbg	Background before adding boss into the game.
+ Image losebg	Background before calling winnerScreen
+ Image lifeImage	Image of the player’s life
+ Image barrierImage	Image of the player’s barrier
+ Image extraBulletImage	Image of the player’s special bullet

5.3.2.2 Method

+ void draw (GraphicsContext gc, int score)	Draw the background image and player’s data.
+ void setBgLose (GraphicsContext gc)	set the alien-lose background
+ void setBgWarning (GraphicsContext gc)	set the warning-boss background
+ boolean isShow ()	Always return true
Setter methods for level, score, life, barrierCount, extraBulletCount and isBarrierOn field	

5.3.3 Class GameWindow extends Canvas

5.3.3.1 Field

- AnimationTimer windowAnimation	Use for running an animation in this window
- StartScreen startScreen	For initialize startScreen in the method draw()
- GameScreen gameScreen	For initialize gameScreen in the method draw()
- GraphicsContext gc	GraphicsContext of the canvas
- AnchorPane bosspane	Create new instance AnchorPane
- StackPane root	For initialize root in the method draw()
- Scene scene	For initialize scene in the method draw()
- Stage primaryStage	For initialize primaryStage in the method draw()
- String control	String which contains the direction of player moving. Initialize to empty string.
- int frame	Count for calling player's levelup method and increase state according to timerLevel. Count for spawning aliens and items according to timerAlien and timerItem.
- int state	State of the game
- boolean isStageOn	True when the GameWindow show.
- boolean isOver	True when the player or the boss dead.
- boolean isAddedBoss	True when add boss into the game (Adding boss exactly once in this game).

- boolean firstTime	False when added boss into the game. Initialize to be true.
- Random randitem	Create random instance
- Random randalien	Create random instance
- int timerLevel	Timer for calling player's levelup method and increase state.
- int timerAlien	Timer for add alien or boss to the game.
- int timerItem	Timer for calling AddItem()
- Player player	For initialize player when method draw() is called.
- Boss boss	For initialize boss in the method addBoss()
- Alien alienA	For initialize alien in the method addAlienA()
- Alien alienB	For initialize alien in the method addAlienB()
- Alien alienC	For initialize alien in the method addAlienC()
- Item item	For initialize item in the method addItem()
- ProgressBar bossBar	For initialize bossBar in the method addBoss()
+ AudioClip gameSound	Sound for the original game.
+ AudioClip bossSound	Sound when state six and the boss is added into the game.

+ AudioClip warningSound	Sound for warning player that boss is coming. It plays when state six before adding boss into the game.
+ AudioClip levelupSound	Sound when the player is level up.
+ AudioClip receiveItemSound	Sound when the player receives any item.
+ AudioClip winnerSound	Sound when the player wins the game. It plays when WinnerScreen is called.
+ AudioClip gameoverSound	Sound when the player loses the game. It plays when GameOverScreen is called.

5.3.3.2 Constructor

+ GameWindow (Stage primaryStage)	Initialize primaryStage field. Create root, scene, gameScreen and startScreen. Create the gc which connect to this canvas (800 * 600) and add it to the root. Set the volume of all sounds.

5.3.3.3 Method

+ void draw ()	Call addMove() and setDefault(). Draw gameScreen canvas. Create Player instance and add it to RenderableHolder. Create animationTimer instance calling updateDetail(), updateState(), updateSong() and isGameEnd()
+ void addMove (GraphicsContext gc)	Set key event handlers for player's moving (using ArrowKeys), player's special shooting (using SpaceBar) and interactions with the game.

+ void setDefault ()	Set the default value of frame, state, every timer, every boolean and data in gameScreen. Clear the list in RenderableHolder and stop all sounds.
+ void addAlienA ()	Create new AlienA instance and add it to RenderableHolder.
+ void addAlienB ()	Create new AlienB instance and add it to RenderableHolder.
+ void addAlienC ()	Create new AlienC instance and add it to RenderableHolder.
+ void addBoss ()	Create new Boss instance and add it to RenderableHolder. Setup bossBar which show boss's life and add it to bossPane. Play bossSound.
+ void addItem ()	Create new Item instance by randomly choosing type of the item and add it to RenderableHolder.
- void updateSong ()	Update the current game sound.
- void updateState ()	Update player's shooting and game state.
- void updateDetail ()	Remove and draw every object in RenderableHolder.
+ void isGameEnd ()	When the game is over, calling either GameoverScreen if player loses or WinnerScreen if player wins.
+ void updataData ()	Update player's data on gameScreen.

+ void stopAllSound ()	Stop all sounds.
+ void setSoundVolume ()	Setup each sound's volume.
+ void fire ()	Call player's method attack()
Getter and Setter for state field	

5.3.4 Class StartScreen

5.3.4.1 Field

- Font titleFont	Font for the game's name "ALIEN"
- Stage primaryStage	For initialize primaryStage in the constructor
- Canvas canvas	Canvas of this screen
- GraphicsContext gc	GraphicsContext of the canvas
- boolean isSoundOn	True when the gameSound plays. Initialize to be false.
+ Buttons menu	It contains start button and exit button
+ Image background	Background of this class
+ AudioClip gameSound	Sound for original main menu.
+ AudioClip buttonSound	Sound when button is clicked.
- AnimationTimer startscreenAnimation	Use for running an animation in this window
- int timer	Count time for showing menu on the screen. Initialize to be zero.

5.3.4.2 Constructor

+ StartScreen (Stage primaryStage)	Initialize primaryStage field. Create and setup menu. Create the gc which connect to this canvas (800 * 600) and add it to the root. Set the volume of all sounds.

5.3.4.3 Method

+ void draw (GraphicsContext gc)	Create root, scene add canvas to the root. Play the game sounds. Initialize the startscreenAnimation
+ void setBackground ()	Set the background image and draw the game's name "ALIEN"
+ void setupButton ()	Setup all button in menu.
+ void startanimation ()	Call the method draw() to start the animation

5.3.5 Class WinnerScreen

5.3.5.1 Field

+ Font mainFont	Font use for showing the score
+ Font winnerFont	Font use for the title
+ Image background	Background of this class
5.3.5.2 Method	
+ void draw (GraphicsContext gc, int score)	Draw the title "WINNER" and text "SCORE : " followed by the score parameter.

+ void startanimation (GraphicsContext gc, int score)	Call the method draw() to start the animation

5.4 Package items

5.4.1 Class Item (Abstract) extends Position

5.4.1.1 Field

- int timeLife	Time that the item will show on the screen. Initialize to 200
- Random rand	Create random instance
+ Image itemImage	Image of the item

5.4.1.2 Constructor

+ Item ()	Initialize position x and y by random

5.4.1.3 Method

+ void draw (GraphicsContext gc)	Draw the bullet's image at its position
+ void effect (Player player)	/* Abstract method */
+ void updatePos ()	It will not show on the screen when it life time is runing out.

5.4.2 Class Barrier extends Item

5.4.2.1 Constuctor

+ Barrier ()	set the item image

5.4.2.2 Method

+ void effect (Player player)	Call player's method getBarrier()

5.4.3 Class Bomb extends Item

5.4.3.1 Constuctor

+ Bomb ()	set the item image

5.4.3.2 Method

+ void effect (Player player)	if player has the barrier, the barrier will be destroy. else, the player will die.

5.4.4 Class Heart extends Item

5.4.4.1 Constuctor

+ Heart ()	set the item image

5.4.4.2 Method

+ void effect (Player player)	Increase player's life by 1

5.4.5 Class ExtraBullet extends Item

5.4.5.1 Constuctor

+ ExtraBullet ()	set the item image

5.4.5.2 Method

+ void effect (Player player)	Call player's method getExtraBullet()

5.5 Package logic

5.5.1 Class Buttons extends HBox

5.5.1.1 Field

- Font mainFont	Font for text in startButton and exitButton

+ Button startButton	For initialize start button in constructor
+ Button exitButton	For initialize exit button in constructor

5.5.1.2 Constuctor

+ Buttons ()	Set size, spacing and alignment. Create startButton and exitButton instance

5.5.1.3 Method

+ void setupExitButton ()	Set the action that will happen when the exitButton is clicked.

5.6 Package sharedObject

5.6.1 Interface IRenderable

5.6.1.1 Method

+ void draw (GraphicsContext gc)	/* Abstract method */
+ boolean isShow ()	/* Abstract method */

5.6.2 Class RenderableHolder

5.6.2.1 Field

- RenderableHolder r	singleton of the RenderableHolder class
- List<IRenderable> object	List of all IRenderable instance

5.6.2.2 Constuctor

+ RenderableHolder ()	Initialize object for this class

5.6.2.3 Method

+ RenderableHolder getInstance ()	Getter method of r
+ void draw (GraphicsContext gc)	Everything in object are called its method draw(GraphicsContext gc)
+ updatePos (String control, Player player)	Everything in object are called its method updatePos()
+ int setShow ()	If the alien is attack by bullet. Set both the alien and the bullet isShow is false.
+ double getDistance (double x1, double x2, double y1, double y2)	Calculate distance between two point
+ boolean Collision (Player player)	To see the thing in the object which collide player.
+ boolean Collision (Alien alien, Player player)	To see which alien collide Player and add the alien's score to the player.
+ void add (IRenderable i)	Add i into the object field
+ void remove ()	The thing in the object which is dead or not show on the screen will be removed from the object.
+ void clearList ()	Clear all the list in object and initialize the new one