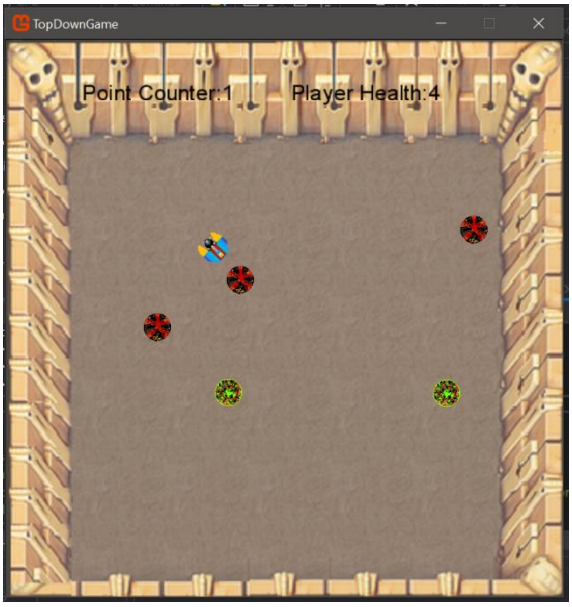
Design Overview for <<TopDownGame: Orb Shooter>>

[Note: this is the final version for the game]

Name: SM Ragib Rezwan
Student ID: 103172423

Summary of Program

Basically it's a TopDownShooter/ survival type game. Player will move around the screen, listening to music and avoiding different types of enemies (each with different behaviour) that spawn while trying to shoot them down using different types of projectiles. Each enemy killed gives 1 point to player. Also when enemy collides with player, enemy dies and player loses 1 health. Player has 5 health in total and when all health has been depleted, its game over and number of points player got is stated.



Required Roles

Roles that I am using:

1 DrawOnly
2 Entity
3 Player
4 ActiveGameLogic
5 Endscreen
6 MainMenu
7 Button
8 Program
9 Game1
10 SoundPlayer
11 Song1
12 SoundEffect1
13 IAudio
14 Enemy
15 EnemyNormal
16 EnemyHoming
17 EnemySpawner
18 Projectile
19 ProjectileManager
20 ProjectileNormal
21 ProjectileSlow
22 CollisionDetector
23 EnemyProjectileCollisionResponder
24 EnemyPlayerCollisionResponder
25 KeyboardController
26 ICommand
27 DownCommand
28 LeftCommand
29 NulCommand
30 QuitCommand
31 RightCommand
32 UpCommand
33 Global (to store all constant stuff)

[Note: There are several other places that can be made into singleton, but I didn't do so as then it might be too much]

Table 1: <<DrawOnly>> details

Responsibility	Type Details	Notes
`DrawOnly`	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is used as a parent class that other objects can use as template to make themselves. Sets position, dimension and also how to load texture from address using game.Content.load.texture2D> Also sets isExpired as false and stores game into _game

Rotation	Property, return float _rotation and sets float _rotation value	It is use to get and set the rotation of the object
IsExpired	Property, returns int _IsExpired and sets int _IsExpired	It is used to get and set the IsExpired value of the object
Pos	Property, returns Vector2_pos and sets Vector2 _pos	It is used to get and set the position of the objects created
Dim	Property, returns Vector2 _dim and sets Vector2 _dim	It is used to get and set the dimension of the object
Draw	Virtual method, Returns void	This mainly sets the conditions to draw the object properly with all the conditions set in a single line (see the comment written to understand what each part does). When other object will call base.draw(), they will be able to utilize this method to draw themselves

Table 2: <<Entity>> details

Responsibility	Type Details	Notes
Entity	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is used base to make itself. Also it is going to pass game to _game
Speed	Property, returns float _speed and sets float _speed	It is used to get and set the speed of the object
Health	Property, returns int _health and sets int _health	It is used to get and set the health of the object
SoundPlayer	Property, returns SoundPlayer from game's soundplayer and sets SoundPlayer to game's soundplayer	It is used to get and set the sounds of the object (if they need any)
Direction	Property, return vector2 _direction and sets vector2 _direction value	It is use to get and set the direction of the object
Update	Virtual method, Takes in parameter GameTime gametime, Returns void	Mainly will let the child classes override this to update themselves in their desired way

Table 3: <<Player> details

Responsibility	Type Details	Notes
Player	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is used base to make itself. Also it is going to set player speed, health, collideddamage, lastshot, direction and also projectile manager
LastShot	Property, returns double _lastshot	It is used to get and set the lastshot

	and sets double _lastshot	value
CollideDamage	Property, returns int _collideddamage and sets int _collideddamage	It is used to get and set the collided damage value (ie the damage player will do to enemy when collided with it)
ProjectileManager	<<readonly>>Property, return ProjectileManager _projectileManager	It is used to get the Projectile Manager
Point	<<readonly>>Property, return int _point and set int _point	It is used to get the Point value
HitEnemy	Method, returns void	Reduce player _health by 1, if health below zero, then play player killed sound by soundplayer and make player isExpired true.
GoRight	Method, returns void	Changes player position to right by using its speed
GoLeft	Method, returns void	Changes player position to left by using its speed
GoUp	Method, returns void	Changes player position to up by using its speed
GoDown	Method, returns void	Changes player position to down by using its speed
Update	override method, Takes in parameter GameTime gametime, Returns void	If player is not expired, it will tell _projjectilemanager to update itself using gametime, and also will use base to update itself as well
Draw	override method, Returns void	If player is not expired, it will tell _projjectilemanager to draw itself, and also will use base to draw itself as well
GetInstance	Static method, Takes in Parameter Game1 game, returns Player	It will create an instance of the player class using singleton design pattern

Table 4: <<ActiveGameLogic> details

Responsibility	Type Details	Notes
ActiveGame1Logic	Constructor, Takes in parameters `Game1 game`	It is going to get a player instance, create enemyspawner, store game into _game, create keyboardinput, create collisiondetector, create gamescreen (ie background pic)
Update	method Takes in GameTime gameTime, Returns void	As long as player Isexpired is false, It is used to do all of these: • tell enemyspawner to update itself • Loads PlayerFaceMouse method by passing the parameter _player • Logic to determine when to let player shoot and what (ie mouse click, shootdelay and type of projectile shot), • Tell collision detector to detect whether enemy collided with player or projectile or not • Update player

		• Update keyboard input • Store player's point into current player point and player health into current player health Else Set _gameScreen.IsExpired to true
Player	<<readonly>>Property, returns Player	It is used to get player
PlayerFaceMouse	Method Takes in parameter Player _player	It is used to make player face the mouse and rotate towards it by using mouse's X and Y position as a vector, subtracting it from player position to find difference, then using mathAtan to get the angle of rotation by using X and Y position of the difference (casted as float) and using cos and sin parts of rotation to set direction player will face (again casting as float)
Draw	virtual method, Returns void	Tells player to draw itself, tells enemyspawner to draw itself And when gameScreen is not Expired: draw gamescreen, and text for player health and player point counter

Table 5: <<EndScreen> details

Responsibility	Type Details	Notes
EndScreen	Constructor, Takes in parameter Game1 game, Player player	It takes game and passes to _game, takes player and sets it to _player, loads gameScreen (background picture for Endscreen), loads quit button
Update	method	Constantly checks if quit button pressed or not If quit button has been selected, then exit the game
Draw	method	Draws gameScreen, text saying points player has now, and the quit button

Table 6: <<MainMenu> details

Responsibility	Type Details	Notes
MainMenu	Constructor, Takes parameters Game1 game	It takes game and passes to _game, plays song Mainmenu song, loads gameScreen (background picture for MainMenu), loads start and quit button, sets game trigger as false

Update	Method Takes parameter GameTime gametime	Constantly checks if start or quit has been pressed or not If newGameLogic is not null,update newGameLogic, make start,quit, gameMenuScreen and game trigger as true. Now if player is not null, but is expired and endscreen is null, then plays music for endscreen and loads endscreen If endscreen is not null, update it If game trigger is false, but start is true, then load activegame and play active game song If game trigger is false, but quit game is true, exit from game
Draw	method,	Draw start and quit If gameMenuScreen is not expired, draw it If newGameLogic is not expired , then draw it If endScreen is not expired, draw it

Table 7: <<button> details

Responsibility	Type Details	Notes
Button	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is used base to make itself. Also it is going to set _buttonSelect as false
ButtonSelect	<<readonly>>Property, returns bool _buttonSelect	It is used to get buttonSelect for the button
Draw	Override method	It button is not expired, draw it using base
ButtonClick	method	Stores mouse's x and y position as cursor position Then it checks whether cursor is in button's box or not when left button was selected, if so makes _buttonSelect as true

Table 8: <<Program> details

Responsibility	Type Details	Notes
Main	Constructor,	Gets a game1 instance and tells game to run

Table 9: <<Game1> details

Responsibility	Type Details	Notes
Game1	Constructor,	It is used to make a new instance of graphics manager, set height and width of game, set the root directory for image and audio to content folder, make mouse visibility true
Initialize	Override method, Return void	It is used to initialize game1 using parent class game (prebuilt in library)
LoadContent	Override method, Return void	Loads in new instance of spritebatch, soundplayer, spritefont and also makes new instance of mainMenu
Update	Override method, Takes in parameter Game1Time gameTime Returns void	It makes mainMenu update itself using gametime parameter and also it updates itself using the same parameter with help of parent class game
Draw	Override method, Takes in parameter Game1Time gameTime Returns void	Clears device screen and loads Black colour, Draws all sprites stored in global spritebatch, tells mainMenu to draw itself, ends spritebatch drawing, draws itself using gametime parameter
SpriteBatch	<<readonly>> property, returns _spriteBatch	Used to get the spritebatch
SoundPlayer	<<readonly>> property, returns _soundplayer	Used to get the soundplayer
SpriteFont	<<readonly>> property, returns _spriteFont	Used to get the spriteFont
GetInstance	Static method, returns Game1	It will create an instance of the game1 class using singleton design pattern

Table 10: <<SoundPlayer> details

Responsibility	Type Details	Notes
SoundPlayer	Constructor, Takes in parameter Game1 game	Creates dictionaries for song1 and soundeffect1, creates all needed song1 and soundeffect1 using helper class and stores them in dictionaries for central management and easy use.
PlaySong	Method, Takes parameter string smth Returns void	It is used to search though songlibrary dictionary to play a certain song using helper class
PlaySoundEffect	Method, Takes parameter	It is used to search though soundEffectlibrary dictionary to play a certain soundEffect using helper class

	string smth Returns void	
StopMusic	Static method, Returns void	Stops whatever background song is being played

Table 11: <<Song1>> details

Responsibility	Type Details	Notes
Song1	Constructor, Takes in parameter string address, Game1 game	Creates a song instance by using game.Content.Load <song> and passing in where song is being stored
Play	Method, Returns void	It is used to lower volume of mediaplayer, using it to play a song, make it repeat over when finished

Table 22: <<SoundEffect1>> details

Responsibility	Type Details	Notes
SoundEffect1	Constructor, Takes in parameter string address, Game1 game	Creates a soundEffect instance by using game.Content.Load <soundeffect> and passing in where soundeffect is being stored
Play	Method, Returns void	It is used to play the sound effect

Table 13: <<IAudio> interface details

Responsibility	Type Details	Notes
Play	Interface method that returns void	Mainly used it to ensure song1 and soundeffect always have Play method that returns void. (This can be used to put them both in a single dictionary instead of putting in two different dictionary, but I am not doing that as I prefer to keep song and soundeffects separate)

Table 14: <<Enemy> details

Responsibility	Type Details	Notes
Enemy	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is used base to make itself.
WasHit	Method, takes in parameter int returns void	Decreases health with an int value that is passed to the method. If health is less or equal to 0, turn _isExpired into true and tell soundplayer to play enemykilled sound

Update	override method, Takes in parameter Game1Time gametime, Returns void	Will update itself using its base if _isExpired is set to false.
Draw	override method, Returns void	Will draw itself using its base if _isExpired is set to false.

Table 15: <<EnemyNormal> details

Responsibility	Type Details	Notes
EnemyNormal	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It will follow template in base to make itself. Also it is going to set its own speed and health values and set _oldMoveTime as 0
CalculateNewMove	Method Returns void	It is used to create a random x and y value between -5 to 5, to give enemy randomness in movement
EnemyHitScreen	Method, Returns Bool	Condition used to see whether it hits wall or not from any side (modified it so that it will match with walls given in picture instead of screen)
Update	override method, Takes in parameter GameTime gametime, Returns void	Will update itself using its parent class. Then it will check if certain time has been passed since it last made correction to its movement (using a move timelimit set in global). If so, it will CalculateNewMove (changing its x and y parts of vector added to its position) and store the currentgametime into oldmovetime to recalculate later on. Gives enemy's general movement Then it adds vector of x and y part multiplied with its speed to position to change its position. Also, if it hits screen (enemyHitScreen) then alter x and y velocity to make it hit wall and return back

Table 16: <<EnemyHoming> details

Responsibility	Type Details	Notes
EnemyHoming	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It will follow template in parent class to make itself. Also it is going to set its own speed and health values And also make an instance of activelogic by passing in game
Update	override method,	Will update itself using its parent class.

	Takes in parameter GameTime gametime, Returns void	Then it update its position by using position of player in activelogic and its own speed (beneficial for player as now if enemy is far, it will run to player but if its close it will slowly creep towards the player making it easier to player to shoot it)

Table 17: <<EnemySpawner> details

Responsibility	Type Details	Notes
EnemySpawner	Constructor, Takes in parameters `Game1 game`	It makes a new enemy list, sets oldspawntime to 0 create a list for removeEnemy, pass game to its own _game field
EnemyList	<<readonly>> Property, returns List<Enemy>_enemyList	It is used to get Enemylist
SpawnEnemyNormal	Method Takes in parameters int x, int y, Player _player Returns void	If x and y passed is not same as player position then make normal enemy and add it to enemylist
SpawnEnemyHoming	Method Takes in parameters int x, int y, Player _player Returns void	If x and y passed is not same as player position then make Homing enemy and add it to enemylist
Update	override method, Takes in parameter GameTime gametime, Returns void	Uses similar technique to that done for movement in enemynormal. Here it just adds random aspect when choosing what type of enemy to spawn. Also if isexpired is true for any enemy, then move it to removeEnemyList, add 1 point to player's point counter and them remove it from _enemyList
Draw	Method, Returns Bool	Tells all enemies present in draw to draw themselves

Table 18: <<Projectile> details

Responsibility	Type Details	Notes
Projectile	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is uses base to make itself.
HitEnemy	Method Return void	It is used to make _isExpired into true
Damage	Property, returns int _damage and	It is used to get and set the damage value of

	sets int _damage	projectile
Update	override method, Takes in parameter Game1Time gametime, Returns void	Checks if projectile's position is outside the walls given in picture, if so makes projectile isExpired into true. If projectile is not expired, it will update itself using its parent class and also set its position using speed and direction
Draw	override method, Returns void	Will draw itself using its parent class if _isExpired is set to false.

Table 19: <<ProjectileManager> details

Responsibility	Type Details	Notes
ProjectileManager	Constructor, Takes in parameters `Game1 game`	It is used to make 2 lists:_projectileList, _remoprojectile. And also stores game into _game
ProjectileList	<<readonly>> Property, returns List<Projectile> _projectileList	It is used to get projectilelist
NormalBullet	Method, Takes in parameter Player player Returns void	It is used make a projectilenormal using helper class, set its directions using player direction and add it to list of projectile
SlowBullet	Method, Takes in parameter Player player Returns void	It is used make a projectileSlow using helper class, set its directions using player direction and add it to list of projectile
Update	method, Takes in parameter Game1Time gametime, Returns void	Will tell each projectile its list to update itself, but if a projectile has isExpired set to true, it will add it to removeProjectileList. Also it will remove all projectiles present in removeProjectileList
Draw	method, Returns void	Will tell all projectiles in projectilelist to draw themselves

Table 4: <<ProjectileNormal> details

Responsibility	Type Details	Notes
ProjectileNormal	Constructor, Takes in parameters `Vector2 position, Vector2 dimension, string address, Game1 game`	It is used to make projectileNormal. Also its sets damage and speed of it using values preset for it in global

Table 21: <<ProjectileSlow> details

Responsibility	Type Details	Notes
ProjectileSlow	Constructor, Takes in parameters	It is used to make projectileSlow. Also its sets damage and speed of it using values

	`Vector2 position, Vector2 dimension, string address, Game1 game`	preset for it in global

Table 22: <<CollisionDetector> details

Responsibility	Type Details	Notes
CollisionDetector	Constructor,	It is used to create two responders: _enemyPLayerCollideResponder, _enemyProjectileCollideResponder
Detect	Method, Takes in parameters Player player, `List<Enemy> enemyList, List<Projectile> projectileList`	It is used to detect whether minimum collision distance (set in global) has been reached between either enemy and player or enemy and projectile and if so calls their respective responder

Table23: <EnemyProjectileCollisionResponder> details

Responsibility	Type Details	Notes
`EnemyProjectileCollisionResponder`	Constructor,	Does nothing Only kept it for good practise and ensure it doesn't go wrong in any way
`EnemyProjectileCollide`	Method, Takes in parameters Projectile p, Enemy e	It is used to make projectile call hitenemy method and enemy to call washit method while passing in projectile's damage as parameter to the washit method

Table 5: <EnemyPlayerCollisionResponder> details

Responsibility	Type Details	Notes
`EnemyPlayerCollisionResponder`	Constructor,	Does nothing Only kept it for good practise and ensure it doesn't go wrong in any way
`EnemyPlayerCollide`	Method, Takes in parameters Player p, Enemy e	It is used to make player call hitEnemy method and enemy to call washit method whole passing in projectile's damage as parameter to the washit method. (currently set player collide damage very high to kill all enemy with 1 collide at the expense of 1 health)

Table25: <<KeyboardController> details

Responsibility	Type Details	Notes
KeyboardController	Constructor, Takes in parameter Player player	It is used to set _player as player, make a new dictionary called _commandLibrary and add keys and commands to the dictionary (after making the commands) It follows the strategy pattern and I am using it here to bind the keys to the commands
Update	method, Returns void	Will set _currentCommand as nullCommand, then it will get keyboardstate and store it as keyboard state. Then it will use the key to look though its command library and find the command and set it as _current command and execute it

Table 6: <<ICommands> <<interface>> details

Responsibility	Type Details	Notes
Execute	Method Returns void	It will be used to ensure all the classes that use it will have an Execute method that takes no parameter and returns void. (here is used it as part of strategy pattern and added all of the commands into a single dictionary)

Table 7: <<DownCommand> details

Responsibility	Type Details	Notes
DownCommand	Constructor Takes parameter Player player	It is used to set _player as player
Execute	Method Returns void	If player is not touching bottom of screen then tell player to GoDown (calibrated it with respect to image in activelogic)

Table 8: <<LeftCommand> details

Responsibility	Type Details	Notes
LeftCommand	Constructor Takes parameter Player player	It is used to set _player as player
Execute	Method Returns void	If player is not touching left of screen then tell player to GoLeft (calibrated it with respect to image in activelogic)

Table 9: <<NullCommand> details

Responsibility	Type Details	Notes
NullCommand	Constructor	Does nothing. Only used it as placeholder for current command in keyboardController
Execute	Method	Does nothing. Only used it as placeholder for current command in keyboardController

Table 10: <<QuitCommand> details

Responsibility	Type Details	Notes
QuitCommand	Constructor	Does nothing. Only kept it for good practise and to ensure it doesn't go wrong in any way
Execute	Method Returns void	Exits code

Table 11: <<RightCommand> details

Responsibility	Type Details	Notes
RightCommand	Constructor Takes parameter Player player	It is used to set _player as player
Execute	Method Returns void	If player is not touching right of screen then tell player to GoRight (calibrated it with respect to image in activelogic)

Table 12: <<UpCommand> details

Responsibility	Type Details	Notes
UpCommand	Constructor Takes parameter Player player	It is used to set _player as player
Execute	Method Returns void	If player is not touching top of screen then tell player to GoUp (calibrated it with respect to image in activelogic)

For Global, it is used to basically keep track of all the constants I have used in my code:

(although both player and enemy height and width are current kept same, I am using different variables to store the current constants as I may edits the values later on to make the enemy bigger or smaller than the player)

[Note: it currently does not have the new constants that have been added due to background picture added in activegame logic!!!]

```
public const int screenHeight = 800;
public const int screenWidth = 800;

public const int projectileHeight = 20;
public const int projectileWidth = 20;
public const int projectileRotationVelocity = 3;
public const int projectileLinearVelocity = 4;
public const double shootDelay = 0.15;

public const int projectileSlowDamage = 2;
public const int projectileSlowSpeed = 5;

public const int projectileNormalDamage = 1;
public const int projectileNormalSpeed = 10;

public const int enemyHeight = 50;
public const int enemyWidth = 50;
public const double moveTimeLimit = 2;
public const double spawnTimeLimit = 1;
public const float enemyNormalSpeed = 1;
public const int enemyNormalHealth = 1;
public const float enemyHomingSpeed = 0.005f;
public const int enemyHomingHealth = 5;

public const int playerHeight = 50;
public const int playerWidth = 50;
public const int playerSpeed = 2;
public const int playerHealth = 5;
public const int playerCollideDamage = 10;

public const int objectTouchDistance = 50;
```

I didn’t use any enums in my code. Instead I used lists and dictionaries which I have already mentioned in their specific classes.