Dark Zone

Siu Man Ho

Overall

Dark Zone is a 2d top-down zombie shooter game. It is set in the near future, where a mutated virus had spread over the world and turned most humanity into zombies. Player have to complete a set of objectives and survive till the end.

gameplay video: https://youtu.be/DmhYlhZxvpQ

Gameplay

Control

Below is the control for the game:

Keys	Actions
W	Move up
A	Move left
S	Move down
D	Move right
Left mouse button	Shoot
Mouse wheel / Q	Cycle weapon
1	Weapon 1
2	Weapon 2
Esc	Pause / resume

Control: cheat mode

There is also a hidden cheat mode:

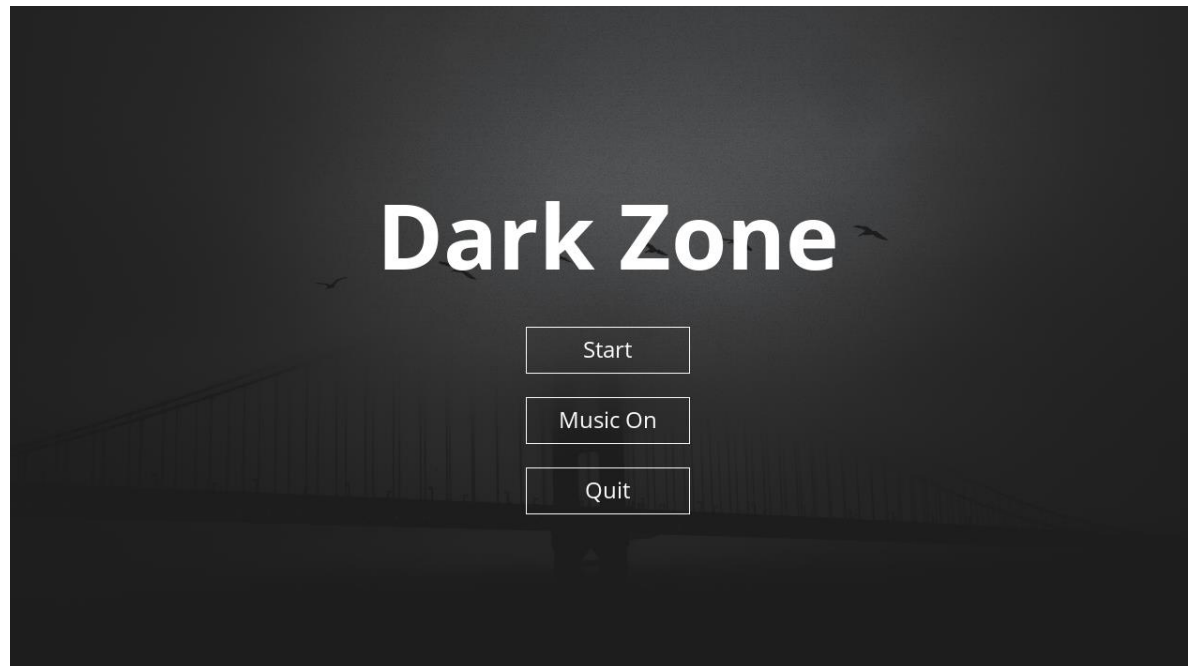| Keys	Actions
`	Toggle cheat mode
Space	Restore player health
Shift	Double the movement speed
Insert	Force spawn zombies
Delete	Kill all zombies
Home	Toggle god mode
End	Instant death

Cheat mode will be shown if its on

God mode activated

Start menu

When the game starts, a start menu will show. User can choose to start the game, or toggle the music, or quit the game.


Game start screen

Game UI

Objectives

Timer

Objective: waiting for objective

Time Left: tutorial section

Crosshair

Ammo

Clip size

Dialogue

Health

100

Radio: First, try move around the area using W, A, S, D.

12 12

Current weapon

Gameplay: map

Player will walk around in an open field with trees and toxic mists all over the place. The map's dimension is 12800 x 12800 for now (player size is around 100, and the game window size is 1280 x 720). The camera will follow the player and put it at the center of the screen until it reached the border of the map.
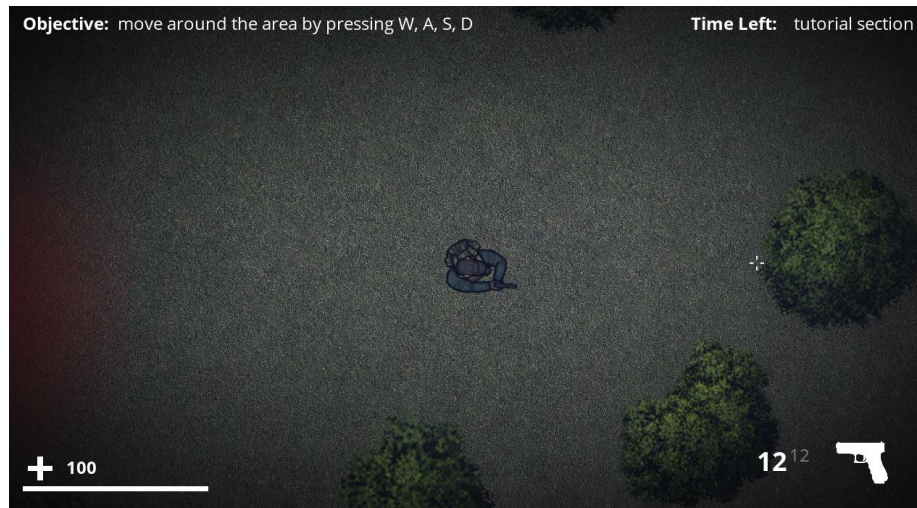

Player reached the border

Gameplay: tutorial

To let new players familiarize with the basic controls, a short tutorial will be play at start of the game.

- Move around the area using W, A, S, D

- Shoot the gun using left mouse button (and switch weapon by pressing Q / mouse wheel)

- Reload the gun by pressing R

Also, during the first 3 objective (tutorial), no zombie will spawn, and timer wouldn't start in order to let the player get familiar with the control first.
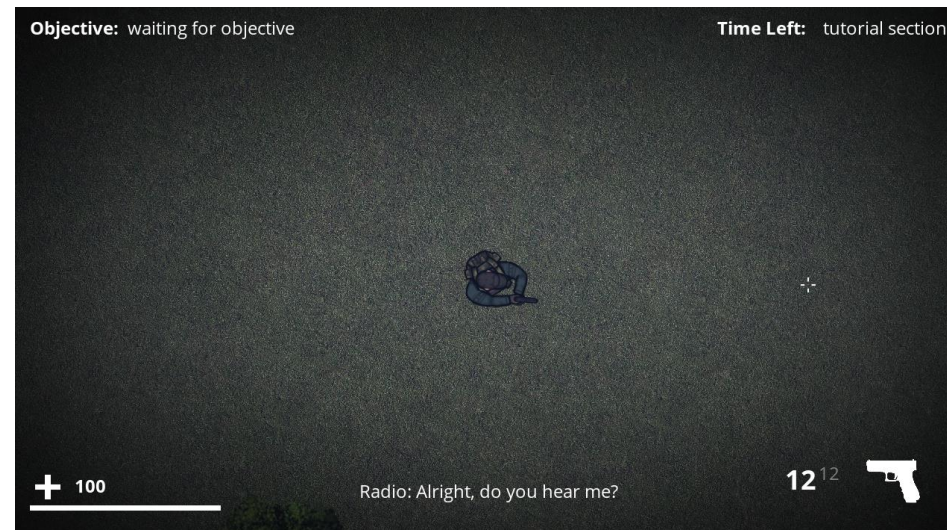
Tutorial section

Gameplay: objective

There are objectives that player needs to be complete in order to win. Fail to complete the objectives within a given time limit (5 minutes) will result in a game over. Currently, there are 3 main objectives in game:

- Kill 10 zombies

- Reach 3 missing signals (which is randomly placed around the map with a blue zone)

- Survive (when the rest objectives have been complete)

Objectives are shown at the top left corner of the screen. While the radio is talking about the next objective, the text will show "waiting for objective", and when the radio end, the objective will update.

**Objective:** waiting for objective

Objective: find the missing signel, 2/3 left
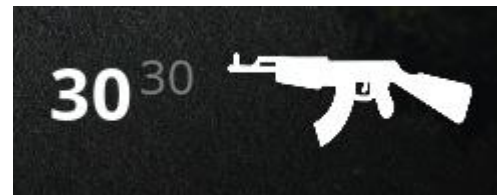
Gameplay: weapons

There are 2 type of weapons players can use: pistol and assault rifle, the stats are as below:

	Damage	Rate of fire (in second)	Clip size	Reload time (in second)
Pistol	5	0.75	12	1
Assault rifle	3.5	0.2	30	2

The pistol have a higher damage per bullet and a faster reload time in exchange of a longer rate of fire and a smaller clip size compare to assault rifle.
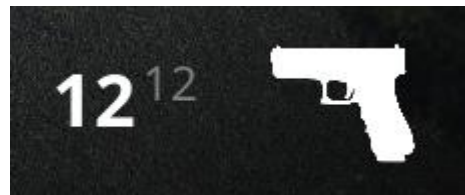
Pistol icon

Assault rifle icon

Gameplay: weapons

When the gun is empty or when its reloading, the crosshair will also grey out, the player can't shoot. Also, if the player switched gun while its reloading, the gun would stop the reload.

Game entities: player

The player will control a male survivor. The player have a default health of **100** and a speed of **300**. The player will have 5 states also, which is **idle**, **walk**, **fire**, **reload** and **dead**. The player will aim at the cursor position all time.

Game entities: zombie

For now, there are 3 type of zombies, which is **normal zombie**, **fast zombie** and **tank zombie**. The stats for each type of zombies are as below:

	Health	Speed	Damage	Attack range	Attack speed (in second)	Spawning chance
Normal	20	Player speed * 1.1 (330)	2.5	25	0.35	50%
Fast	15	Player speed * 1.5 (450)	1.5	20	0.15	30%
Tank	50	Player speed * 0.75 (225)	10	20	0.75	20%

Normal zombie

Fast zombie

Tank zombie

Game entities: zombie

The zombie will have 3 states also, which is **walk**, **attack** and **dead**.

- **Walk state:** zombies will chase the player

- **Attack state:** when player is inside the player's range, zombie will attack according to its attack speed.

- **Dead state:** when the zombie is dead, it will turn into a blood pool. There is a maximum number of 50 blood pools allowed in game. The oldest one get deleted if it exists the limit

Zombies are randomly spawn outside the camera view, and there are a maximum number of zombies that can be spawn in the level, which will increase based on difficulty (will talk later).

Blood pool

Game entities: zombie

To make the game more intense, the zombie have collision detection to player, meaning player might get trapped by a swarm of zombies and can't move until he find a gap to escape.

Player are trapped and can't move forward

Gameplay: difficulty

The difficulty of the game will increase overtime based on the number of zombie the player have killed. Each difficulty will increase the maximum zombies in level by 3. At start, the difficulty starts at 1, and each 10 zombie kills will increase the difficulty by 1.

Game object: bushes

There will be bushes with random size spawned randomly around the map when the game start. If player walks into it, then their speed is reduced to 75% (zombie don't have such effect though). Also, bullets can't shoot past the bushes, making it harder to hit the zombies which is behind / inside the bushes.

Variations of the bushes

Objective: reload your gun by pressing R   **Time Left:** tutorial section

+ 100

7 12

Bushes in game

Game object: toxic mist

The toxic red mist will randomly spawn around the map with random size when the game start, and if the player walks into it, health will be reduced every second. The more inside the player is into the mist, the more damage he will get. Therefore, player must walk carefully and avoid walking into the mist.
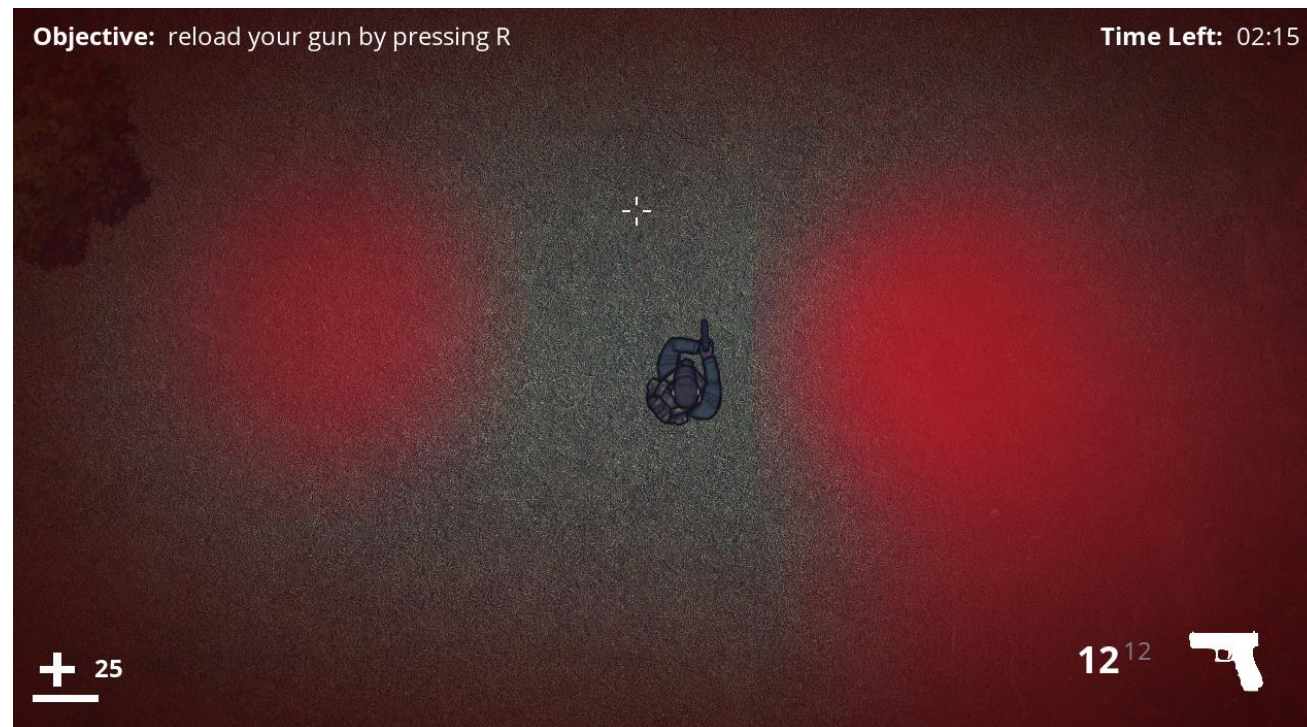
Collectable object: first aid kit

The first aid kit will randomly spawn around the map when the game start also, if the player walks into it with a non-full health, he can pickup the first aid kit and get 25 health. There are only 10 first aid kit around the map though, so player must use them carefully.

Objective: move around the area by pressing W, A, S, D

Time Left: tutorial section

+ 100

12 ^{12}

Collectable object: signals

At the fifth objectives, player have to find 3 missing signals which is randomly placed around the map. The signals are indicated with a large blue zone, where the more center it get, the bluer and less transparent it is. Player have to walk into the center most part of the signal in order to collect it
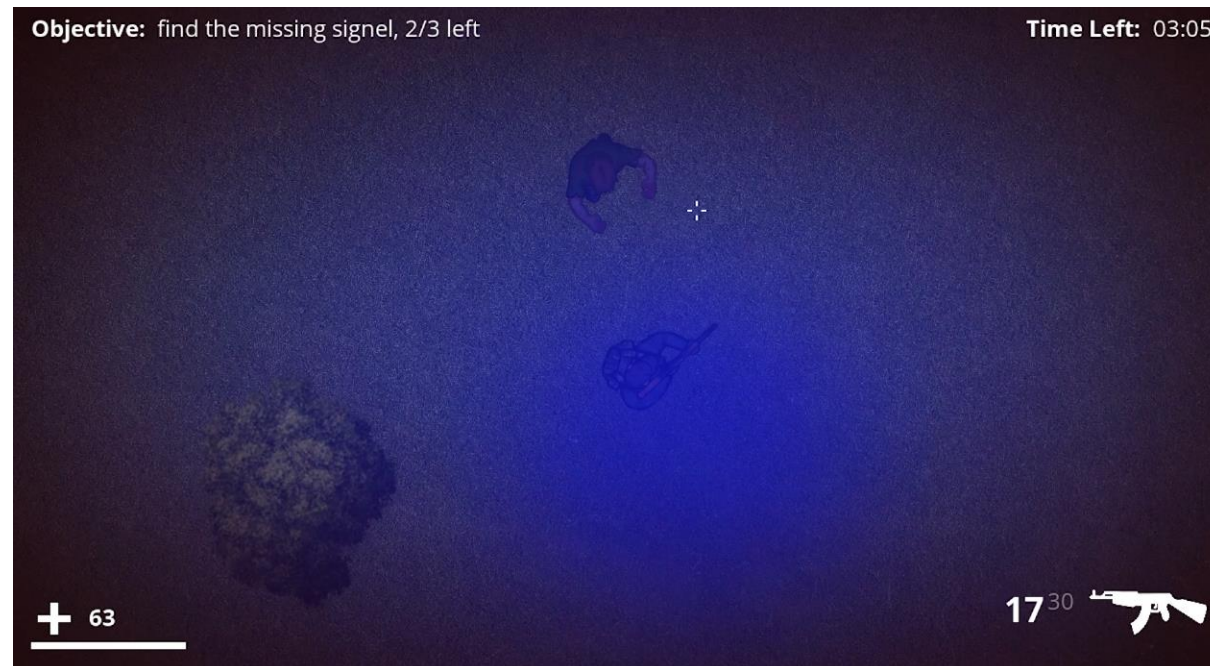
Game system: health

Player's health is shown at the bottom left corner of the screen. It's indicated with a digital number and a health bar. The bar will shorten if player's health gets low.

Game system: dialogue

During the game, a radio will be show on screen and tell the player their next objectives. Each dialog with have few second on screen time and interval to let player read.

Dialogue showing on the bottom part of the screen

Alright, do you hear me?
Seems you have arrived the target zone.
Before we get started, lets have a quick rehearsal again.
First, try move around the area using W, A, S, D.
Don't walk into the toxic red mist though.

Good, now shoot your gun with left mouse button.
You can switch weapon using Q or mouse wheel also.
And remember you can't shoot through the bushes.

Great, now reload your gun by pressing R.

Alright enough for now... Wait whats that?
Seems the zombies are heading to your position now!
Watch out and don't let them get close to you!

Well we don't have much time left now.
Your mission is to recover the missing signals.
But their position is unknown, you have to find it yourself.
They should be marked with a blue zone also.

Great! Seems you have recovered all missing signals.
We are coming to rescue you.
Hold on and don't die!

Dialogue script

Game system: timer

The timer is shown at the top right corner of the screen. During the tutorial section, the timer will be shown as "tutorial section" to let player know the timer would start. But once the player finished the tutorial, the timer will start to countdown until it reaches 0.
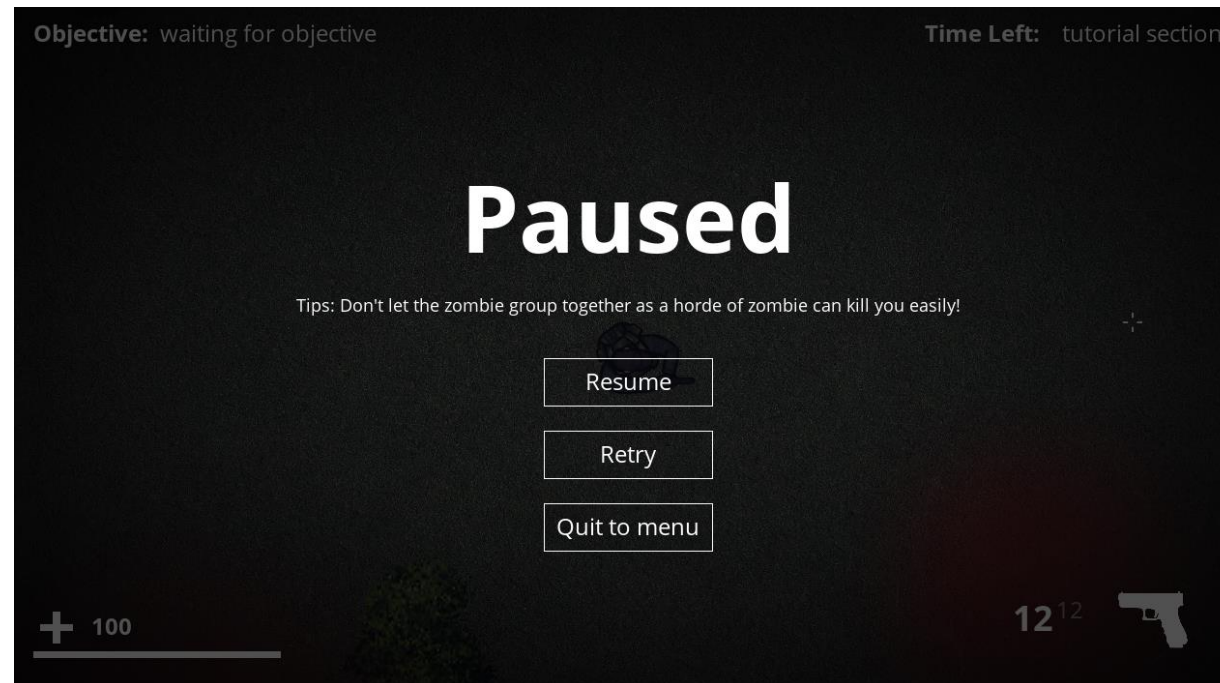
Time Left: tutorial section

During tutorial

**Time Left:** 04:20

Count down timer

Pause screen

If the player have pressed esc, or if the game window have lost focus, then the semi-transparent pause screen is shown. There will be random tips showing the middle of the screen each time the pause screen is opened. Player can resume the game, retry the game, or quit to menu
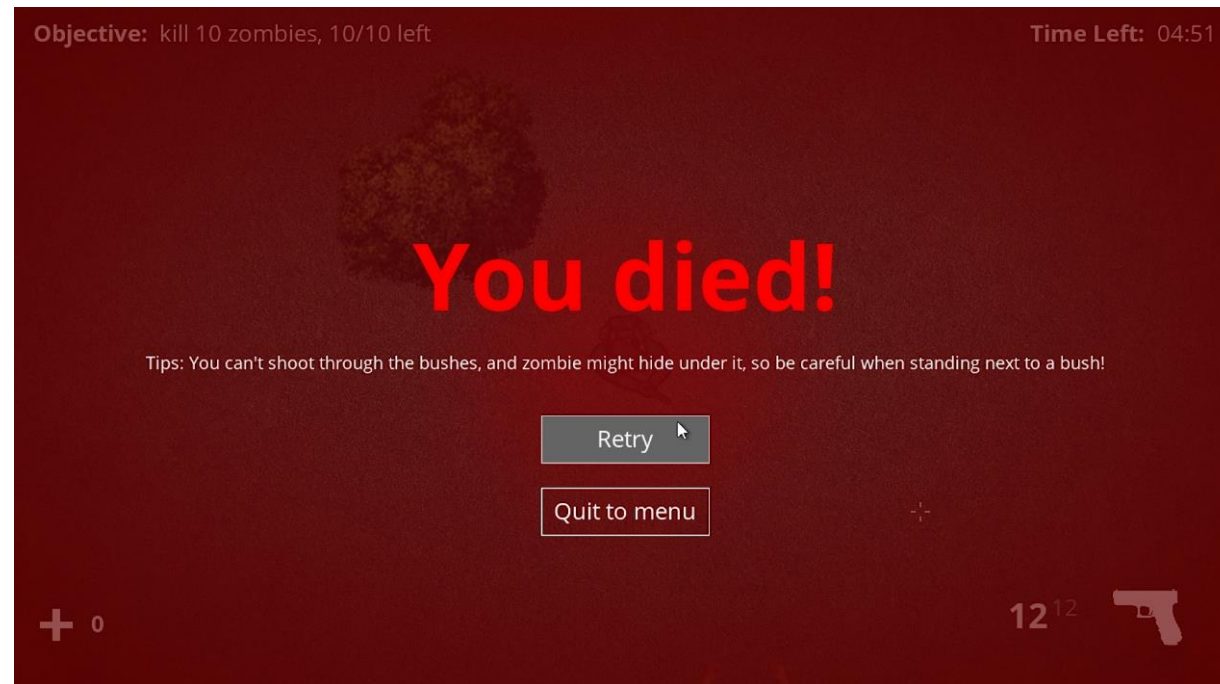
End game screen: win

When the player have completed the last objective and have survived till the end, then the win screen is shown.
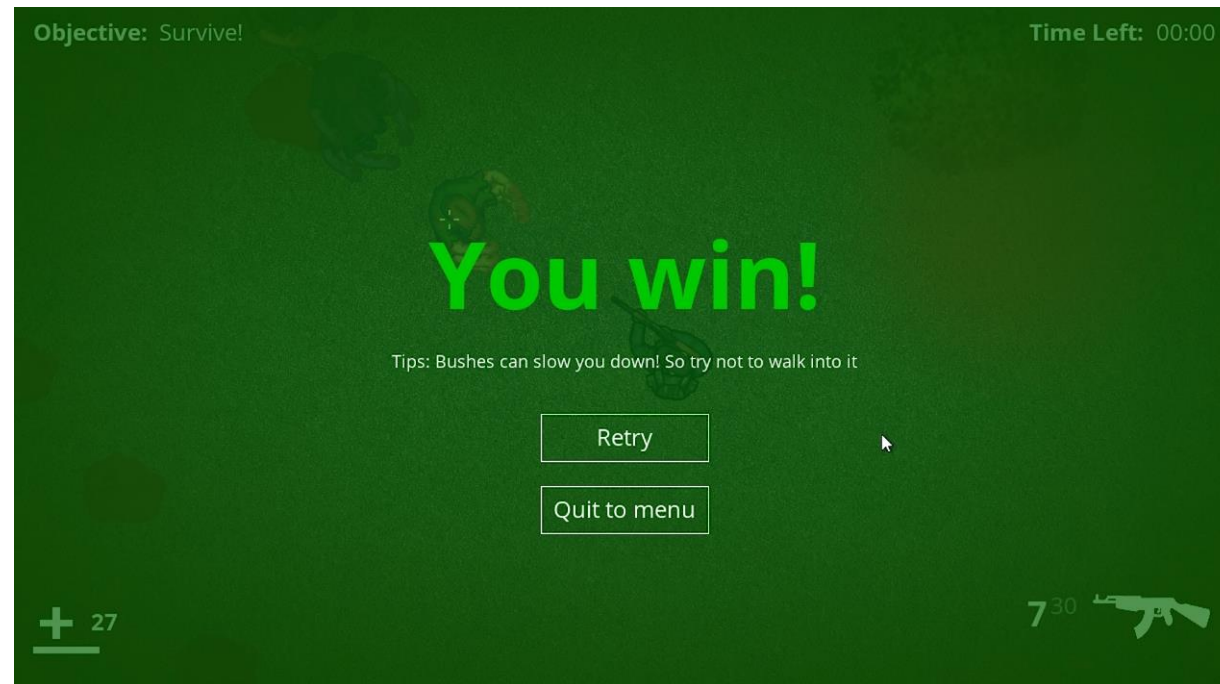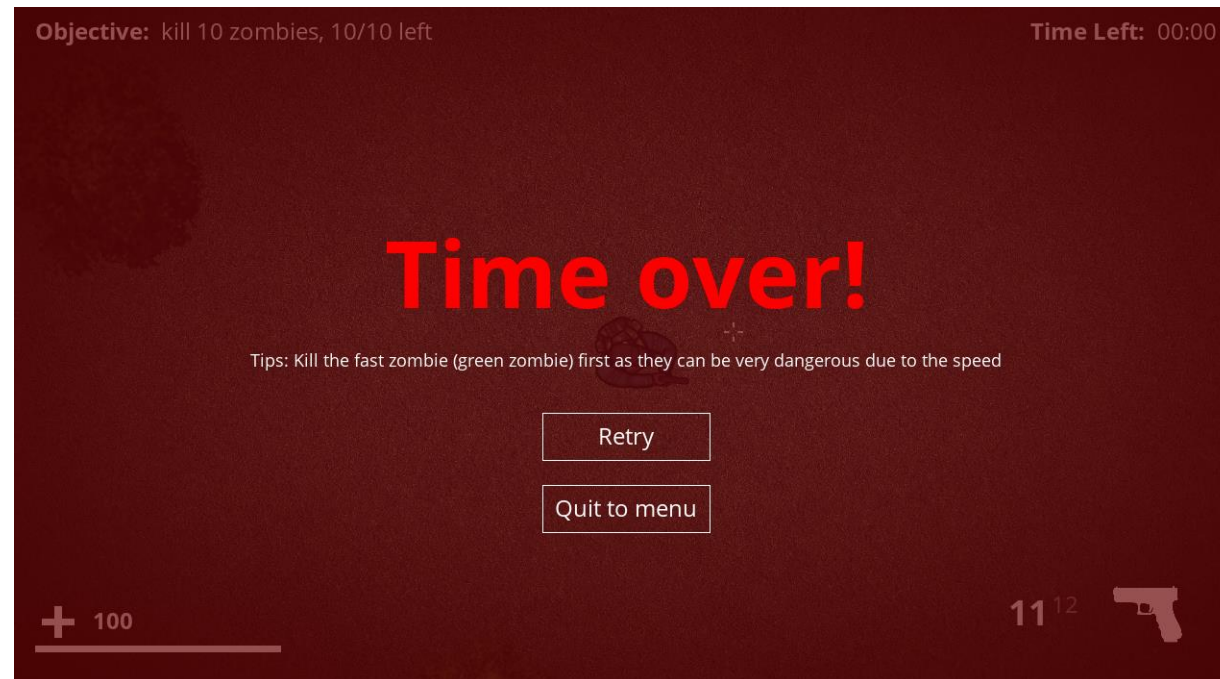
End game screen: dealth

If the player's health dropped to 0, then the death screen will shown.

End game screen: time over

If the timer have reached 0 and player haven't completed all objectives, then the time over screen is shown.

Confirm screen

When player have pressed "retry", "quit to menu" or 'X', then a confirm screen will shown, asking if player really want to perform that action. If player pressed yes, then it will continue the action, and if player pressed no, then the screen will go back to previous screen.
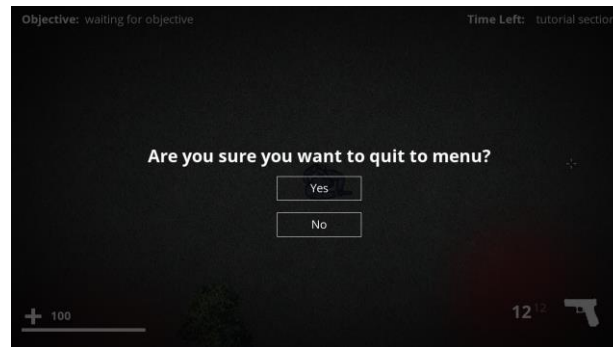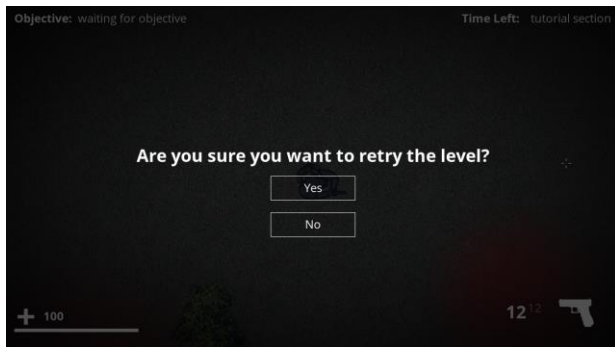
Buttons

There are buttons shown in above screens. The button have 3 states: default, hover and pressed:

Default state: the button will show as a transparent rectangle with border

Hover state: When the mouse enter the button, it will enter this state, which the button will be in a light grey filled rectangle

Pressed state: if the player is pressing the button, then it will enter this state, which the button will turn to a dark grey rectangle

And when the player have pressed and released the mouse inside the button, then it will start the action of that button.
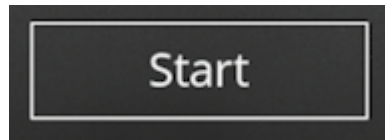
Default state
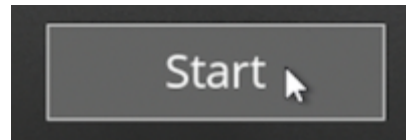
Hover state
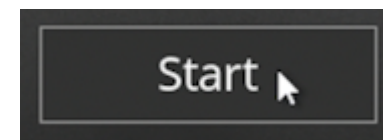
Pressed state

Audio

There are 31 piece of audios used in the game, here is the list of them:

- Background music

- Background ambient

- Player walk

- Collect object

- Gunshot (3 variations)

- Gun reload

- Gun empty

- Swap weapon

- Hitting bush

- Hitting zombies (4 variations)

- Zombie attack (7 variations)

- Player hurt (6 variations)

- Radio beep

Implementation

Rendering

All objects on screen are rendered using textures. Lightings and post processing effects like simple color correction, vignette, lens dirt, blood overlay are also added using alpha blending.

Different effects showing on screen

Rendering orders:

Background
↓
Health pickups
↓
Bullet
↓
Player
↓
Zombies
↓
Bullet lighting
↓
Trees
↓
Toxic mists
↓
Color filter
↓
Vignette effect
↓
Lens dirt effect
↓
Blood overlay
↓
UI
↓
Crosshair
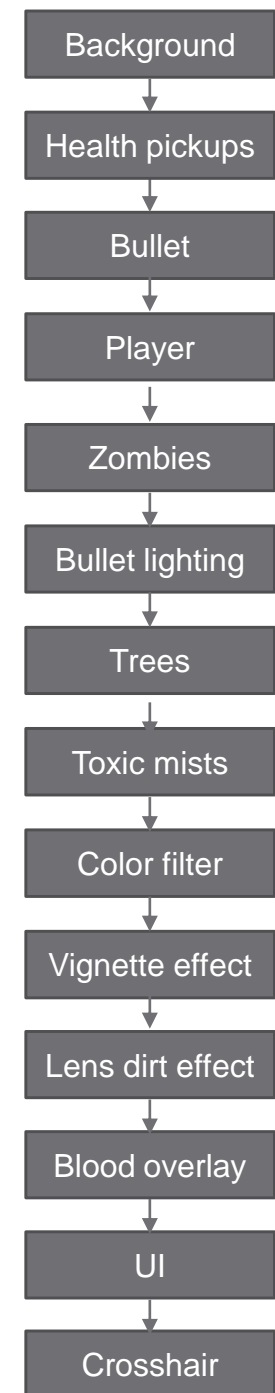
Camera

A SDL_Rect with the size of the screen is used as the camera of the game. The camera is centered based on the player position, and every object in the game world's render position is calculated using gameObject.position – camera.position

Game menus

Class diagram

GameObject

int: size
double: rotation
float: px, py
int: rx, ry
int: type

Weapon

int: ammo
float: damage
float: rateOfFire
int: clipSize
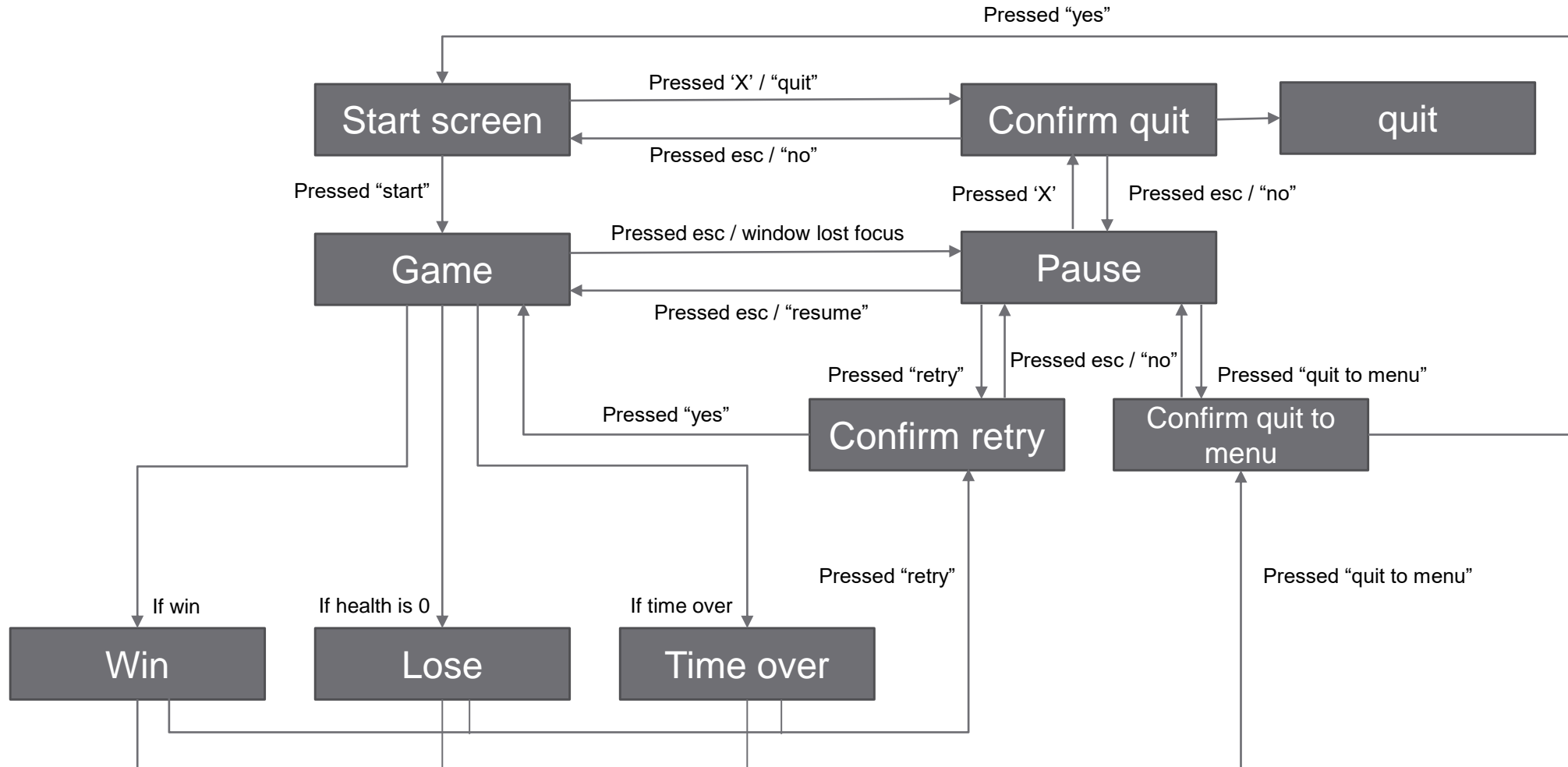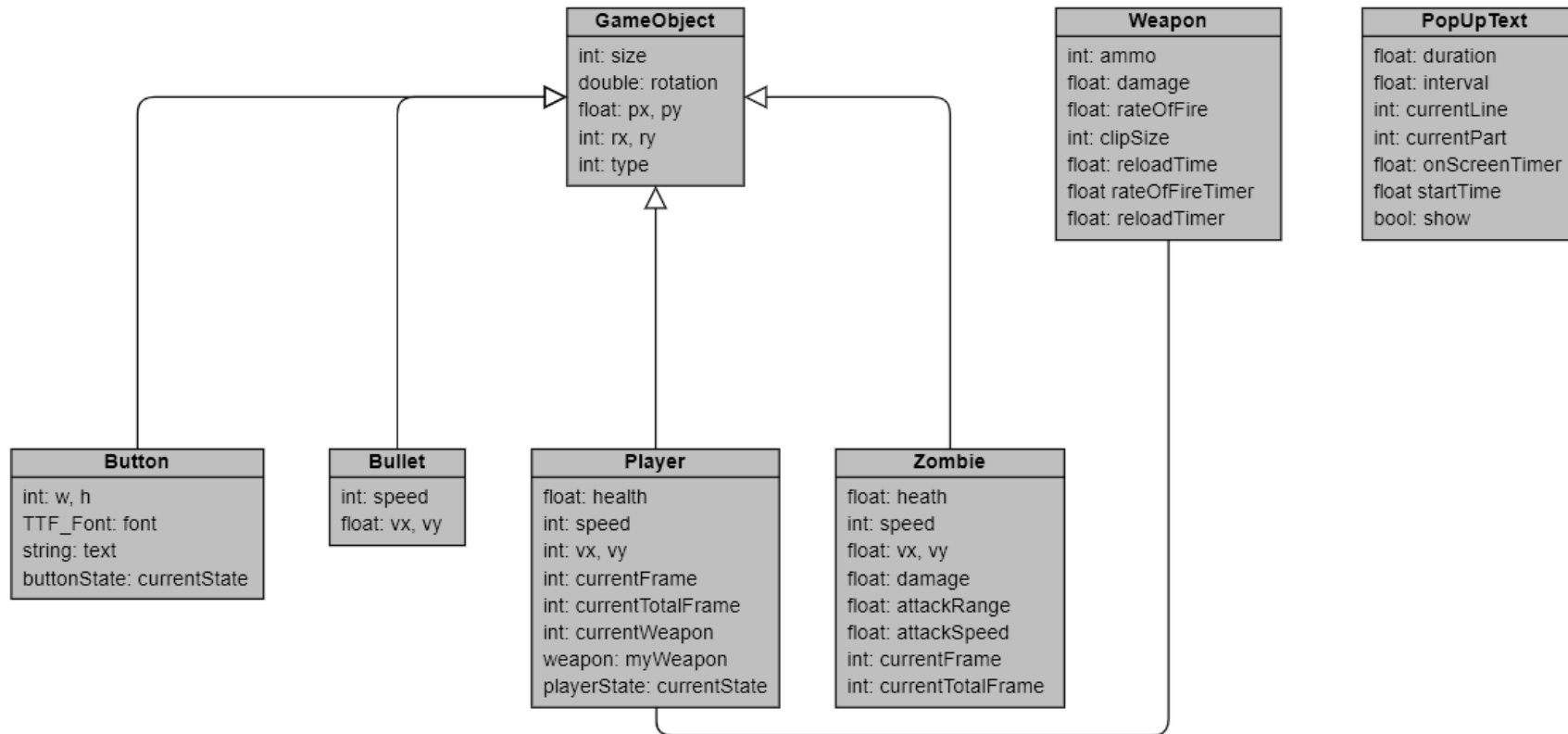float: reloadTime
float rateOfFireTimer
float: reloadTimer

PopUpText

float: duration
float: interval
int: currentLine
int: currentPart
float: onScreenTimer
float startTime
bool: show

Button

int: w, h
TTF_Font: font
string: text
buttonState: currentState

Bullet

int: speed
float: vx, vy

Player

float: health
int: speed
int: vx, vy
int: currentFrame
int: currentTotalFrame
int: currentWeapon
weapon: myWeapon
playerState: currentState

Zombie

float: heath
int: speed
float: vx, vy
float: damage
float: attackRange
float: attackSpeed
int: currentFrame
int: currentTotalFrame

Game objects

For multiple game objects like bushes, zombies, harm zones, bullets, blood pools, health pickups, etc, they are all stored inside vectors with either a gameObject class or their specific class like zombie and bullet. For trees / harm zones / health pickups, they are initialized with a random position (and size and rotation). While for zombies or bullets, they will be created on call. Players and bullets will check collision with other objects, and if it detected collision, then it will stop checking and perform the required action.

Collision

Sphere collision are used for game objects, as most game objects are round in shape. And usually, its player and bullet checking collision with other objects. While box collision is used for button. So when the mouse have entered the button area, then the button state will change.

States

Some game objects or systems uses state, and the action and the animation will change based on the states. The state are defined using enum class. Here is the states used:

Player: idle, walk, fire, reload, dead

Zombie: walk, attack, dead

Button: default, hovered, pressed

Confirm screen: false, retry, quit, quit to menu

End game screen: false, win, lose, time over

Animation

Animation is done using sprite sheets and clipping. The player and zombies will have a different animation based on the state (and weapon for player). The clips for each sprite sheet is initialized at start. And when in game, player and each zombie will store their current frame and the current total frame for the current animation. And a global timer would increase the current frame if it reached the animation interval.

Dialogue and tips

The dialogue and tips are stored in 2 txt files. When the game start, it will load the txt and store each line into a dialogue / tips vector. For the dialogue, there is a "//end part//" in the text, which indicates the end of a dialogue part. As each part represents an objective, when the current objective is completed, the next dialogue part will play (the current line and current part is stored also). While for the tips, a line is randomly picked each time when needed.

Alright, do you hear me?
Seems you have arrived the target zone.
Before we get started, lets have a quick rehearsal again.
First, try move around the area using W, A, S, D.
Don't walk into the toxic red mist though.
//end part//
Good, now shoot your gun with left mouse button.
You can switch weapon using Q or mouse wheel also.
And remember you can't shoot through the bushes.
//end part//
Great, now reload your gun by pressing R.
//end part//
Alright enough for now... Wait whats that?
Seems the zombies are heading to your position now!
Watch out and don't let them get close to you!
//end part//
Well we don't have much time left now.
Your mission is to recover the missing signals.
But their position is unknown, you have to find it yourself.
They should be marked with a blue zone also.
//end part//
Great! Seems you have recovered all missing signals.
We are coming to rescue you.
Hold on and don't die!
//end part//

dialouges.txt

You can swap your weapon either by using the mouse wheel, or press Q / 1 / 2
Don't stand still! Keep moving around so it's harder for the zombie to get to you
Kill the fast zombie (green zombie) first as they can be very dangerous due to the speed
Don't let the zombie group together as a horde of zombie can kill you easily!
Tank zombies (purple zombie) are hard to kill, but you can usually outrun them as they are slow
You don't have to wait until your gun is empty, reload you weapon whatever is possible!
Avoid the toxic red mists at all cost! The insider you are in the mist, the more damage you will get
You can't shoot through the bushes, and zombie might hide under it, so be careful when standing next to a bush!
If the crosshair turns grey, it means you can't shoot right now
The zombie numbers will increase overtime as you progress, so be prepared!
If your window had lost focus, the game will automatically pause for you :)
There won't be any zombies during the tutorial, so you can familiarize the controls freely
Bushes can slow you down! So try not to walk into it
There are few health pickups in the level which can recover your health. They are so rare though so use it wisely!

tips.txt

Audio

Audios are handled with an audio class, which set the audio piece and functions to play/ pause the audio when called. If the audio have variations, it will be stored in a vector, and a random piece will be picked each time when called.

Sources

https://opengameart.org/content/animated-top-down-survivor-player

https://opengameart.org/content/animated-top-down-zombie

https://www.fesliyanstudios.com/royalty-free-sound-effects-download/zombie-174

https://www.pngwing.com/en/free-png-bmvrr

https://pixabay.com/illustrations/kit-first-aid-drugs-medicine-4866370/

https://www.deviantart.com/7he1ndigo/art/Blood-Vignette-704205045

https://fonts.google.com/specimen/Open+Sans

http://www.textures.com/ for textures

https://freesound.org/ for every other audios beside zombie attack sound effect

https://unsplash.com/ for photo images

https://thenounproject.com/ for weapon icons

And photoshop for custom textures