PvZ - CodeStrike

OOP Project

Advisor : Prof. Trần Thanh Tùng

TEAM MEMBERS

Nguyễn Thế Khoa

ITCSIU24042

Trần Khánh Bình

ITCSIU24015

Nguyễn Hưng

ITCSIU24030

Nguyễn Hữu Ninh

ITCSIU24066

Hoàng Triệu Nam

ITCSIU24059

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Introduction

In our simplified version of Plants vs Zombie game, the architecture adheres to Object-Oriented Programming (OOP) principles to maintain modularity, scalability, and ease of maintenance. Key OOP concepts applied include:

- **Encapsulation:** Game elements such as `Plant`, `Zombie`, and `Lawnmower` are structured with private attributes and controlled access via public methods.
- **Inheritance:** The `Zombie` class serves as a base type, with specialized subclasses such as `BrickheadZombie` inheriting core functionality while introducing unique mechanics.
- **Polymorphism:** Entities like `Zombie` and `Lawnmower` share a common interface, enabling dynamic behavior changes based on context without requiring explicit type-checking.

Additional gameplay enhancements:

- **Lawnmower mechanic** added, functioning as a last line of defense that automatically clears approaching enemies upon activation.
- **Level selection system** integrated, allowing players to choose specific stages rather than following a linear progression.

Gameplay

01. Characters

- Plants: Sunflower, Peashooter, Potato Mine, Walnut, and Cactus.
- Zombies: Basic Zombie, Conehead Zombie, Buckethead Zombie, and Brickhead Zombie.

02. Gameplay

- Collecting and using the sun to plant the Plants to defend your home.

03. Levels

- There are 4 levels to play through.
- After beating each level, you will achieve a new Plant.
- For the 4th level, this can be played by pressing “4” on the keyboard.

04. Running platform

- Using Greenfoot platform to execute the game.

GREENFOOT

GREENFOOT APPLICATION

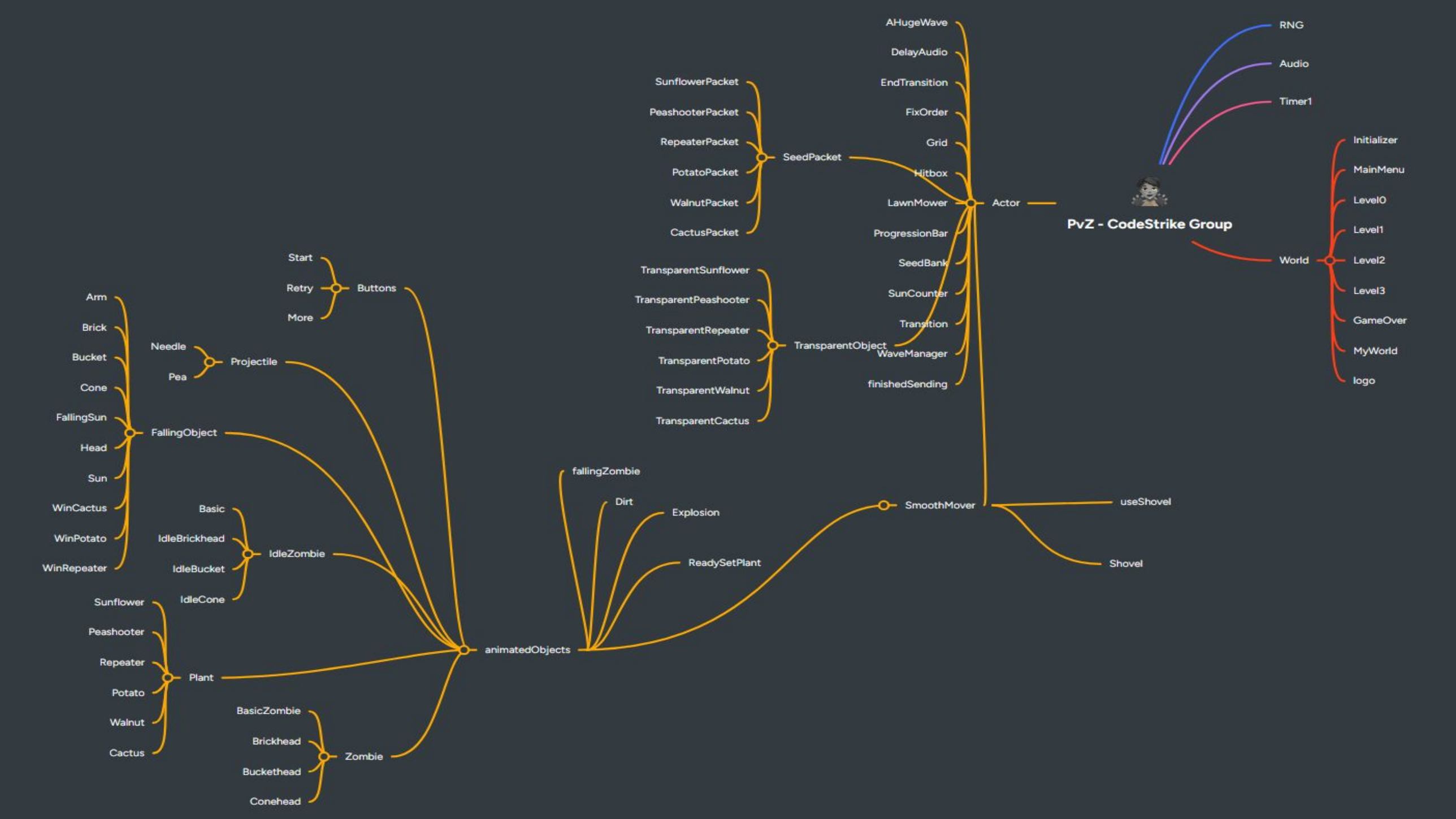
https://www.greenfoot.org/overview

Greenfoot is an educational tool for learning Java
→ interactive
→ user-friendly
Highly recommended for budding coders !

DEMO

https://www.youtube.com/watch?v=vKbh2-2IUVM

UML/Class Diagram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Level0
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WinRepeater
IdleZombie
Basic
IdleBrickhead
IdleBucket
IdleCone
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Potato
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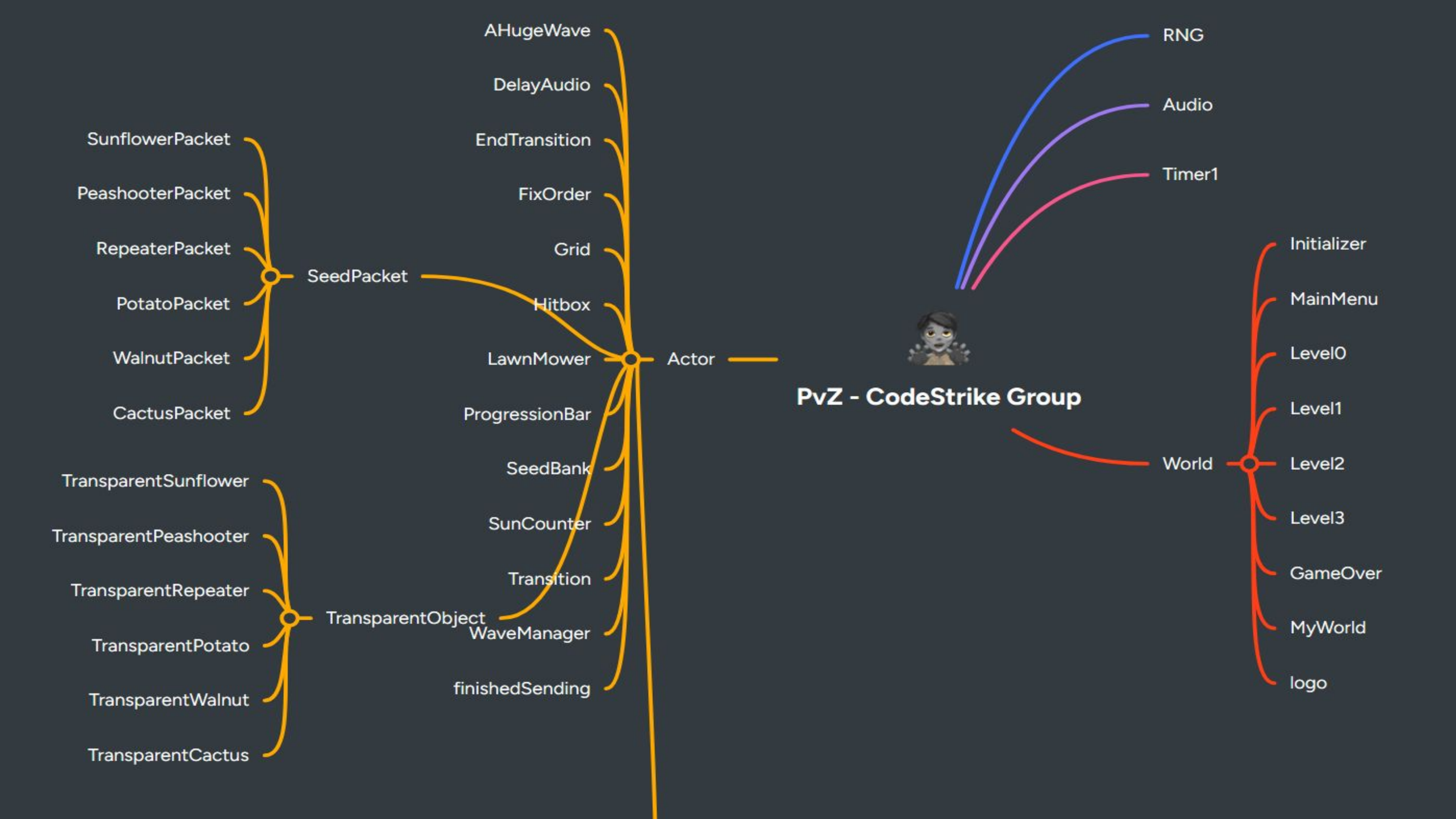
Zombie
BasicZombie
Brickhead
Buckethead
Conehead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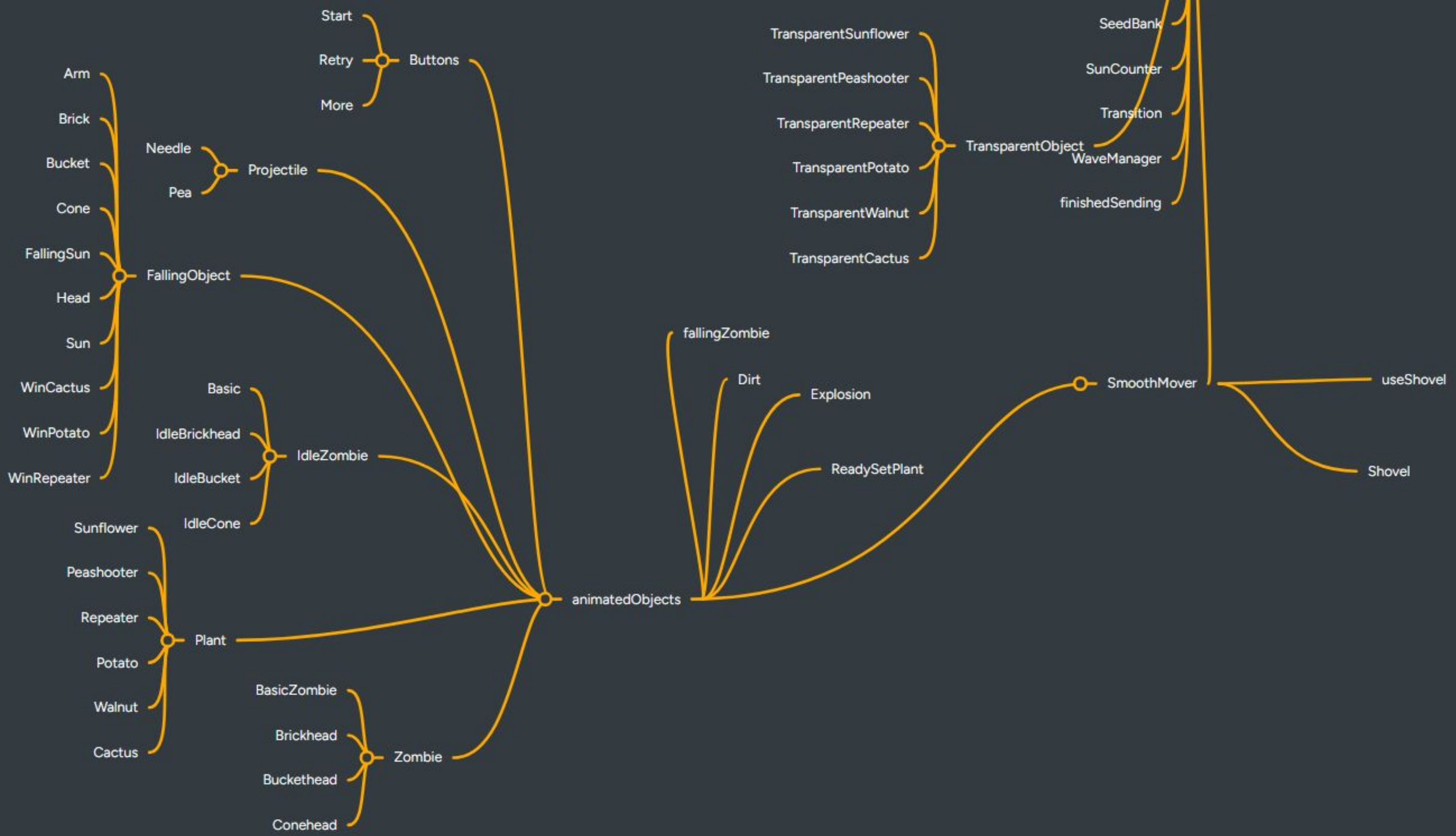
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Supported by Oracle

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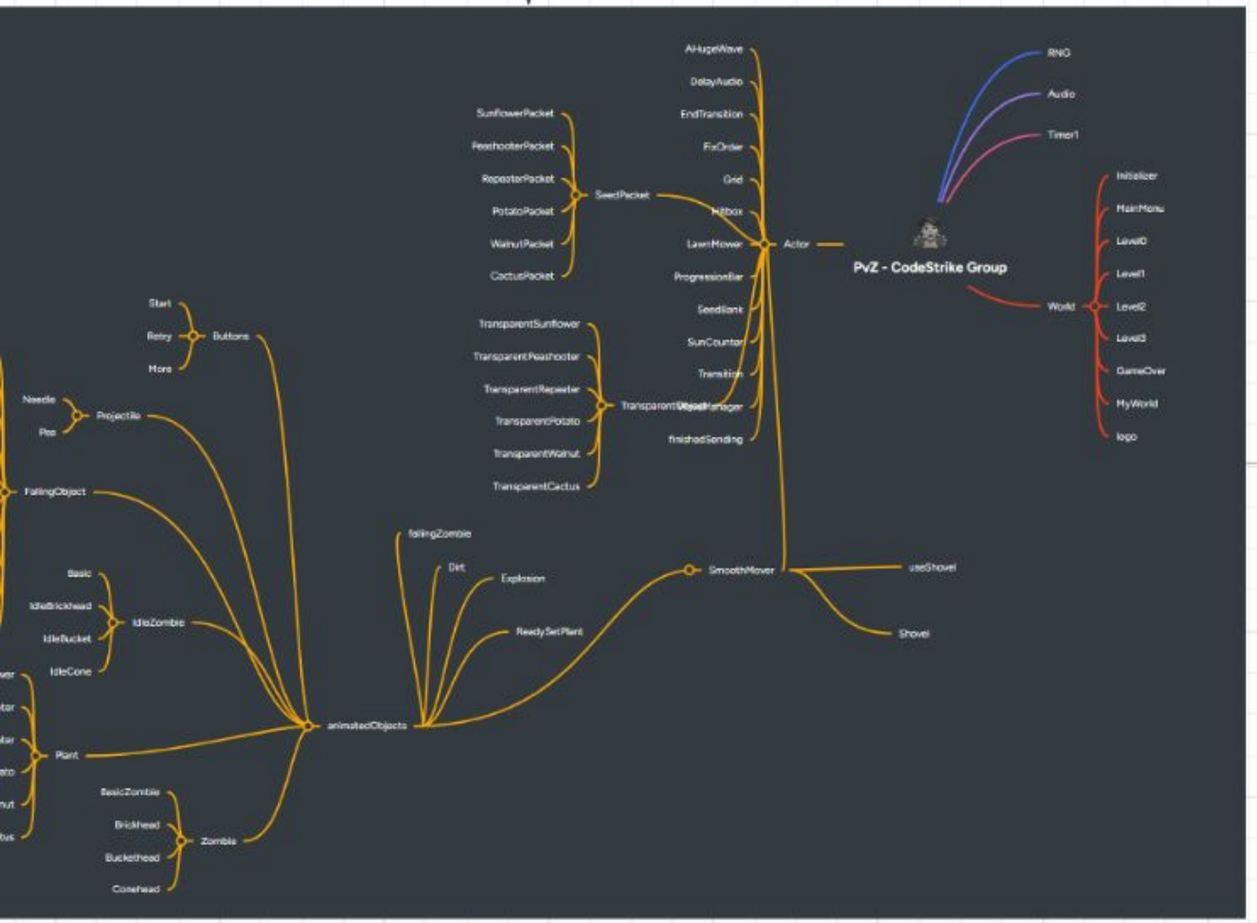


World

World is the world that Actors live in. It is a two-dimensional grid of cells. All Actor are associated with a World and can get access to the world object. The size of cells can be specified at world creation time, and is constant after creation.

Greenfoot
https://www.greenfoot.org › files › javadoc › World

World (greenfoot API)

World

- worldWidth : int
- worldHeight : int
- cellSize : int
- bounded : boolean
- background : GreenfootImage

+ World(worldWidth: int, worldHeight: int, cellSize: int)
+ World(worldWidth: int, worldHeight: int, cellSize: int, bounded: boolean)
+ addObject(object: Actor, x: int, y: int) : void
+ removeObject(object: Actor) : void
+ removeObjects(objects: Collection<? extends Actor>) : void
+ getWidth() : int
+ getHeight() : int
+ getCellSize() : int
+ getObjects() : List<Actor>
+ getObjects(cls: Class) : List<Actor>
+ showText(text: String, x: int, y: int) : void
+ setBackground(image: GreenfootImage) : void
+ setBackground(filename: String) : void
+ repaint() : void
+ act() : void
+ started() : void
+ stopped() : void

SeedBank
<<extends Actor>>

+ MyWorld: MyWorld
+ suncounter: SunCounter = new SunCounter()
+ bank: SeedPacket[]
+ selectedPacket: SeedPacket = null
+ image: TransparentObject = null
+ transparent: TransparentObject = null

+ static final x1: int = 182
+ static final x2: int = 702
+ static final xSpacing: int = Grid.xSpacing
+ static final y1: int = 62
+ static final y2: int = 417
+ static final ySpacing: int = Grid.ySpacing

+ SeedBank(bank: SeedPacket[])
+ act(): void
+ addedToWorld(world: World): void

SeedPacket
<<extends Actor>>

+ deltaTime: long
+ deltaTime2: long
+ lastFrame: long = System.nanoTime()
+ lastFrame2: long = System.nanoTime()
+ rechargeTime: long
+ currentFrame: long = System.nanoTime()
+ sunCost: int
+ recharged: boolean = false
+ selected: boolean = false
+ doneRechargeTime: boolean = false
+ recharge: GreenfootImage
+ image1: GreenfootImage
+ image2: GreenfootImage
+ name: String
+ myWorld: MyWorld

+ SeedPacket(rechargeTime: long, recharged: boolean, sunCost: int, name: String)
+ addedToWorld(world: World): void
+ act(): void
+ handleRechargeProgress(): void
+ startRecharge(): void
+ setRecharged(charge: boolean): void
+ setSelected(selected: boolean): void
+ getCharge(): boolean
+ getSelected(): boolean
+ addImage(): TransparentObject
+ getPlant(): Plant

LawnMower
<<extends Actor>>

- activated: boolean
- speed: int = 7
- lawnmowerImage: GreenfootImage

+ LawnMower()
+ act() : void
- activate() : void

ProgressionBar
<<extends Actor>>

- level: WaveManager
- frameWidth: int = 458
- frameHeight: int = 34
- fillAreaWidth: int = 438
- fillAreaHeight: int = 14
- fillOffsetX: int = (frameWidth - fillAreaWidth) / 2
- fillOffsetY: int = (frameHeight - fillAreaHeight) / 2
- frame: GreenfootImage
- bar: GreenfootImage

+ ProgressionBar(level: WaveManager)
+ act(): void

Actor

Actor

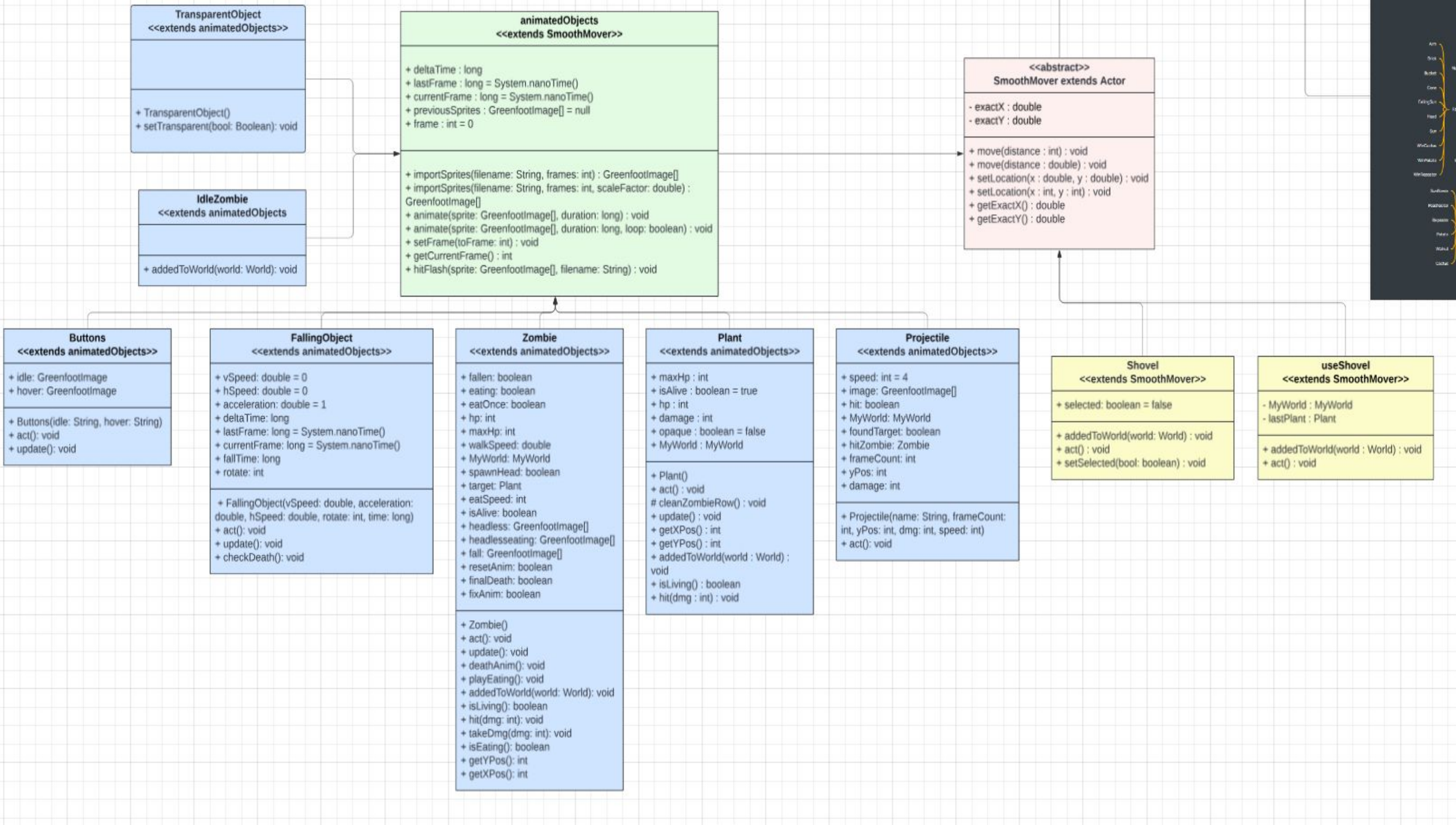
- image : GreenfootImage
- world : World
- x : int
- y : int

+ act() : void
+ getWorld() : World
+ setLocation(x: int, y: int) : void
+ move(distance: int) : void
+ turn(angle: int) : void
+ getX() : int
+ getY() : int
+ getImage() : GreenfootImage
+ setImage(image: GreenfootImage) : void
+ getRotation() : int
+ setRotation(angle: int) : void
+ isAtEdge() : boolean

An Actor is an object that exists in the Greenfoot world. Every Actor has a location in the world, and an appearance (that is: an icon). An Actor is not normally instantiated, but instead used as a superclass to more specific objects in the world. Every object that is intended to appear in the world must extend Actor.

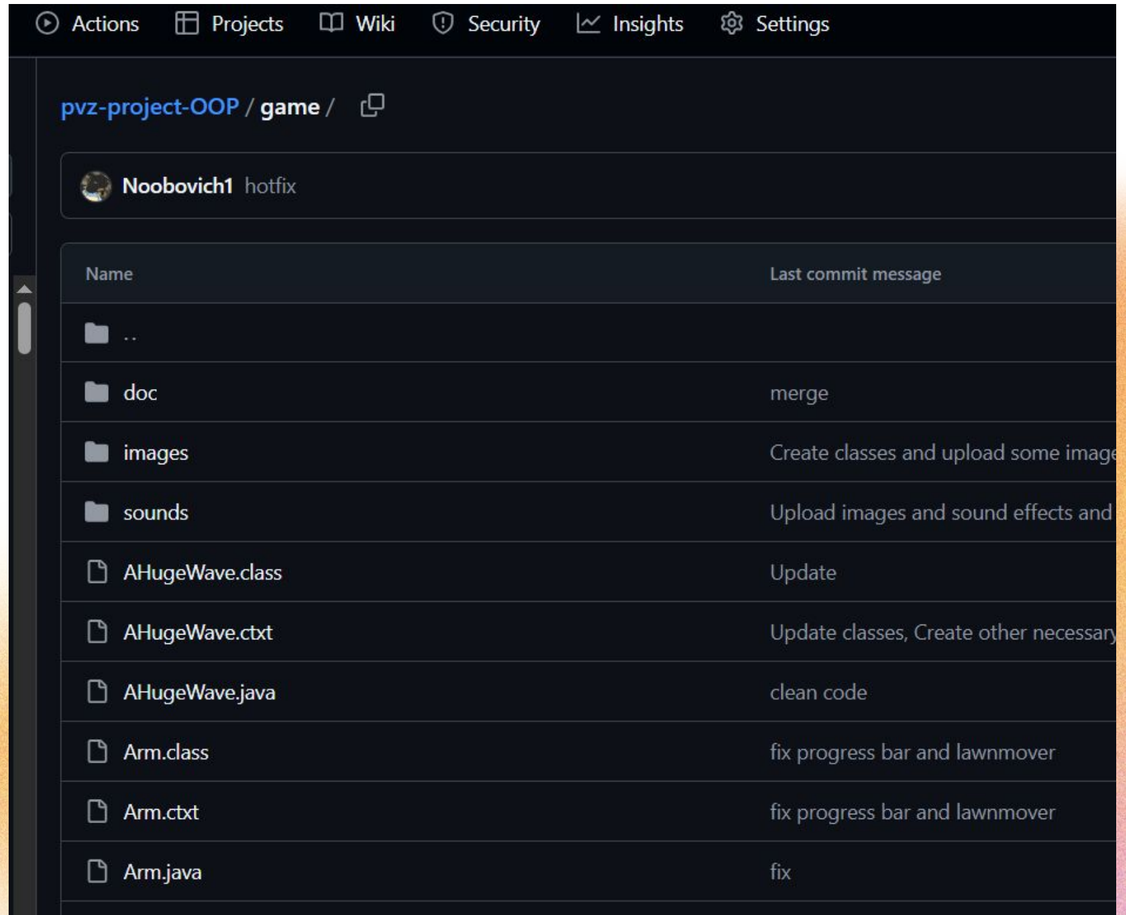
Greenfoot
https://www.greenfoot.org › files › javadoc › Actor

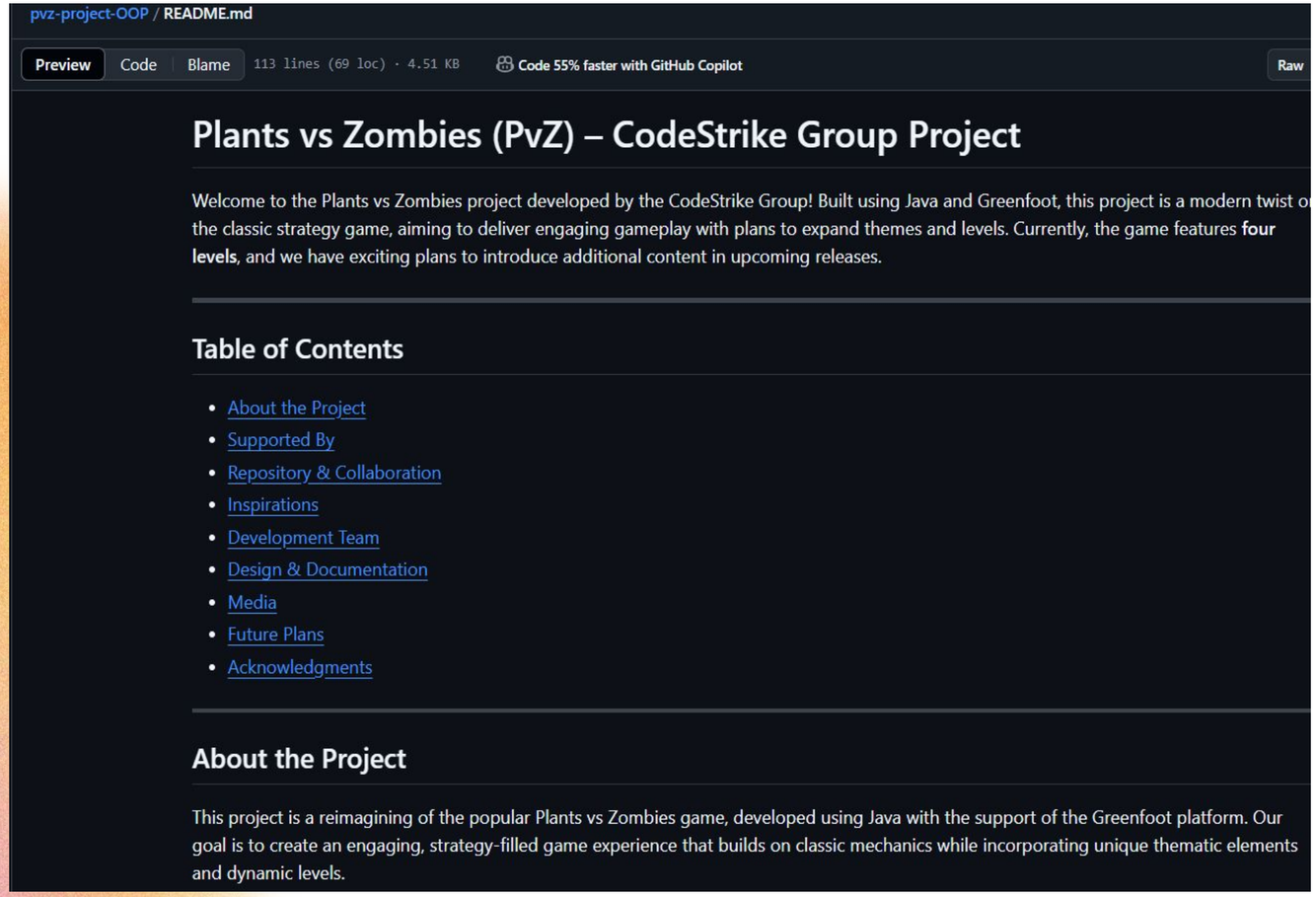
Actor (greenfoot API)


TransparentObject
<<extends animatedObjects>>
+ TransparentObject()
+ setTransparent(bool: Boolean): void
IdleZombie
<<extends animatedObjects
+ addedToWorld(world: World): void
animatedObjects
<<extends SmoothMover>>
+ deltaTime : long
+ lastFrame : long = System.nanoTime()
+ currentFrame : long = System.nanoTime()
+ previousSprites : GreenfootImage[] = null
+ frame : int = 0
+ importSprites(filename: String, frames: int) : GreenfootImage[]
+ importSprites(filename: String, frames: int, scaleFactor: double) : GreenfootImage[]
+ animate(sprite: GreenfootImage[], duration: long) : void
+ animate(sprite: GreenfootImage[], duration: long, loop: boolean) : void
+ setFrame(toFrame: int) : void
+ getCurrentFrame() : int
+ hitFlash(sprite: GreenfootImage[], filename: String) : void
<<abstract>>
SmoothMover extends Actor
- exactX : double
- exactY : double
+ move(distance : int) : void
+ move(distance : double) : void
+ setLocation(x : double, y : double) : void
+ setLocation(x : int, y : int) : void
+ getExactX() : double
+ getExactY() : double
Buttons
<<extends animatedObjects>>
+ idle: GreenfootImage
+ hover: GreenfootImage
+ Buttons(idle: String, hover: String)
+ act(): void
+ update(): void
FallingObject
<<extends animatedObjects>>
+ vSpeed: double = 0
+ hSpeed: double = 0
+ acceleration: double = 1
+ deltaTime: long
+ lastFrame: long = System.nanoTime()
+ currentFrame: long = System.nanoTime()
+ fallTime: long
+ rotate: int
+ FallingObject(vSpeed: double, acceleration: double, hSpeed: double, rotate: int, time: long)
+ act(): void
+ update(): void
+ checkDeath(): void
Zombie
<<extends animatedObjects>>
+ fallen: boolean
+ eating: boolean
+ eatOnce: boolean
+ hp: int
+ maxHp: int
+ walkSpeed: double
+ MyWorld: MyWorld
+ spawnHead: boolean
+ target: Plant
+ eatSpeed: int
+ isAlive: boolean
+ headless: GreenfootImage[]
+ headlesseating: GreenfootImage[]
+ fall: GreenfootImage[]
+ resetAnim: boolean
+ finalDeath: boolean
+ fixAnim: boolean
+ Zombie()
+ act(): void
+ update(): void
+ deathAnim(): void
+ playEating(): void
+ addedToWorld(world: World): void
+ isLiving(): boolean
+ hit(dmg: int): void
+ takeDmg(dmg: int): void
+ isEating(): boolean
+ getYPos(): int
+ getXPos(): int
Plant
<<extends animatedObjects>>
+ maxHp : int
+ isAlive : boolean = true
+ hp : int
+ damage : int
+ opaque : boolean = false
+ MyWorld : MyWorld
+ Plant()
+ act() : void
# cleanZombieRow() : void
+ update() : void
+ getXPos() : int
+ getYPos() : int
+ addedToWorld(world : World) : void
+ isLiving() : boolean
+ hit(dmg : int) : void
Projectile
<<extends animatedObjects>>
+ speed: int = 4
+ image: GreenfootImage[]
+ hit: boolean
+ MyWorld: MyWorld
+ foundTarget: boolean
+ hitZombie: Zombie
+ frameCount: int
+ yPos: int
+ damage: int
+ Projectile(name: String, frameCount: int, yPos: int, dmg: int, speed: int)
+ act(): void
Shovel
<<extends SmoothMover>>
+ selected: boolean = false
+ addedToWorld(world: World) : void
+ act() : void
+ setSelected(bool: boolean) : void
useShovel
<<extends SmoothMover>>
- MyWorld : MyWorld
- lastPlant : Plant
+ addedToWorld(world : World) : void
+ act() : void

GITHUB

Our github link: https://github.com/trankhanhbinh/pvz-project-OOP.git





CONCLUSION

By implementing a well-researched and innovative sales strategy, our goal is not only to boost immediate sales figures but also to establish a sustainable framework for continued growth and success

THANK YOU!