Save the Animals

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Introduction

This game was created as a final project for John Sterling's Intro to Game Programming course (CS3113). Our intention behind the game was to exercise the concepts and tools we learned in the course: flocking, collision detection, gravity, and 3D transformations.

Storyline

In this game, aliens are invading and stealing our animals for experimentation. You must save the animals from the alien lab. You need to rush through each room and collect as many animals as possible before the time runs out. Once you pass the last room, you wake a spaceship alien who chases after you while you try to exit the lab with your collected animals.

Gameplay

This is a platform game. Each level has a number of animals and portals. You need to navigate the level with the portals to collect as many animals as possible. To advance to the next level, you must be standing on the "next level" platform, either when time runs out or after you've collected all the animals.

After you've reached the spaceship alien, you must run back through the levels and hit the "previous level" platforms to retreat to the previous level.

You lose the game if you aren't on the "next level" platform before time runs out.

You win the game if you successfully exit the lab.

You
This is your character. You move with arrow keys (UP, LEFT, RIGHT)

There are two different **platforms**:

Solid
You cannot go through this block

Plank
You can jump through this block if you're coming from below it. You can stand on top of it.

There are various **portals** that alter gravity for whatever passes through them:

Neutral
Sets the force of gravity to the normal amount

Rightside down
Changes the direction of gravity to pull right

Leftside down
Changes the direction of gravity to pull left

Downside down
Changes the direction of gravity to pull down

Upside-down
Changes the direction of gravity to pull up

Half gravity
Halves the strength of the force of gravity

Double gravity
Doubles the strength of the force of gravity

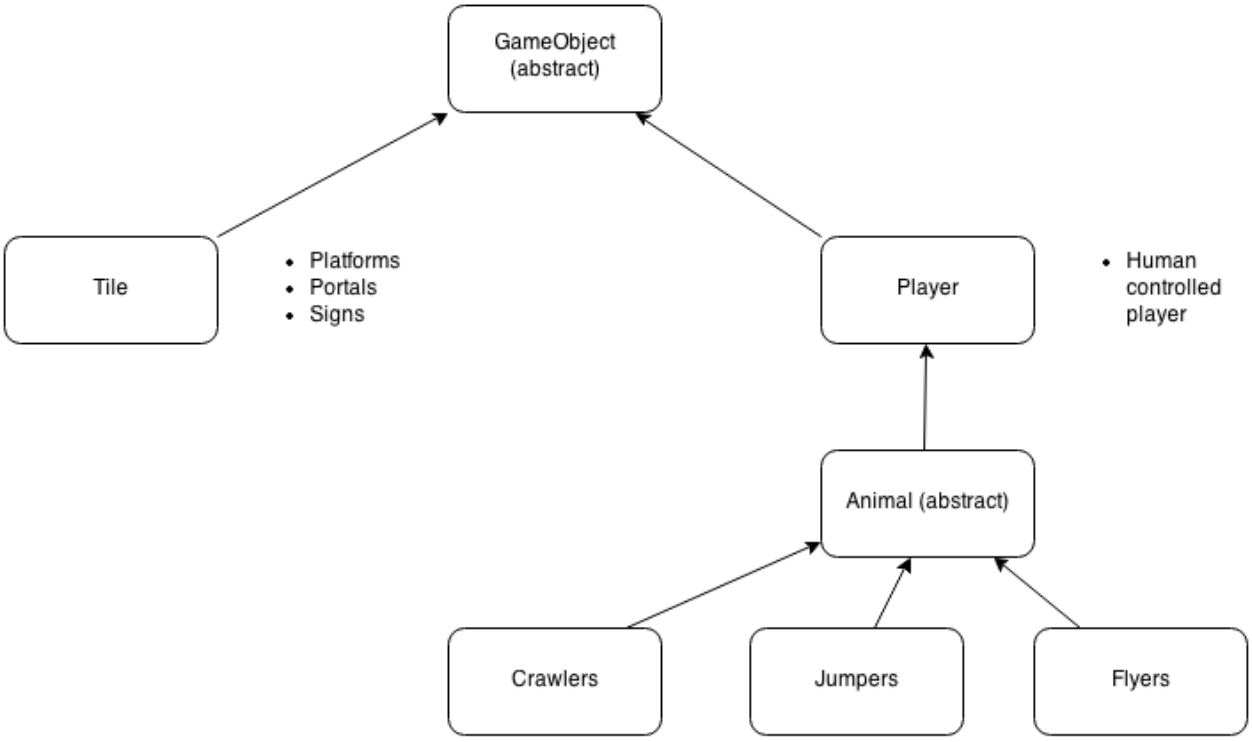
Animals
This is an animal. They may behave differently, but this is what you need to collect.

Next Level
Stand on this sign after collecting all the animals (or right before time runs out) to go to the next level

Previous Level
Stand on this sign to go back to the previous level when fleeing from the spaceship alien

Design

Here is an overview of the class hierarchy:



Game Object

GameObject is an abstract class that is the parent of the Tile class and the Player class. Each GameObject has a rectangle “boundBox”, a portalType1 “pt1”, a portalType2 “pt2”, and a GOType (Game Object type) “type”. Many of the objects’ unique properties will be decided in Game1.cs by looking at the “type”. The X, Y, Height, and Width properties of boundBox can be accessed directly. The GameObject also has “Intersect” and “Intersects” functions which will check the intersection of the boundBox to another GameObjects boundBox.

Portal Types

The portal types, “portalType1” and “portalType2” are enumerated types that will communicate what kind of gravity the GameObject has. The first portal type describes what direction gravity is pulling and the second portal type describes how strong the force is.

Tile

Tiles are a simple child of GameObject. The tiles are created when levels are loaded. The levels are loaded by reading in a text file with 15 lines (rows) and 20 characters per line (columns). The row and column of each character will decide the boundBox location while the character decides the type. The characters being used are defined in GOType in GameObject.cs. The platforms, portals, and arrow signs are all different types of Tiles.

Player
The player class is a child class of GameObject that adds many new properties. These properties allow for gravity and for collision detection during movement. The character that the user plays as is a Player object, as are any GameObjects that can move.

Animal
Animal is an abstract child class of Player and inherits the gravity and collision properties while adding animal behaviors. Their behavior algorithm is defined in the “doWander” method.

Player Movement
Player movement is done in the function “handlePlayerMovement” in Game1. It handles the keyboard input for the player. It tracks what the changes of the players x and y would be under normal gravity, and then applies it to the appropriate direction depending on the players portalType1.

Platform Collisions
The function “handlePlatCollisions” takes a player object and checks for collision with every Tile of the current level. If the player is mostly inside a portal, one of its portal types will change. If the player did not land on any platforms, then he will be considered jumping so that gravity will start being applied. This function uses the player’s portalType1 to make collisions appropriate to the direction of gravity.

Crawlers
These animals have a very simple wandering algorithm. They wander back and forth along the platform they are standing on.

Jumpers
These animals can jump to avoid the player. They can jump off of the platform they’ve started on and fall to the ones below it.

Flyers
These animals are not affected when the player changes gravity’s direction (only their sprite image is rotated). They behave like birds, so they flock together, and try to avoid the walls of the game screen, solid blocks, and the player.

Challenging Aspects
Collision detection and flocking were the most challenging features to implement.

For collision detection, there were many cases to cover when relocating the player after colliding with a block, especially with the different gravity directions. If a bug was found or a platform property was changed, the change had to be applied differently to all four directions of gravity.

Flocking, although the concept seemed simple to implement (average the directions/locations of the flyers (boids) within a certain distance from myself), took a long time to successfully implement. It was easy to forget some of the important factors, such as using the distance between the other boids and myself as a weight for how much to move in their direction.