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Comp 565

Project 1

Project 1: Model, Terrain and Treasures with AGMGSKv7

**Scene:**

The scene that I created is lunar themed. The scene does not have hills, but rather has canyons or craters. The surface is different shades of grey and as the ground gets lower the grey color will be lighter. (Height < 0) I was able to figure out a nice way of adding a jpeg as the background to give the scene the appearance that it is in space. (This code can be found in Stage.cs on lines 115, 464, 581 - 584)(Note: Had to move the restore state code to after the spriteBatch.End() to get the correct blend effect.) The treasures in the scene are just simple rectangles colored dark purple if it is not tagged and green if it is tagged. (Note: I could not figure out how to remove a model in the scene, so when the treasure is tagged it will draw the green model over the purple and increased its height to give a better indicator that it is tagged.) Also I removed the clouds from the original scene as they are not objects you find on the moon. (Note: I was going to put asteroids in place of the clouds, but ran out of time.)

**Description of Height Generation Algorithm:**

For the height generation algorithm I choose to do the Brownian Motion Algorithm. I mainly choose this algorithm because it was very straight forward and easy to understand. (Note: Code can be found on lines 192 – 265.) I first initialized my data structure and set my variables up. The centers that the algorithm can choose are (100, 100), (250, 125), (400, 100) or (50, 256). The number of steps through the algorithm is 5, steps inside each algorithm run through was 2000, and the radius of the circle where all heights are increased by one is 33. The algorithm basically runs like this for each run through the algorithm it picks a random center increases every index in the terrainHeight 2d array by 1 in a radius of 33 from the center of a move. After each increase of 1 it then picks a random step for x and z and increases again. If the random step makes the radius fall outside the bounds of the 2d array then a random center will be chosen. This stepping and increasing will continue to occur until I has done 2000 increases and steps. At this time it will do another 2000 of these sequences till it reaches 4 total 2000 increases and steps. After the Brownian Motion Algorithm the highest point is found to use for scaling. Each integer inside the 2d array is then scaled and cast to a float. Next each of those floats is then divided by 255 and used to make a vector3. Those vector3’s will be used to make a vector4 and then later used to make a png. I did change the ranges on the color selection based on height in the heightToVector4 method.(Note: When using the instructor code on a mac the user will have to specify the exact path with the saving of any files.)

The methods or variables that where modified or created for the above description:

createHeightTexture() in class TerrainMap.cs – Modified,

LoadContent() in class TerrainMap.cs – Modified,

heightToVector4(int h) in class TerrainMap.cs – Modified,

createColorTexture() in class TerrainMap.cs – Modified.

**Description of Staying on Top of the Terrain:**

For the Terrain Following Algorithm I elected to use the linear interpolation approach. I decided to use this approach because it seems to be the one used the most in game development. The algorithm starts when the lerpFlag is set to true. The x and z get scaled back, for use as indices, to the top left position of the square the object is in. Vector A,B,C,D are then created to get all the vertices of the square. Then by using vertex C and the objects position I can compute which triangle the object is in. After finding the correct triangle the height for the x and z of the objects relative position is then found using lerp. Adding all the Y’s and you get the approximated height of the objects position in the square.

The methods or variables that where modified or created for the above description:

bool lerpFlag in class Stage.cs – Created,

attribute LerpFlag{get and set} in Stage.cs – Created,

setSurfaceHeight(Object3D anObject3D) in class Stage.cs – Modified,

Update(GameTime gameTime) in class Stage.cs – Modified.

**Description of the NPAgent Movement:**

The NPAgent , or Chaser, has two modes treasure and follow path mode. The follow path mode is the default. When “N” is pressed the NPAgent goes into treasure mode. In treasure mode the NPAgent will get the closest treasure that is untagged and is set to his nextGoal. I added some behavior to the NPAgent to make him a little adaptive. If the treasure that the NPAgent is going to is tagged before it gets there, then it will switch to the next nearest treasure. If the NPAgent can not find a treasure because they are all tagged now, then he will just go back to the static path at the node he was going to before treasure mode was enabled. If the NPAgent gets within snap distance of the treasure in treasure mode, then he will tag the treasure, increase his score by 1, turn treasure mode off, and go to the NavNode that was nextGoal before treasure mode was first enabled. When the treasure game is over and all the treasures are tagged pressing “N” will not enable treasure mode on the NPAgent. If after the NPAgent has tagged a treasure and “N” is pressed as it starts to go back to his path. Then the NPAgent will divert from going back to the static path and go into treasure mode for the next nearest untagged treasure.

The methods or variables that where modified or created for the above description:

LoadContent() in class Stage.cs – Modified,

Update(GameTime gameTIme) in class Stage.cs – Modified,

bool treasureMode in class NPAgent.cs – Created,

NavNode nextGoalTemp in class NPAgent.cs – Created,

attribute TreasureMode {get and set} in class NPAgent.cs – Created,

Update(GameTime gameTIme) in class NPAgent.cs – Modified,

List<Vector3> treasureLocations in class Treasure.cs – Created,

int[] tagged in class Treasure.cs – Created,

bool gameOver in class Treasure.cs –Created,

Treasure(Stage theStage, string label, string meshFile) in class Treasure.cs –Created,

attribute GameOver{get and set} in class Treasure.cs –Created,

isTagged(Vector3 treasure) in class Treasure.cs –Created,

tagTreasure(Vector3 treasure) in class Treasure.cs –Created,

getTreasure(Vector3 position) in class Treasure.cs –Created,

isClosest(Vector3 treasure, Vector3 position) in class Treasure.cs –Created,

isTreasure(Vector3 treasure) in class Treasure.cs –Created,

addTreasures()in class Treasure.cs –Created.

**New Input for AGMGSKv7**

Press “N” to Enable Treasure Mode for the NPAgent. (Player will always be in treasure mode)

Press “L“ to Enable all MovableObject3D to follow the terrain. (Lerp)

Press “S” to Show the Treasure Score Board. (Works as a toggle)

**Treasure Locations:**

Treasure1 = (442, 468)

Treasure2 = (400, 420)

Treasure3 = (390, 390)

Treasure4 = (495, 505)

**Model List:**

pinkTreasure.xnb

Author: David Kopp

Modeler: Maya

Note: Exported from Maya as a FBX and used XNAFormatter to get the XNB. Before when using the pipeline on the pc it would make my FBX models black. XNAFormatter fixed this.

greenTagBox.xnb

Author: David Kopp

Modeler: Maya

Note: Exported from Maya as a FBX and used XNAFormatter to get the XNB. Before when using the pipeline on the pc it would make my FBX models black. XNAFormatter fixed this.

**Texture List:**

stars.jpg

Author: Unknown

URL: [Google Image Search for Space](https://www.google.com/search?q=space&rlz=1C1CHWA_enUS642US642&espv=2&biw=950&bih=934&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjjiYzy9r7LAhVC1mMKHSRbAbUQ_AUIBigB)

Note: Randomly found image in google images.

**Table of all modified or created methods / variables:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | **Name** | **class** | **Created** | **Modified** | **Line#s** |
| **Method** | **LoadContent()** | **TerrainMap** |  | **X** | **132,133** |
| **Method** | **createHeightTexture()** | **TerrainMap** |  | **X** | **193 to 265** |
| **Method** | **heightToVector4(int h)** | **TerrainMap** |  | **X** | **334 to 376** |
| **Method** | **createColorTexture()** | **TerrainMap** |  | **X** | **405 to 407** |
| **Variable** | **Int scoreBase** | **Inspector** | **X** |  | **65** |
| **Variable** | **Bool showTreasureBoard** | **Inspector** | **X** |  | **76** |
| **Attribute** | **ShowTreasureBoard** | **Inspector** | **X** |  | **95 to 97** |
| **Method** | **setScoreBoard(int npAgent, in player, String winner)** | **Inspector** | **X** |  | **185 to 194** |
| **Method** | **Draw(SpriteBatch spriteBatch)** | **Inspector** |  | **X** | **215 to 220** |
| **Variable** | **Int score** | **NPAgent** | **X** |  | **47** |
| **Variable** | **Bool treasureMode** | **NPAgent** | **X** |  | **48** |
| **Variable** | **NavNode nextGoalTemp** | **NPAgent** | **X** |  | **49** |
| **Method** | **NPAgent(Stage thestage, string label, Vector3 pos, Vector3 orientAxis, float Radians, string meshFile, Treasure treasure)** | **NPAgent** |  | **X** | **73,87,88** |
| **Attribute** | **Score** | **NPAgent** | **X** |  | **94 to 96** |
| **Attribute** | **TreasureMode** | **NPAgent** | **X** |  | **101 to 104** |
| **Method** | **Update(GameTime gameTime)** | **NPAgent** |  | **X** | **115 to 135, 146, 150 to 155** |
| **Variable** | **Int Score** | **Player** | **X** |  | **51** |
| **Variable** | **Bool treasureMode** | **Player** | **X** |  | **52** |
| **Method** | **Player(Stage theStage, string label, Vector3 pos, Vector3 orientAxis, float radians, string meshFile)** | **Player** |  | **X** | **67 to 68** |
| **Attribute** | **Score** | **Player** | **X** |  | **74 to 75** |
| **Attribute** | **TreasureMode** | **Player** | **X** |  | **80 to 82** |
| **Method** | **Update(GameTime gameTime)** | **Player** |  | **X** | **108 to 115** |
| **Variable** | **Bool lerpFlag** | **Stage** | **X** |  | **97** |
| **Variable** | **Texture2D background** | **Stage** | **X** |  | **115** |
| **Variable** | **Treasure treasure** | **Stage** | **X** |  | **116** |
| **Attribute** | **LerpFlag** | **Stage** | **X** |  | **218 to 220** |
| **Attribute** | **Treasure** | **Stage** | **X** |  | **225 to 226** |
| **Attribute** | **Winner** | **Stage** | **X** |  | **232 to 243** |
| **Method** | **SetSurfaecHeight(Object3D anObject3D)** | **Stage** |  | **X** | **318 to 348** |
| **Method** | **LoadContent()** | **Stage** |  | **X** | **461 to 462, 464 to 467** |
| **Method** | **Update(GameTime gameTime)** | **Stage** |  | **X** | **505, 523, 532, 533, 541 to 551** |
| **Method** | **Draw(GameTime gameTime)** | **Stage** |  | **X** | **566, 582 to 584** |
| **Method** | **Terrain(Stage theStage, string label, string heightFile, string colorFile)** | **Terrain** |  | **X** | **105** |
| **Variable** | **List<Vector> treasureLocations** | **Treasure** | **X** |  | **42** |
| **Variable** | **Int[] tagged** | **Treasure** | **X** |  | **43** |
| **Variable** | **Bool gameOver** | **Treasure** | **X** |  | **44** |
| **Method** | **Treasure(Stage theStage, string label, string meshFile)** | **Treasure** | **X** |  | **49 to 53** |
| **Attribute** | **GameOver** | **Treasure** | **X** |  | **58 to 61** |
| **Method** | **isTagged(Vector3 treasure)** | **Treasure** | **X** |  | **69 to 76** |
| **Method** | **tagTreasure(Vector3 treasure)** | **Treasure** | **X** |  | **82 to102** |
| **Method** | **getTreasure(Vector3 position)** | **Treasure** | **X** |  | **109 to 116** |
| **Method** | **isClosest(Vector3 treasure. Vector3 position)** | **Treasure** | **X** |  | **125 to 136** |
| **Method** | **isTreasure(Vector3 treasure)** | **Treasure** | **X** |  | **144 to 151** |
| **Method** | **addTreasures()** | **Treasure** | **X** |  | **156 to 172** |