

Data Structures Final Project Reflection Report

By Stephen Zoccoli.

Tier 1:

- ShopManager.cs used to use a List<> of Artifacts for the shop. The list was fixed to size 6, or the maximum number of undiscovered artifacts remaining (whichever is less). Since the size is fixed and pre-determined, I switched to a fixed size Array.
- The old algorithm shuffled all undiscovered artifacts, and took the first 6 of the shuffle (Fisher Yates). I changed to do a partial Fisher Yates shuffle, only up to the first 6 items.
- (Insert algorithm into PDF. Insert Array change).

```
+ public A_Base[] GetRandomArtifacts(int maxItems) //List<A_Base> GetRandomArtifacts(int maxItems)
+ {
+     int itemCount = Mathf.Min(maxItems, undiscoveredArtifacts.Count);
+     // 0 to itemCount - 1
+     int[] itemNums = new int[itemCount];
+     for (int i = 0; i < itemCount; i++) { itemNums[i] = i; }
+
+     // We use an Array instead of a list since the size is fixed
+     A_Base[] selectedItems = new A_Base[itemCount];
+     // Partial Fisher-Yates shuffle for random selection
+     for (int i = 0; i < itemCount; i++)
+     {
+         int randomIndex = Random.Range(i, itemCount);
+         int temp = itemNums[i];
+         itemNums[i] = itemNums[randomIndex];
+         itemNums[randomIndex] = temp;
+
+         selectedItems[i] = undiscoveredArtifacts[itemNums[i]];
+
+     }
+ }
```

-
- The change in ShopManager.cs required a small change in ArtifactManager.cs, now getting an Array from the respective function instead of a List.

Tier 2:

- PlayerStats.cs had several separate variables for the “# enemies defeated”, “artifacts discovered”, “damage dealt”, “health remaining”, etc. Instead, I used a hash table (dictionary) called “playerStatDict” for all of these.

```

9      - public int enemiesDefeated;
10     - public int artifactsDiscovered;
11     - public int artifactsTriggered;
12     - public int damageDealt;
13     - public int damageTaken;
14     - public int healthHealed;
15     - public int coinsCollected;

10    +
11    + public Dictionary<string, int> playerStatsDic = new Dictionary<string, int>();

```

- All variables were initialized to 0. Instead of doing it manually for each variable, now with a dictionary, I can for-loop “foreach key” and set all to 0. (include code).

```

17 20 public void ResetStats()
18 21 {
19 22     win = false;
20 23     stage = 0;
21 24     time = 0;

22     - enemiesDefeated = 0;
23     - artifactsDiscovered = 0;
24     - artifactsTriggered = 0;
25     - damageDealt = 0;
26     - damageTaken = 0;
27     - healthHealed = 0;
28     - coinsCollected = 0;

25 +
26 + string[] keys = { "enemiesDefeated", "artifactsDiscovered", "artifactsTriggered", "damageDealt", "damageTaken", "healthHealed", "coinsCollected" };
27 + foreach (string key in keys)
28 + {
29 +     if (playerStatsDic.ContainsKey(key))
30 +     {
31 +         playerStatsDic[key] = 0;
32 +     }
33 +     else
34 +     {
35 +         playerStatsDic.Add(key, 0);
36 +     }
37 +
38 + }

```

- This change propagated to several other files that used these variables. That took some time to find everything.

Tier 3:

DungeonManager.cs randomly generated the dungeon as a tree. This is done layer by layer up to a max tree depth. I pre-defined a tree structure, then made the dungeon follow the pre-defined tree.

```

51 +         Tree tree = new Tree();
52 +
53         // Generate first room
54 -         CreateRoom(stage, 0, null);
54 +         CreateRoom(stage, 0, null, tree.root);
55         // Iteratively generate layers
56 -         GenerateLayer(stage, 1);
56 +         GenerateLayer(stage, 1, tree);

```

To get this to work with the current tree building algorithm, I needed to write a getLayer function for the tree, to integrate into the current dungeon build.

```

void GenerateLayer(int stage, int depth)
void GenerateLayer(int stage, int depth, Tree tree)
{
    // Stop when reached max depth or no doors to fill
    if (depth > gen.maxDepth || doorsToFill.Count <= 0) return;
@@ -108,17 +111,19 @@ void GenerateLayer(int stage, int depth)
    _doorsToFill.Add(doorsToFill[i]);
    doorsToFill.Clear();

    List<Node> _nodes = tree.GetLayer(depth);

    // Create new room for all empty doors
    for (int i = 0; i < _doorsToFill.Count; i++)
    {
        Room _parentRoom = _doorsToFill[i].GetComponent<EC_Entity>().room;
        Room _newRoom = CreateRoom(stage, depth, _parentRoom);
        Room _newRoom = CreateRoom(stage, depth, _parentRoom, _nodes[i]);
        _doorsToFill[i].destination = _newRoom;
        _parentRoom.children.Add(_newRoom);
    }

    // Generate next layer
    GenerateLayer(stage, depth + 1);
    GenerateLayer(stage, depth + 1, tree);
}

```

```

+ public List<Node> GetLayer(int depth)
+ {
+     List<Node> layer = new List<Node>();
+     if (depth == 0)
+     {
+         layer.Add(root);
+         return layer;
+     }
+
+     if (depth == 1)
+     {
+         if (root.left != null)
+         {
+             layer.Add(root.left);
+         }
+         if (root.right != null)
+         {
+             layer.Add(root.right);
+         }
+         return layer;
+     }
+
+     // depth > 1
+     if (root.left != null)
+     {
+         layer.AddRange(GetLayer(depth, root.left));
+     }
+     if (root.right != null)
+     {
+         layer.AddRange(GetLayer(depth, root.right));
+     }
+
+     return layer;
+ }

```

In all cases, the end result is the same, but the code should work faster, i.e., optimized.

Within my experience, my biggest difficulty with this project was actually finding a working game that didn't have any technical problems, and that was also not in Godot since I am really not good with Godot. I started with a puzzle game which had problems running, and then I tried this mail sorting game which had problems loading. Which lead to me picking this game where all my actually changes ended up working and running.

Game:

<https://github.com/Darkmatter-64/UDCgame/tree/main/Game> - Untitled Dungeon Crawler.exe