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using System;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.Tilemaps;
using Random = UnityEngine.Random;

public class ProceduralGeneration : MonoBehaviour
{
    public Master M;
    public Tilemap Map;
    public TileBase Rule;
    private int xIndex = 0;
    private List<int[][]> Chunks = new List<int[][]>();
    private int Height = 0;
    public int PlatformLength = 10;
    private int ChunkLength = 0;
    // This is the base chance for a tile to be empty. It slightly favours filled blocks
    private const int BaseEmptyChance = 45;
    // Tiles are more likely to be the same as the tiles next to them
    private const int NeighbourWeight = 22;
    private readonly int BaseFlatChance = 20;
    // This is to determine the fastest possible time to run a chunk
    private float Speed = 0f;
    private float TimeToRun;
    private float PreviousTime;
    private bool PlatformDeleted = false;
    // This is a grid showing where a tile has to be placed / has to not be placed for a jump to work
    // 0 means it will be empty, 1 means it will be filled, 2 means that it can be either
    private List<int[]> Jumps = new List<int[]>();

    public void Start()
    {
        // Creates starting values
        float width = Camera.main.orthographicSize * Camera.main.aspect * 2;
        ChunkLength = (int)Math.Ceiling(width);
        Height = (int)Math.Ceiling(Camera.main.orthographicSize * 2 - 2);
        Speed = M.GetSpeed();
        TimeToRun = ChunkLength * 1.5f / Speed;
        PreviousTime = Time.time - TimeToRun / 1.5f;
        CreateStart();
    }

    private void CreateStart()
    {
        // Removes the previous map's tiles
        Stats.TileColumns.Clear();

        // Creates the start of the map
        var wall = CreateWall();
        var platform = CreatePlatform();
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51
52          // Combines both the wall and the platform into a single chunk
53          int[][] chunk = new int[1 + platform.Count][];
54          chunk[0] = wall.ToArray();
55          for (int counter = 0; counter < platform.Count; counter++)
56          {
57              chunk[counter + 1] = platform[counter].ToArray();
58          }
59
60          // Stores a 2 in the next 8 columns to allow other parts to
              overwrite the jump
61          for (int j = 0; j < 8; j++)
62          {
63              AddEmptyJump();
64          }
65
66          // Draws out the initial chunk
67          DrawChunk(chunk);
68          Chunks.Add(chunk);
69
70          // Creates 2 more chunks
71          CreateNewTiles();
72      }
73
74      // Initialises a list of 1's to create a barrier to the left of the map
75      private List<int> CreateWall()
76      {
77          var wall = new List<int>();
78          for (int counter = 0; counter < Height; counter++)
79          {
80              wall.Add(1);
81          }
82          return wall;
83      }
84
85      // Creates a flat surface
86      private List<List<int>> CreatePlatform()
87      {
88          // Creates a random height at which the starting platform should sit
89          int platformHeight = Random.Range(2, Height - 6);
90          var platform = new List<List<int>>();
91
92          // Creates a template for a column as 1 line of the platform
93          List<int> column = new List<int>();
94          for (int counter = 0; counter < Height; counter++)
95          {
96              if (counter < platformHeight)
97              {
98                  column.Add(1);
99              }
100             else
101             {
102                 column.Add(0);
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103             }
104         }
105
106         // Adds the columns to the platform
107         for (int counter = 0; counter < PlatformLength; counter++)
108         {
109             platform.Add(column);
110         }
111         return platform;
112     }
113
114     // Creates a new chunk and draws it
115     public void CreateNewTiles()
116     {
117         var chunk = CreateChunk();
118         DrawChunk(chunk);
119         Chunks.Add(chunk);
120         if (Chunks.Count > 2)
121         {
122             DeleteChunk();
123         }
124     }
125
126     // Creates a chunk
127     private int[][] CreateChunk()
128     {
129         // Calculates the weight
130         float time = Time.time - PreviousTime;
131         PreviousTime = Time.time;
132         float weight = time * 1.5f / TimeToRun;
133
134         var chunkList = new List<int[]>();
135         for (int counter = 0; counter < ChunkLength; counter++)
136         {
137             // A parameter of CreateColumn is the previous column which is
                difficult for the first column
138             // but simple for subsequent columns, hence the selection
139             if (counter > 0)
140             {
141                 chunkList.Add(CreateColumn(chunkList[counter - 1], weight));
142             }
143             else
144             {
145                 // Gets the last column from the previous chunk
146                 chunkList.Add(CreateColumn(Chunks[Chunks.Count - 1][Chunks
                    [Chunks.Count - 1].Length - 1], weight));
147             }
148         }
149         return chunkList.ToArray();
150     }
151
152     // Creates a column
153     private int[] CreateColumn(int[] previousColumn, float weight)
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154     {
155         var columnList = new List<int>();
156         // Takes the first set of jumps as the fixed tiles
157         var fixedTiles = Jumps[0];
158 
159         FixedTiles(fixedTiles, previousColumn, weight);
160 
161         // Decides what the tile will be
162         for (int counter = 0; counter < Height; counter++)
163         {
164             // If the tile is fixed, it just uses the number
165             if (fixedTiles[counter] == 0 || fixedTiles[counter] == 1)
166             {
167                 columnList.Add(fixedTiles[counter]);
168             }
169             else
170             {
171                 int emptyChance = BaseEmptyChance;
172                 if (Height - counter > 4)
173                 {
174                     // If the tile is not at the top, it checks the tiles to the left below to see what they are and uses
175                     // This to influence the chance for the tile to be empty
176                     if (previousColumn[counter] == 0) emptyChance += NeighbourWeight;
177                     else emptyChance -= NeighbourWeight;
178 
179                     if (counter != 0)
180                     {
181                         if (columnList[counter - 1] == 0) emptyChance += NeighbourWeight;
182                         else emptyChance -= NeighbourWeight;
183                     }
184                 }
185                 else
186                 {
187                     // If the tile is near the top, it drastically increases the chance of it being empty
188                     emptyChance = 95;
189                 }
190 
191                 // This randomly picks the tile
192                 if (weight >= 1)
193                 {
194                     if (Random.Range(1, 101) > emptyChance - 2 * weight) columnList.Add(1);
195                     else columnList.Add(0);
196                 }
197                 else
198                 {
199                     if (Random.Range(1, 101) > emptyChance + 2 / weight) columnList.Add(1);
200                     else columnList.Add(0);
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201                 }
202 
203             }
204         }
205 
206         // Removes the 0th index of jumps and adds a new empty section to it
207         Jumps.Remove(Jumps[0]);
208         AddEmptyJump();
209 
210         return columnList.ToArray();
211     }
212 
213     private void FixedTiles(int[] fixedTiles, int[] previousColumn, float
      weight)
214     {
215         // This loop looks at the previous column and if there is a valid
          space for the player to be,
216         // it will ensure that they are able to progress
217         for (int counter = 0; counter < Height - 4; counter++)
218         {
219             // Checks if the tile to the left was valid position
220             if (previousColumn[counter] == 1 && previousColumn[counter + 1]
              == 0 && previousColumn[counter + 2] == 0)
221             {
222                 // Checks that there is not already a fixed position for the
                    tile
223                 if (fixedTiles[counter] == 2)
224                 {
225                     // If the two tiles above the tile are fixed, this will
                    cause a clash which has to be resolved
226                     if (fixedTiles[counter + 1] == 2 && fixedTiles[counter +
                     2] == 2)
227                     {
228                         // There is a random chance of the tile being
                    above / below the previous one
229                         int percent = Random.Range(1, 101);
230 
231                         int dropChance = BaseFlatChance;
232 
233                         // Increases the drop chance as it gets higher up
                    the column
234                         if ((Height - counter) < 8)
235                         {
236                             dropChance += 2 * (8 - Height + counter);
237                         }
238 
239                         // Checks the tiles above the previous tile to see
                    if they allow the user to jump
240                         if (previousColumn[counter + 3] == 1 ||
                    previousColumn[counter + 4] == 1)
241                         {
242                             if (percent > dropChance)
243                             {
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244                                 FixUp0(fixedTiles, counter);
245                             }
246                             else
247                             {
248                                 Jump(fixedTiles, counter, weight);
249                             }
250                         }
251                         else if (percent > 50 / weight)
252                         {
253                             FixUp0(fixedTiles, counter);
254                         }
255                         else if (percent > (25 + dropChance / 2) / weight)
256                         {
257                             FixUp1(fixedTiles, counter);
258                         }
259                         else if (percent > dropChance / weight)
260                         {
261                             FixUp2(fixedTiles, counter);
262                         }
263                         else
264                         {
265                             Jump(fixedTiles, counter, weight);
266                         }
267                     }
268                     else
269                     {
270                         // If both are a 0 then the terrain can just carry ↪
                    on
271                         if (fixedTiles[counter + 1] == 0 || fixedTiles ↪
                    [counter + 2] == 0)
272                         {
273                             FixUp0(fixedTiles, counter);
274                         }
275                         else
276                         {
277                             // FixUp1 has a land and a gap above which works ↪
                     for the fixed tiles
278                             if (fixedTiles[counter + 1] == 1)
279                             {
280                                 FixUp1(fixedTiles, counter);
281                             }
282                             // FixUp2 needs a land 2 above and doesn't ↪
                    affect the tile 1 above
283                             else
284                             {
285                                 FixUp2(fixedTiles, counter);
286                             }
287                         }
288                     }
289                 }
290                 else
291                 {
292                     if (fixedTiles[counter] == 1)
```

```
293                     {
294                         FixUp0(fixedTiles, counter);
295                     }
296                     else if (fixedTiles[counter] == 0)
297                     {
298                         FixGap(fixedTiles, counter);
299                     }
300                 }
301             }
302         }
303 
304         // Ensures that the map won't go above the limit of the screen
305         for (int l = Height - 4; l < Height - 2; l++)
306         {
307             if (fixedTiles[l] == 2)
308             {
309                 if (previousColumn[l] == 1 && previousColumn[l + 1] == 0 &&
                      previousColumn[l + 2] == 0)
310                 {
311                     fixedTiles[l] = 0;
312                     fixedTiles[l + 1] = 0;
313                     fixedTiles[l + 2] = 0;
314                 }
315             }
316         }
317     }
318 
319     // Commonly used fixed tile groups
320     private void FixGap(int[] fixedTiles, int counter)
321     {
322         fixedTiles[counter + 1] = 0;
323         fixedTiles[counter + 2] = 0;
324     }
325 
326     private void FixUp0(int[] fixedTiles, int counter)
327     {
328         fixedTiles[counter] = 1;
329         fixedTiles[counter + 1] = 0;
330         fixedTiles[counter + 2] = 0;
331     }
332 
333     private void FixUp1(int[] fixedTiles, int counter)
334     {
335         fixedTiles[counter + 1] = 1;
336         fixedTiles[counter + 2] = 0;
337         fixedTiles[counter + 3] = 0;
338     }
339 
340     private void FixUp2(int[] fixedTiles, int counter)
341     {
342         fixedTiles[counter + 2] = 1;
343         fixedTiles[counter + 3] = 0;
344         fixedTiles[counter + 4] = 0;
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```
345     }
346
347     private void AddEmptyJump()
348     {
349         // Creates a new index for jumps and fills it all with 2's (empty)
350         var emptyJump = new int[Height];
351         for (int counter = 0; counter < Height; counter++)
352         {
353             emptyJump[counter] = 2;
354         }
355         Jumps.Add(emptyJump);
356     }
357
358     private void Jump(int[] fixedTiles, int yIndex, float weight)
359     {
360         fixedTiles[yIndex] = 0;
361         fixedTiles[yIndex + 1] = 0;
362         fixedTiles[yIndex + 2] = 0;
363         fixedTiles[yIndex + 3] = 0;
364         fixedTiles[yIndex + 4] = 0;
365
366         // Prevents accessing invalid indexes of the array
367         if (Height - yIndex > 3)
368         {
369             int length = JumpLength(weight);
370             for (int counter = 1; counter < length + 1; counter++)
371             {
372                 Jumps[counter][yIndex + 1] = 0;
373                 Jumps[counter][yIndex + 2] = 0;
374                 Jumps[counter][yIndex + 3] = 0;
375                 Jumps[counter][yIndex + 4] = 0;
376             }
377             Jumps[length][yIndex] = 1;
378         }
379     }
380
381     // Randomly decides the jump length
382     private int JumpLength(float weight)
383     {
384         int percent = Random.Range(1, 101);
385         if (percent < 30 * weight)
386         {
387             return 3;
388         }
389         else if (percent < 60 * weight)
390         {
391             return 4;
392         }
393         else
394         {
395             return 5;
396         }
397     }
```

```
398
399     private void DrawChunk(int[][] chunk)
400     {
401         // Checks every index of the chunk and adds a tile if it contains a
              1
402         for (int counter = 0; counter < chunk.Length; counter++)
403         {
404             for (int j = 0; j < chunk[counter].Length; j++)
405             {
406                 if (chunk[counter][j] == 1)
407                 {
408                     DrawTile(new Vector3Int(counter, j, 0));
409                 }
410             }
411
412             // Adds the column to Tiles
413             Stats.TileColumns.Add(chunk[counter]);
414         }
415         // Moves the next tile placement along by the length of the chunk
416         xIndex += chunk.Length;
417     }
418
419     private void DrawTile(Vector3Int pos)
420     {
421         try
422         {
423             // Aligns the tile to be set
424             pos.x += xIndex;
425             Map.SetTile(pos, Rule);
426         }
427         catch { }
428     }
429
430     // Deletes an old chunk
431     private void DeleteChunk()
432     {
433         if (PlatformDeleted)
434         {
435             for (int x = 0; x < ChunkLength; x++)
436             {
437                 for (int y = 0; y < Height; y++)
438                 {
439                     DeleteTile(new Vector3Int(x, y, 0), ChunkLength * 4);
440                 }
441             }
442         }
443         else
444         {
445             for (int x = 0; x < PlatformLength + 1; x++)
446             {
447                 for (int y = 0; y < Height; y++)
448                 {
449                     DeleteTile(new Vector3Int(x, y, 0), ChunkLength * 3 +
```

```
                        PlatformLength + 1);
450                 }
451             }
452             PlatformDeleted = true;
453         }
454     }
455
456     private void DeleteTile(Vector3Int pos, int deleteIndex)
457     {
458         try
459         {
460             pos.x += xIndex - deleteIndex;
461             Map.SetTile(pos, null);
462         }
463         catch { }
464     }
465 }
```