TECHNICAL DESIGN DOCUMENT

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1 INTRODUCTION

1.1 RATIONALE

In open world games, level design is a very tedious process and time consuming. Gray Boxing serves as a very useful method that precedes this step and can help pre visualize how the game would turn out. The system that is to be designed will help the artists to construct the level from their sketch in a easy way.

One of the problems we faced in the game we worked on last semester was that we wanted to have a non-conformal shaped maze of corn field (Fig 1.a). Since the maze was irregularly shaped with irregular paths, it was difficult for our game designer to grey box it and also to distribute the corn stalks in the cornfield.

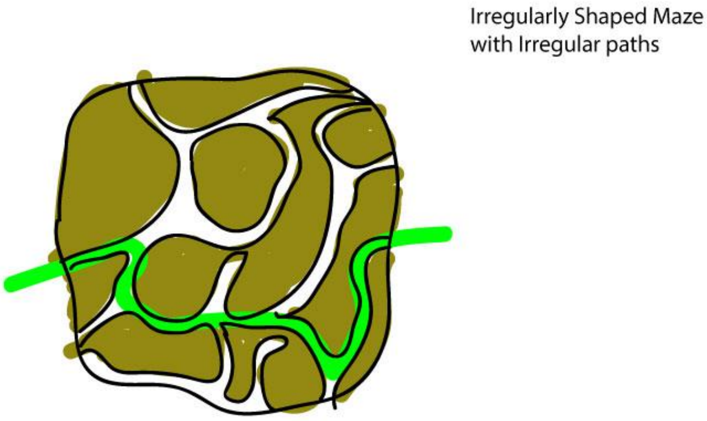


Fig 1.a

Without the experimental tool provided by unreal which supports random distribution of models inside various predefined primitive volumetric shapes, it would have been very difficult for us to create the level we wanted.

1.2 TERMINOLOGY:

1.2.1 Gray Boxing:

Blocking out a level/environment with primitives with a grey texture applied is called gray boxing. This process is very important as it helps to visualize the 2D sketch that the level designer uses to jot down the ideas. Gray boxing is a quick way to prototype a level and get it into the game for play testing. It also helps us to determine if the level is going to be fun, if the scale is right and is the environment balanced.

1.2.2 Map:

This term refers to a 2D sketch in an image format representing a particular landscape area in the level (example: trees)

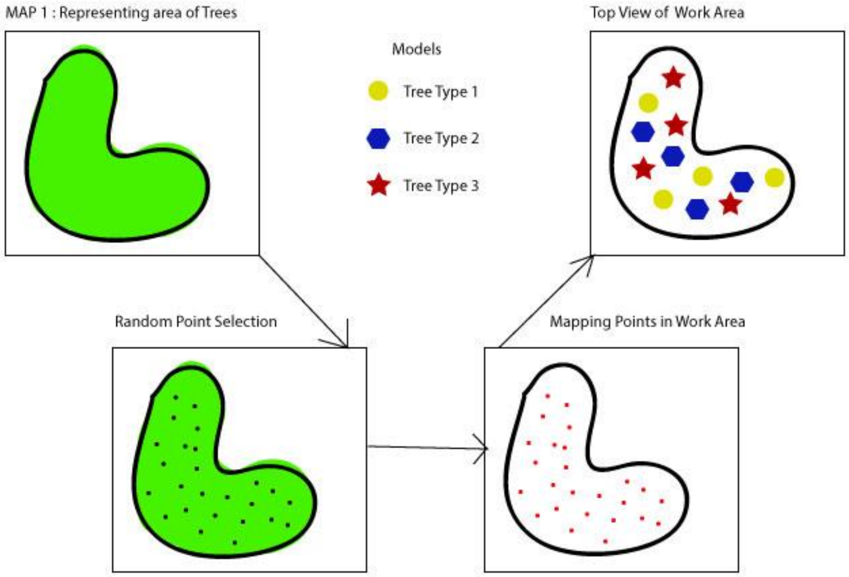
2 PROPOSED DESIGN

The system provides an easy intuitive interface that helps artist create a complete 3D level from a 2D layout with randomized asset placement options.

2.1 SYSTEM ARCHITECTURE

2.1.1 Base Functionality

The artist provides a map (an image with a colored area). The system reads the map and creates a relation between the image and the work area. The scale of the work area can be defined by the artist. The artist then includes the models that he needs to randomly place in the mapped work area. The artist will be allowed to change the attributes of randomized point selection. The system then placed these included models at different scales in these randomized points. The scaling range of these models can be specified by the artist. The artist will now have a work area which is randomly populated with the provided models at different scale. This can be exported out for use with different modeling software and game engines.



General Process of the System

2.1.2 Expanding the Base Functionality

- The base functionality can be repeated for different models and different maps
- The different maps mentioned refer to input images which have a different colored area representing a different landscape
- The scene created using the different maps can be combined to create one environment
- Artists should be allowed to assign priorities for the different maps and this can be used in case the mapped areas overlap

2.1.3 Nice to Have Feature

- Allowing the Artist to draw the map in Houdini
- Generate an clickable map interface (either Grids or Centroidal Voronoi Tessellation)
- Allow artist to mark the grid/tessellations (This will serve as a replacement of the image map)
- This will help the artist to make changes to the map.
- This will also cut down the effort to create a map in a image editing software which is required in the base functionality

2.1.4 Stretch Goals

- Defining a height map that can be used on the land
- Incorporating additional feature to construct roads or other areas where a random placement of assets is not needed
- Defining a density map which can be used to concentrate assets in one particular region of the map

3 SYSTEM DESIGN STEPS

1. Mapping the Input Image (map) to the area of placement
    a. Read the Input image
    b. Identify Colored Area
    c. Map the Colored area to the actual placement area
    d. Provide option to scale the placement area
    e. Update Mapping to fit new scale
2. Determining the Random points inside mapped area of placement
    a. Finding Random distribution of points in the mapped area
    b. Provide options to choose different randomization
3. Randomly choosing from different models to place in the determined points
    a. Import and add different models that the user provides to the system
    b. Randomly choose among the added models
    c. Allow the user to provide a scaling range for the models
4. Placing the selected models in the determined points
    a. Provide a generate options to place the models

4 SYSTEM COMPONENT DESCRIPTION

4.1 LOADING THE MAP (Base Functionality)

This component associates the map that has been imported into the system with the work area. The user interface of this component will have the functionality to import the map. The artist will be given the option to scale the mapping as needed.

4.2 RANDOMIZATION COMPONENT (Base Functionality)

This system component generates random array of locations in the mapped work area. The interface of this component will help the artist to control the randomization with a variety of attributes. The artist can also create uniformly distributed locations with this interface. Note that all the locations generated will adhere to the map.

4.3 RANDOM PLACEMENT OF ASSETS (Base Functionality)

This component places the imported assets in a uniform/random order in the generated locations. The artist will have the option to provide a scaling range which the system uses to randomly scale the assets.

Note: Several components will be added here once the base functionality is achieved

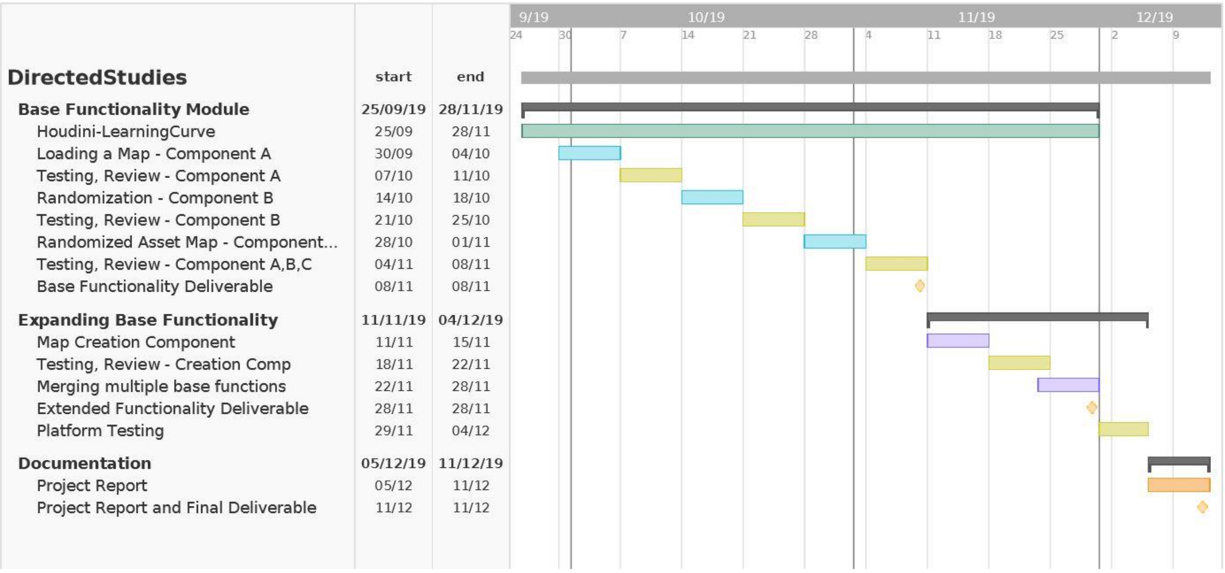
5 BASE USE CASE

The artists could draw different maps, each map specifying a particular landscape area (roads, vegetation, fields, rocks, buildings, etc) and the 3D landscape generated changes based on it. The assets that are to be used in the procedural construction of the 3D environment has to be specified by the artist.

6 SOFTWARE DEVELOPMENT TOOLS

- HOUDINI for Tool Development
- Unreal & Maya for Using the Tool
- Microsoft Word for Documentation
- Adobe Illustrator for Visualizing Diagrams
- TeamGantt.com for project schedule and management

7 PROJECT SCHEDULE (Gantt Chart)



DirectedStudies	start	end
Base Functionality Module	**25/09/19**	**28/11/19**
Houdini-LearningCurve	25/09	28/11
Loading a Map - Component A	30/09	04/10
Testing, Review - Component A	07/10	11/10
Randomization - Component B	14/10	18/10
Testing, Review - Component B	21/10	25/10
Randomized Asset Map - Component...	28/10	01/11
Testing, Review - Component A,B,C	04/11	08/11
Base Functionality Deliverable	08/11	08/11
Expanding Base Functionality	**11/11/19**	**04/12/19**
Map Creation Component	11/11	15/11
Testing, Review - Creation Comp	18/11	22/11
Merging multiple base functions	22/11	28/11
Extended Functionality Deliverable	28/11	28/11
Platform Testing	29/11	04/12
Documentation	**05/12/19**	**11/12/19**
Project Report	05/12	11/12
Project Report and Final Deliverable	11/12	11/12