Requirements

You will design and implement a simple semi-procedural WebGL app that will paint a very simple top-down village. In this program, there will be 5 different entities: terrain, river, houses, trees, and rocks.

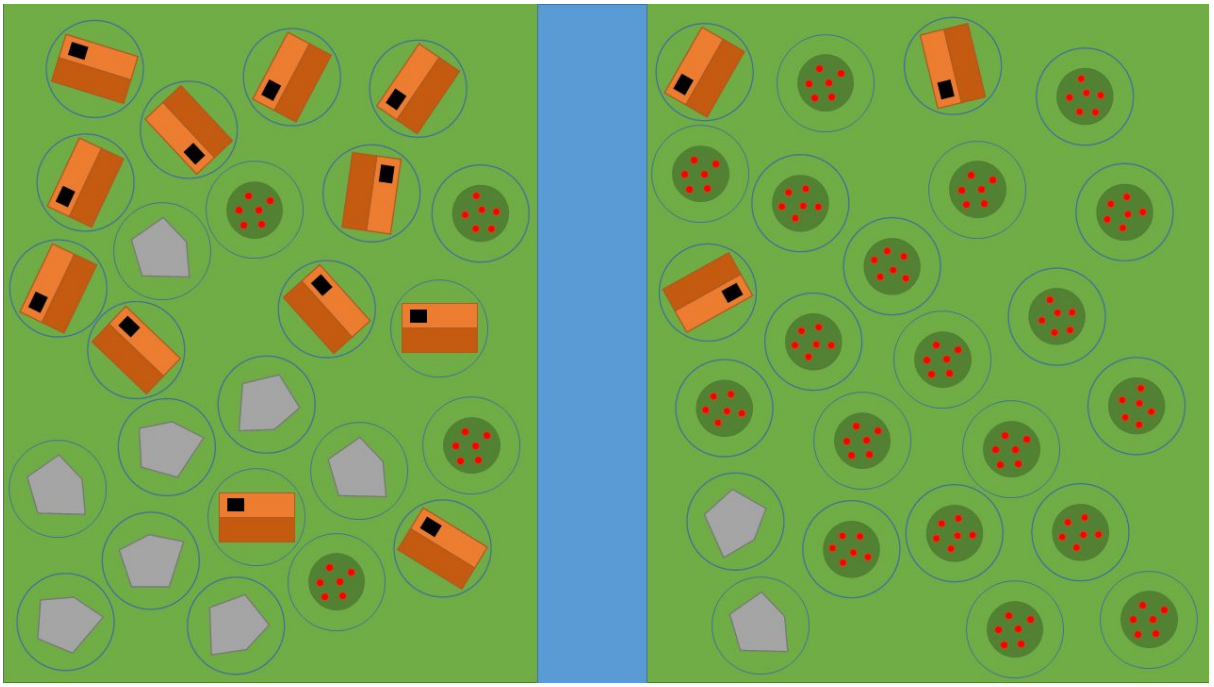
- **Terrain:** Terrain should cover the whole scene.
- **River:** River should be in the middle of the screen and lay vertical. River width should be a random value between user-specified values(river_width_min, river_width_max).
- **Houses:** Houses should be represented using a roof (use slightly different colors as shown in the image) and a chimney.
- **Trees:** Trees should be represented using a circle. You should use additional circles to draw fruits.
- **Rocks:** Rocks should be represented as simple polygons.

The placement of **houses**, **trees** and **rocks** will be driven by simple Poisson-Disc sampling process. To do that, assign a radius to each entity. Entities' drawable content should never overflow from the circular shape defined by its radius. Start generating 2-D coordinates on the canvas and check for previously placed entities and river for collisions/overlap. During these checks, you should only consider the circular borders of the entities. If there is an overlap, simply do not generate an entity at the given position and choose a new random position. This process should continue until a certain number of entities are generated. This value should be user-defined.

Entities must have a random rotation to ensure variation.

Before drawing an entity, you should decide on the type of the entity. To decide, you will use 'attractors' that are placed on the canvas by the user. You should be able to create an attractor for each kind of placeable entity (houses, trees, and rocks). Once you generate a coordinate and there is no overlap on this coordinate, probabilistically decide on the type of the entity considering the distance between entity and attractors. If an entity is very close to a house attractor, then this entity should be a house with a relatively large probability. Attractors should be placed on the canvas by the user. When the user places a new attractor on a canvas, the whole village should be regenerated.

In the User Interface (UI), there should be appropriate controls for variables and attractor types, and so on. In the following figure, a sample village drawing is shown. In this figure, there are three attractors. On the top-left, there is a house attractor. On the bottom-left, there is rock attractor. On the right part of the canvas, there is a tree attractor. Borders of the entities are shown in blue for illustrative purposes. You should **not** display those in the demo (it is useful for debugging though).



You need to use suitable GL primitives for each entity (quads, tris, etc). **Don't hardcode the coordinates of the vertices.** For example, circular entities (trees) should have at least 32 segments which you can compute using trigonometric functions.. Don't be afraid to get creative! You could add random variations to entities to generate better-looking drawings. Also, additional effects & entities are welcome! Since each drawing will be random, you might want to save them if one of them looks interesting. Provide a save and load mechanism that saves the properties of the drawings (coordinates and colors of the houses, trees and so on). You should be able to load these files from disk and get the exact drawing. (Do not save the whole framebuffer pixel by pixel!). You can also save the whole drawing by just saving the random seed, attractor positions and user defined parameters. However, for this assignment, you are not allowed to do that.

Important: Always comment your code. The code will also be checked during the demos.

Tips

Also DO NOT use the third party wrappers like three.js. Use WebGL from scratch.