Advance Graphic Report
Assignment 1
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This assignment explores generating terrain through a fractal type algorithm. The algorithm that we were assigned to do is Diamond Square algorithm. This algorithm uses four value that is initialized and will generate a whole terrain from those two values;

To generate any terrain, I would have to make a heightmap and using Diamond Square Algorithm, generate a height value for each index. Given the input being an odd number for the number of grid points, we can initialize the height map array like so;

```
this->heightMap = new GLdouble* [this->resolution];

for (int i = 0; i < this->resolution; i++){
        this->heightMap[i] = new GLdouble[this->resolution];
        for (int j = 0; j < this->resolution; j++) {
                this->heightMap[i][j] = 0.0;
        }
}
```
Where this->heightMap is an 2d array of [n][n], and this->resolution is the n value

After generating the height map with zeros value, we would need to give the four value to the height map such that the Diamond square algorithm generates the height value. This is done by

```
this->heightMap[0][0] = GenerateValue();
this->heightMap[0][this->resolution - 1] = GenerateValue();
this->heightMap[this->resolution - 1][0] = GenerateValue();
this->heightMap[this->resolution - 1][this->resolution - 1] = GenerateValue();
```

Where GenerateValue() will generate random values. The GenerateValue() was supposed to generate value from 0,1, however for actual changes that we can see, I have increased the range

Now the actual part will begin, in order to compute the Diamond Square algorithm, I would need to compute the diamond, then square steps. I first called the function

```
void diamondSquare() {
        int sideL = this->resolution / 2;

        diamondSteps(this->resolution);
        squareSteps(this->resolution);

        while (sideL >= 2){
                diamondSteps(sideL + 1);
                squareSteps(sideL + 1);
                sideL /= 2;
        }
}
```

Which will initiate the algorithm. The main approach on doing this algorithm was by recursion, however in this case, I'll be recomputing the diamond and square every time. I

compute the diamond by averaging the four corners, and the middle point will be assigned the average. I also at the random value to the average, since the terrain could look really plain. For the square, I average the 2 corners + the middle point to find out the side value.
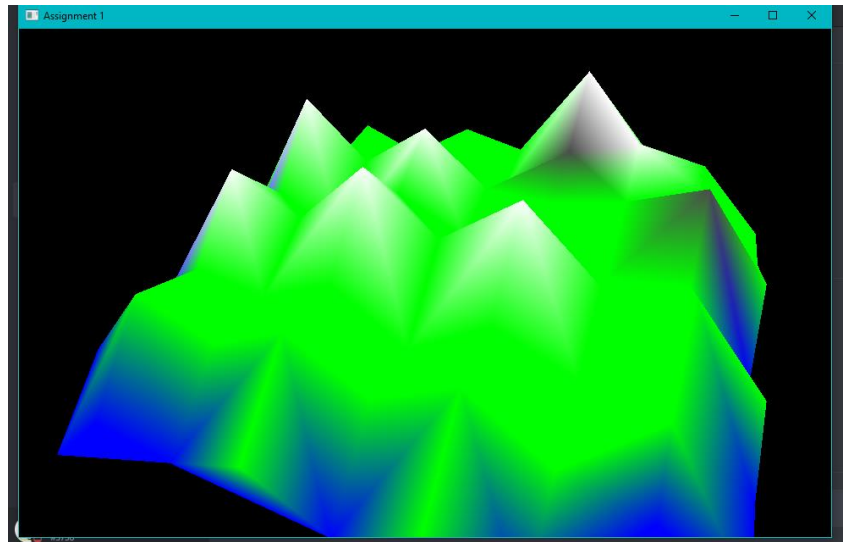
At the end, I would generate this terrain. Unfortunatly for somereason the `this`->resolution would only work up till 9.