

## Exercise 9

### Exercise 9.1 - Octree Structure for Isosurfacing

32bit floating point  $\rightarrow$  4 bytes for each voxel

only the last layer needs to store these voxels which contains  $500 * 500 * 100 = 25\,000\,000$  nodes

$$8^x \leq 25\,000\,000 \Rightarrow x = 9$$

$$layer_9 = 8^9 = 134\,217\,728 \text{ leaves}$$

$$layer_8 = 8^8 = 16\,777\,216 \text{ leaves}$$

$$layer_7 = 8^7 = 2\,097\,152 \text{ leaves}$$

$$layer_6 = 8^6 = 262\,144 \text{ leaves}$$

$$layer_5 = 8^5 = 32\,768 \text{ leaves}$$

$$layer_4 = 8^4 = 4096 \text{ leaves}$$

$$layer_3 = 8^3 = 512 \text{ leaves}$$

$$layer_2 = 8^2 = 64 \text{ leaves}$$

$$layer_1 = 8^1 = 8 \text{ leaves}$$

$$layer_0 = 8^0 = 1 \text{ leaves}$$

full octree:

$$= 134\,217\,728 * 4 \text{ bytes}$$

$$= 536\,870\,912$$

$$\approx 537 \text{ MB}$$

minimum and maximum values:

$$= 134\,217\,728 + 2 * (16\,777\,216 + 2\,097\,152 + 262\,144 + 32\,768 + 4096 + 512 + 64 + 8 + 1)$$

$$= 172\,565\,650 * 4 \text{ bytes}$$

$$= 690\,262\,600 \text{ bytes}$$

$$\approx 690 \text{ MB}$$