DATA PREPARATION

This document provides more details about training data preparation. We assume the 256^3 voxel models are given. All illustrations are 2D examples, which can be easily transferred to 3D cases.

A. Voxel models in different resolutions (16^3, 32^3, 64^3, 128^3)

At each resolution, we label a voxel occupied if this voxel contains at least one occupied voxel in the 256^3 model. See Figure 1 for an example, where 16^3 is given and 8^3 and 4^3 are sampled.

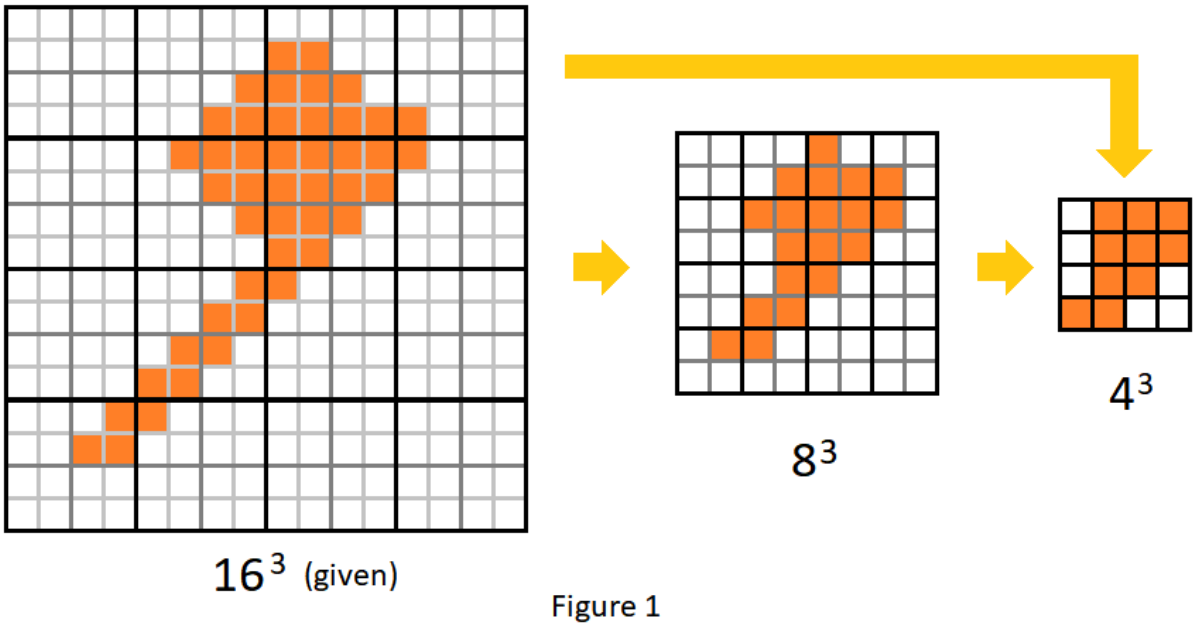

Figure 1

B. Sampling point-value pairs

For 2D shapes, we simply take the center of all pixels as points and the corresponding values as values.

For 3D shapes, we sample more points near the surface to keep the number of point-value pairs not too large. Specifically, we sample each resolution with the following number of point-value pairs.

Voxel grid resolution	16^3	32^3	64^3	128^3
Number of points	16^3	$16^3 \times 2$	32^3	$32^3 \times 4$

We use one of the three sampling approaches:

(1) Sample points which are within 3 voxels (in all x,y,z directions) from shape boundaries. If the number of sampled points does not exceed the limit, randomly sample more points up to the limit.

(2) If (1) fails, sample points every two voxels in all x,y,z directions. If the number of sampled points does not exceed the limit, randomly sample more points up to the limit.

(3) If (2) fails, randomly sample points up to the limit.

See Figure 2 for an example.

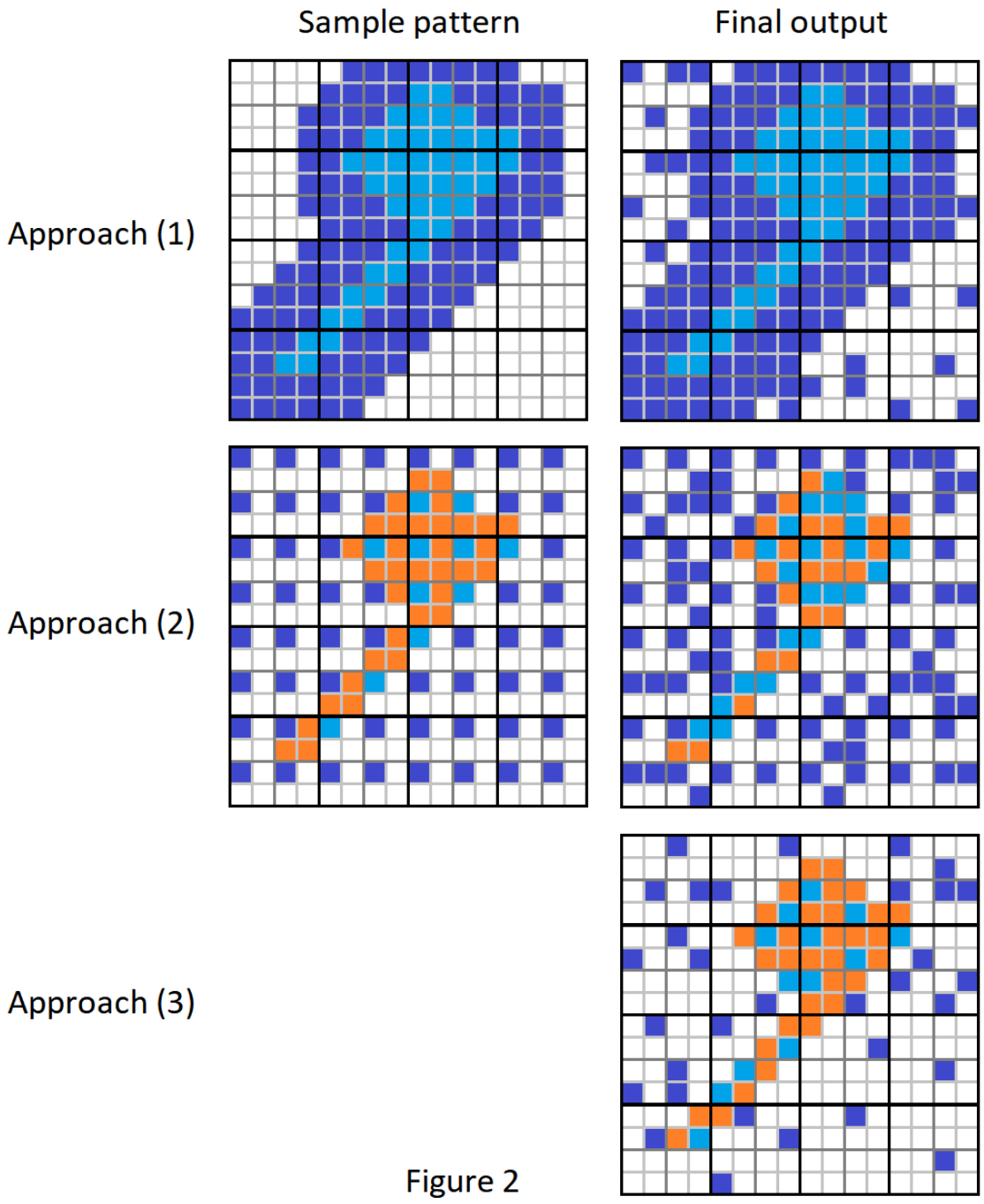

Figure 2

In practice (1) works for most shapes, therefore we did not try sampling points within 2 voxels from shape boundaries as an alternative to (2).

We assigned weights of all sampled points to 1. Because we want the model to pay more attention to the surface and allow small error in the void area, as long as the error is lower than the marching cube threshold.