CS 519: Interactive Computer Graphics Fall 2015
In-class Worksheet 2

Dual Contouring

Dual Contouring in 2D (Surface Net) Algorithm
Choose an isovalue σ

Let s_p be the scalar value at a grid point *p*
A grid edge e = [*p*,*q*] is bipolar if $s_p \geq \sigma$ and $s_q < \sigma$ or the reverse

Estimate the point of intersection on e as:
$w = (1-\alpha)p + \alpha q$ with $\alpha = (\sigma - s_p)/(s_q - s_p)$

Let w_i be the *k* intersection points around a grid face.
Compute the contour vertex as:

$$w_c = \frac{1}{k}\sum_{i=1}^{k} w_i$$

Generate lines connecting contour vertices across bipolar grid edges.

1. **Dual Contouring**
   Suppose we chose an isovalue of 5. Generate the dual contour for the grid below. Simply estimate the vertex positions.

8	9	7	6	3
7	3	5	3	2
8	1	7	8	4
8	6	4	2	6
9	8	3	7	6

2. Vertex Placement

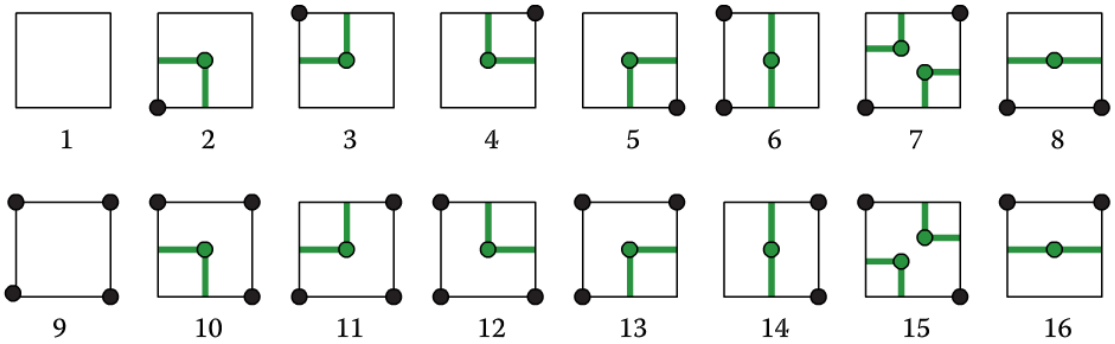
What are the coordinates of the contour vertex generated for the cell using an isovalue of 5.

s(0,0) = 8 s(1,0) = 9

s(0,1) = 7 s(1,1) = 3

3. Dual Marching Squares

Dual Marching Squares places contour vertices in cells but uses a lookup the following lookup table to generate the contour:



What cells from question would be different and in what way?

What problem with Dual Contouring is Dual Marching Squares attempting to solve?