CSCIE 236 – Homework 2, Written portion
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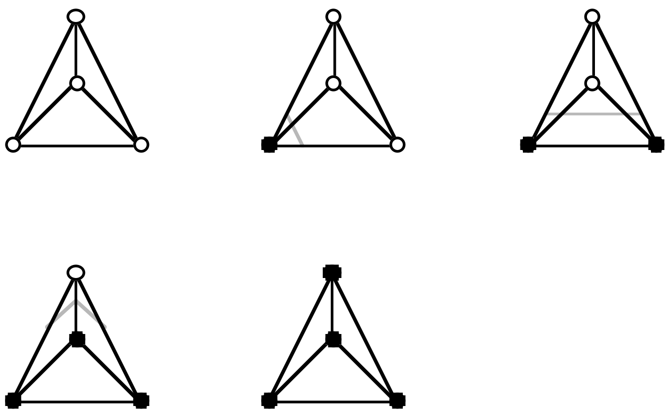
Consider the case of marching tetrahedrons. Enumerate all possible contour cases up to rotational symmetry.

a) Draw out each of the contours.

Without rotational symmetry there are 2^4 = 16 contours.
With rotational symmetry contours are reduced to only 5 cases, these cases are:



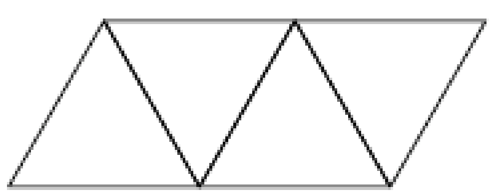
Dark vertices indicate scalar value is above contour value.

b) Are there any ambiguous cases?

No, there are no ambiguous cases in the instance of marching tetrahedrons, where every vertex is adjacent to every other vertex in the tetrahedron. In other words, all vertices being connected, there is no room for ambiguity, unlike marching squares or marching cubes where opposing vertices can create potential ambiguity.

c) How would you run marching tetrahedrons on a rectilinear volume?

The tetrahedrons would be calculated in a solid interconnected lattice "net" over the rectilinear volume. Every row of the net would be comprised of an upright and an inverted tetrahedron, like so,



The net would completely cover the rectilinear volume, overlapping at the edges, and the volume could then be rendered using marching tetrahedrons.