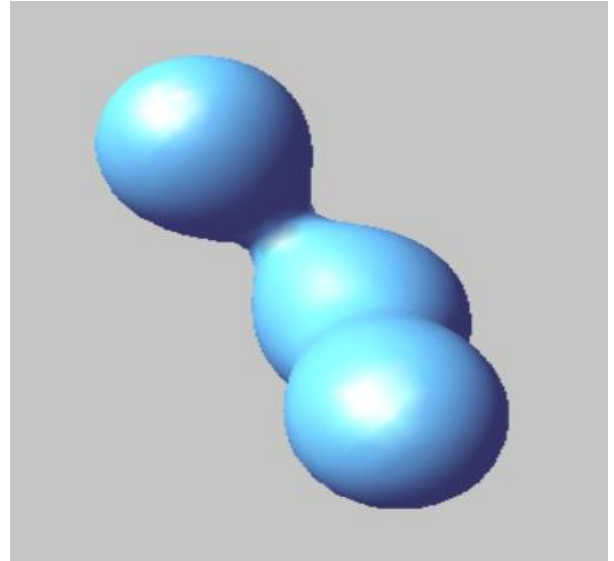
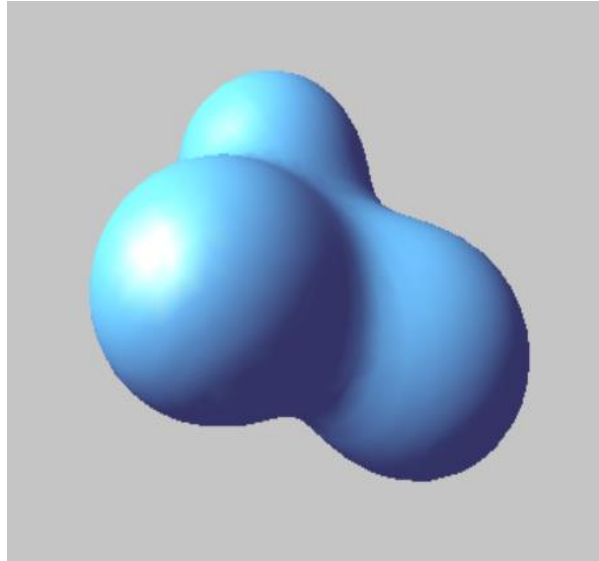
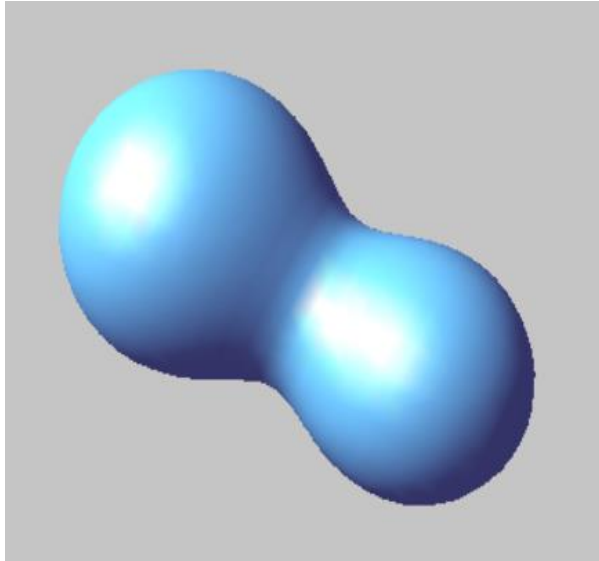


# Marching Cubes



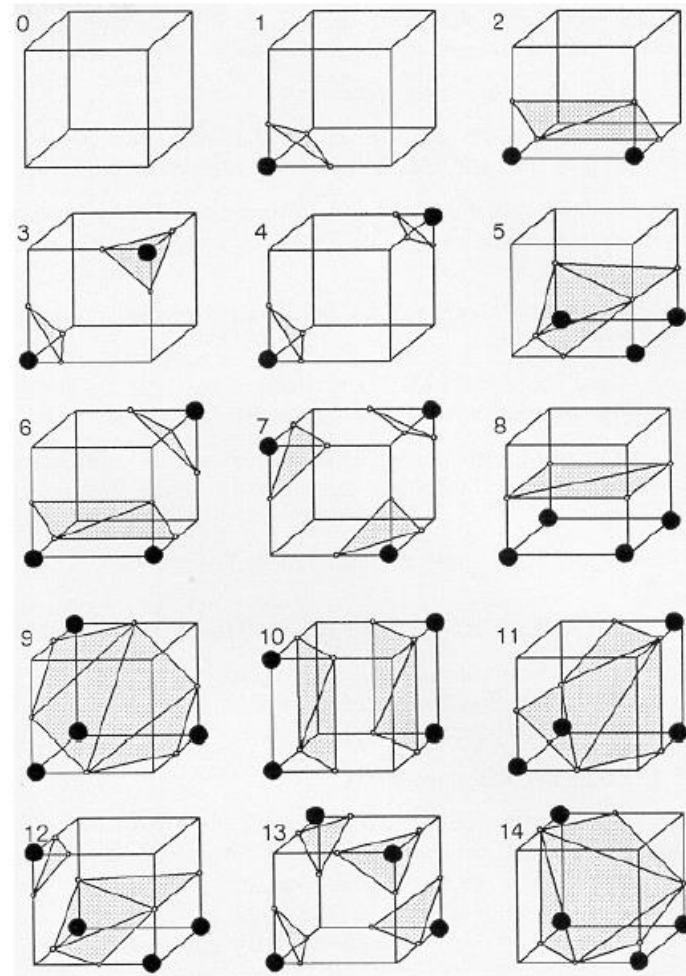
# Metaball and Blobby Algorithms

- Marching cubes:
  - Approximating surface of 3D blobby surfaces through volumetric sampling.

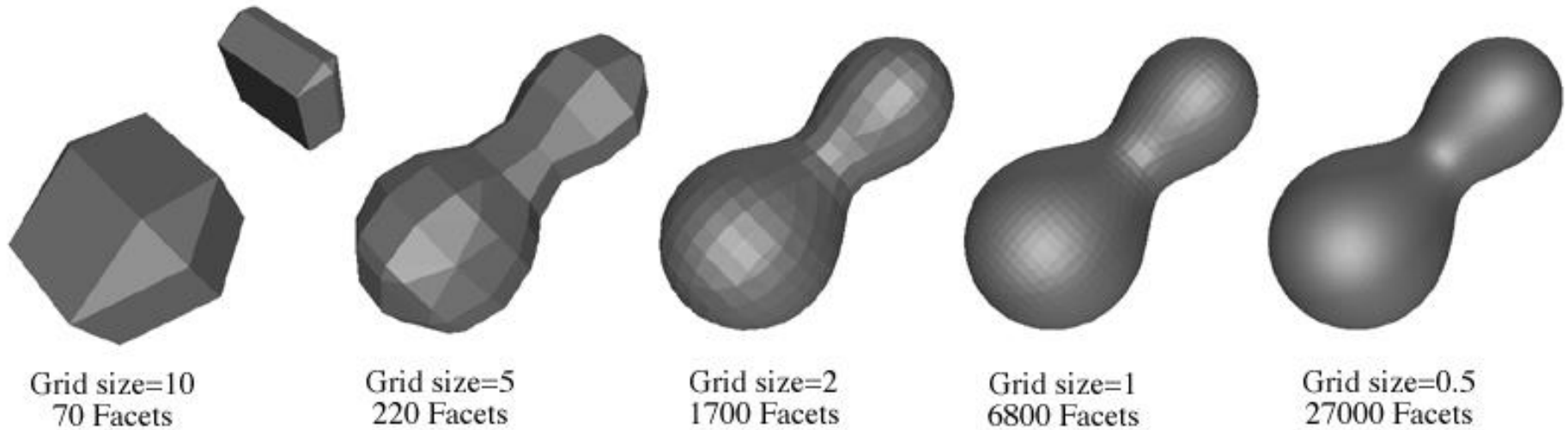
# Marching cubes algorithm

- Construct 3D surface based on sampling with cubes!
- Cubes are then sliced into triangles.
- Triangles determine if we are on the surface of or inside the metaball object

# Marching cubes algorithm: cases



# Marching cubes: grid size samples



Source: <http://paulbourke.net/geometry/polygonise/>

# Variation on a them: Marching Tetrahedrons

- Construct 3D surface based on sampling with tetrahedra!
- Avoid patent infringement on Marching Cubes algorithm.

# Metaball OpenGL source code

Paul's Project metaball download:

<http://www.paulsprojects.net/opengl/metaballs/metaballs.zip>

# For Further Reading

Bourke, P. (1994). Polygonising a scalar field. Retrieved from <http://paulbourke.net/geometry/polygonise/>

Kommareddy, S., Siripun, J., & Sum, J. (n.d.). *3D Object Morphing with Metaballs*. Retrieved from <https://www.evl.uic.edu/creativecoding/cs488/finalprojects/metaball/metaball.pdf>

Lorensen, W. E., Cline., H. E. (1987). Marching cubes: A high resolution 3D surface construction algorithm. *Computer Graphics* 21(4), 163-169.

Nielson, G. M. & Franke, R. (1997). Computing the Separating Surface for Segmented Data. Proceedings of IEEE Visualizations '97. DOI: 10.1109/VISUAL.1997.663887

*Paul's Projects*. (n.d.). <http://www.paulsprojects.net/opengl/metaballs/metaballs.html>

Wong, J. (2014). Metaballs and Marching Squares. Retrieved from <http://jamie-wong.com/2014/08/19/metaballs-and-marching-squares/>

Wyvill, G., McPheeters, C., & Wyvill, B. (1986). Data structure for soft objects. *Visual Computer* 2(4), 227-234.