CS 519 Scientific Visualization
Machine Problem 1: Due 9/23/2016 at 11:55pm

**Programming Language and Tools**

For this MP, use HTML5 and JavaScript. If you wish, you can use WebGL, although you can accomplish the MPs just using the HTML5 *canvas* element as you have done in class.

Marching Squares

You will implement marching squares to draw 2D contour lines. The algorithm is described in section 5.3.1 of *Data Visualization: Principles and Practice* by Telea. You can also refer to the Wikipedia article (http://en.wikipedia.org/wiki/Marching_squares).

Implementation Requirements:
1. Your user interface should support the specification of an arbitrary number of contour values. You could use a text box to allow the user to type in a list of values, for example. Similarly your code should support the creation of multiple contour lines.

2. You should resolve the ambiguous case for marching squares by averaging the function values at the corners of the square to generate a sample in the square center as shown
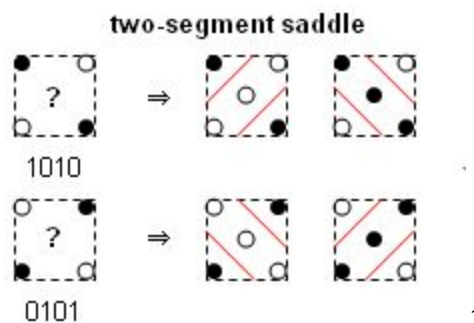
3. In addition to rendering the contour lines, your code should display the function across the domain using the rainbow color map. In the interest of saving you time, you don't need to draw a legend depicting the mapping of color to values, although you would obviously do so for professional work.

4. Implement another colormap that is neither greyscale nor rainbow. Design a colormap with a clear break at the zero crossing.

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[1] "Marching-squares-isoline". Licensed under CC BY 3.0 via Wikipedia - http://en.wikipedia.org/wiki/File:Marching-squares-isoline.png#mediaviewer/File:Marching-squares-isoline.png

5. Your code should work for the Gaussian function we have used in class, as well as the function $sin\left(\frac{1}{x^2+y^2}\right)$ which can be seen in Figure 2.3 of *Data Visualization: Principles and Practice* by Telea

6. Your code should consist of the following files:
   ScalarVis.html
   ScalarVis.js
   SciVisMath.js
   UGrid2D.js
   You may base your code off of startup code available on GitHub at
   https://github.com/shaffer1/UIllinois_SciVis/tree/master/MP1

Grading

The MP is worth 10% of your total course grade. It will be graded out of 10pts as follows:
- 6 points: Correct Implementation of Marching Squares
- 2 points: Correct implementation of the new colormap
- 1 point: Providing a reasonable user interface
- 1 point: Implementing the function $sin\left(\frac{1}{x^2+y^2}\right)$

Submission

Submission will be through Compass. You are required to submit the following:
1. Your source code (all four files listed above).
2. An image demonstrating marching squares applied to the Gaussian function you implemented in class with multiple contour lines.
3. An image demonstrating your new colormap applied to the new function you implement