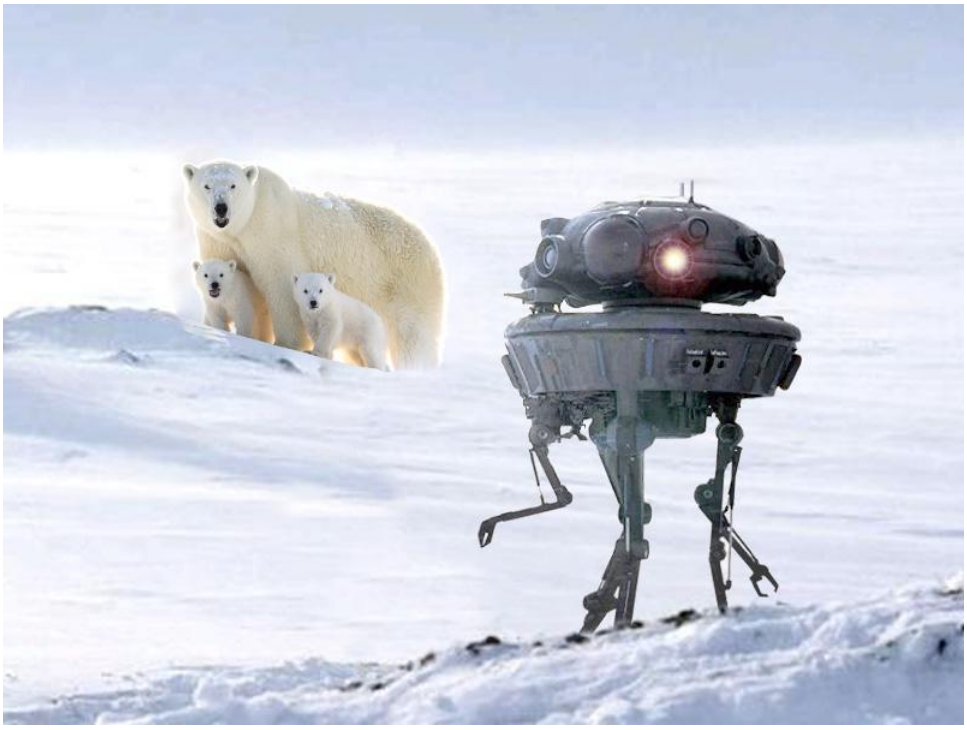
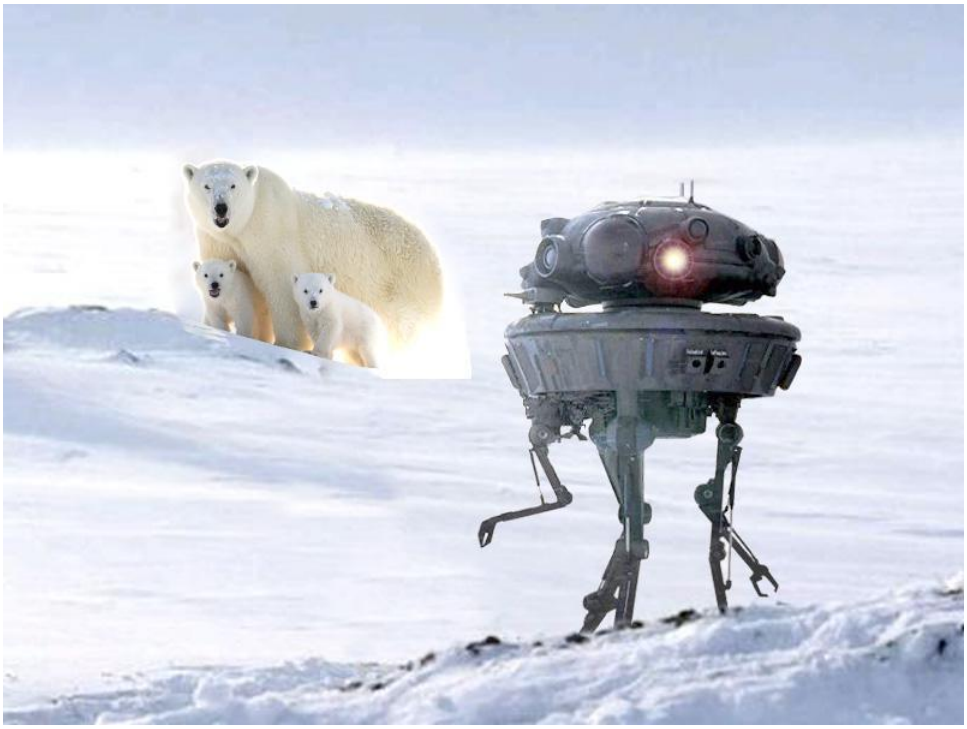
CS445 Project 3, Nathan Fitzpatrick

The composite figure below contains 1) the target image 2) the source image 3) the masked image pasted directly onto the target image, and 4) the final Poisson blend. Poisson blending works by solving the foreground pixels as a system of linear equations. The boundary conditions for those equations are set such that the gradients at the edge of the foreground match the gradients at the background, and the internal gradients within the foreground are preserved. With the penguin sample images, I found that using a dense array for the equation matrix was not only inefficient but impossible because it was so large it could not be instantiated in memory. So, as per the recommendations in the sample code I decided to use a sparse csr_matrix for the equation matrix. With this matrix, the blending worked but it took over 7 hours to solve. After timing each portion of my code, I discovered that it was not the solver that took so long but building the equation matrix. I then proceeded to use a lil_matrix (a different form of sparse matrix) which is much more efficient at changing the structure of the matrix, then converting to a csr_matrix for the solver. This approach took the total solve time from over 7 hours to about 6 minutes.

More Poisson Blending Results:



Failure: For some reason, I observed that if the source image mask has sharp edges, the Poisson blend results in a bright white bloom at that location. I have thought about it, but I'm not quite sure why that is.



Mixed Blending

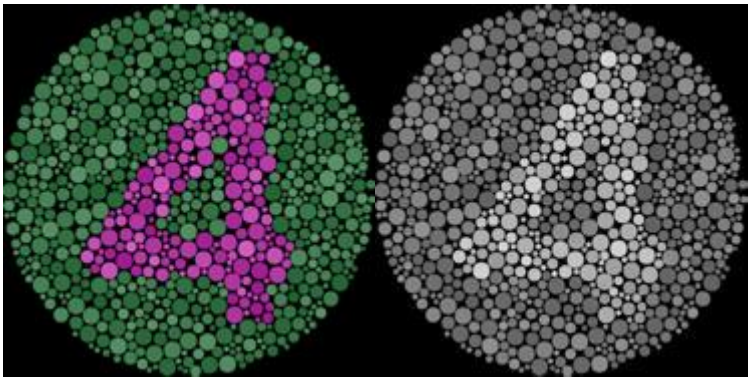
The following figure shows the mixed gradient blending result.

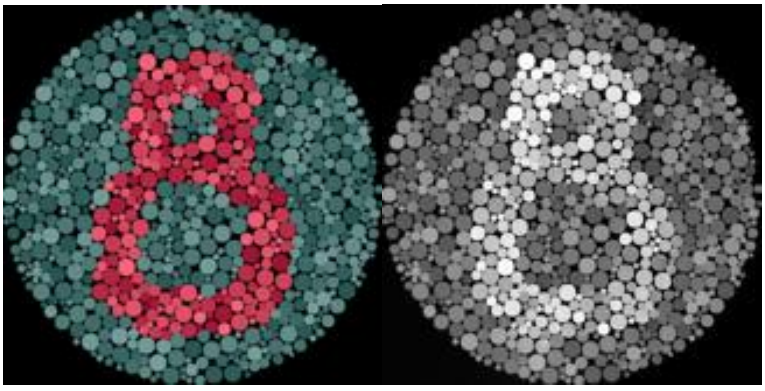
Toy Problem

The error I got for the toy problem was: 0.00031701850068623744

Bells and Whistles

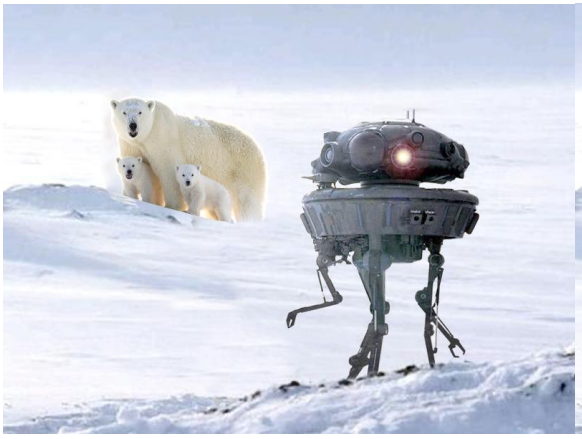
I chose to do the Color2Gray bell and whistle. The code for this work is in the project notebook.



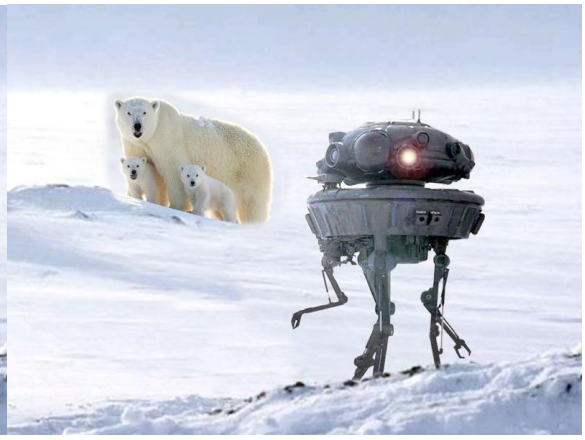


I also did the do the Laplacian pyramid blending bell and whistle.

Poisson Blend



Laplacian Blend



It seems the Poisson blend performs better at hiding the seams between the two images. It's also clear that the polar bear's color has changed in Poisson blending.

Points:

I believe I should receive all 100 points for the regular assignment and 40 points of bells and whistles.