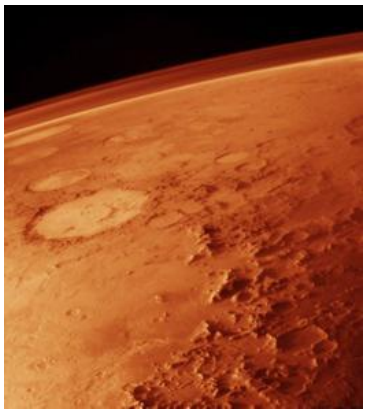
DMET 1002 – Advanced Media Lab

Lab 2 Procedure

Unsharp Mask

In all parts of this lab, you will process the image "Mars.jpg" shown below with the goal to get the sharpened image shown on the right. You will be implementing each of the parts detailed below using MATLAB.



PART 1: Sharpening by Mean Subtraction

Write a MATLAB function to apply the sharpening by mean subtraction algorithm to the "Mars.jpg" colored image. The function should take the image, the size of the average filter s and the weight factor w as inputs and it should output the sharpened image. When applying the average filter to the colored image, apply it to each of the R, G and B matrices individually.

Note: Write your own average filter function. Don't use the MATLAB function.

1. **Show the output image for ($s = 3$, $w = 1$) and ($s = 3$, $w = 3$)**
2. **Show the output image for ($s = 5$, $w = 1$) and ($s = 5$, $w = 3$)**
3. **From the images you obtained in 1 and 2, how does changing s and w affect the sharpened image?**

PART 2: Sharpening by Edge Detection

Write a MATLAB function to apply the sharpening by edge detection algorithm to the "Mars.jpg" colored image. The function should take the image and the weight factor w as inputs and it should output the sharpened image. In your implementation, you can use the MATLAB edge detection function `edge`. Use the Sobel operator in your implementation.

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Notes:

- To know how to use the MATLAB function `edge`, check the help.

- The following use of the MATLAB function `edge` "[BW,thresh,gv,gh] = edge(I,'sobel')" returns vertical (gv) and horizontal (gh) edge responses to Sobel gradient operators. Edge magnitude can be computed for any pixel (i, j) as $M(i,j) = \sqrt{gv(i,j)^2 + gh(i,j)^2}$.

- If the sharpened image does not show properly, make sure you re-scale it such that the maximum color in each of the R, G and B matrices is 255.

4. Show the output image for w = 50 and w = 300

5. Which of the two algorithms (the one in PART 1 or the one in PART 2) gives a better output?

6. MATLAB has its own sharpening method `unsharp` that uses the function `fspecial`. Search the help for the word `unsharp` and use it to sharpen the image "Mars.jpg". Show the output obtained