**USER STORY ONE: NATURAL SCENES**

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**User Story 1: Natural Scene**

Swapan Chakrabarti wants a way to upload an HDR photo of a natural image and have a tone-mapped image displayed after processing. He wants to enter a file path and have the minimum, maximum, and average intensity of the HDR image displayed. After viewing those values, he wants to be able to enter settings of his choosing for saturation, lightness, and number of tiles. Finally, he wants the tone-mapped image to be displayed, along with the mean, standard deviation, and signal-to-noise ratio of the image. If any of the user-entered values (filepath or parameters) are invalid, an error message will be displayed.

Tasks

1. Take in input for the file path of the image. MATLAB requires single quotes and a .HDR file type. If the file entered is a correct path surrounded by single quotes of .HDR file type, the image will be uploaded to the program.
2. Calculate and print average minimum and average maximum intensity values across the three colors for HDR image.
3. Display recommended and valid parameter ranges. Take in input fields for lightness, saturation, and number of tiles. If input is invalid, MATLAB will issue an error message and the script will exit.
4. Tone map image with user-provided parameters and save image to a variable.
5. Calculate mean, standard deviation, signal-to-noise ratio.
6. Display image and print mean, standard deviation, and signal-to-noise ratio.

Task 1:

The implementation and tests for task one were completed successfully. Since MATLAB does error checking for incorrect file names, the user is able to get instant feedback if the filename is wrong. As expected, the script terminates after an incorrect input.

Task 2:

The second task was implemented successfully. During testing, the initial results did not match the expected criteria. The minimum value was reasonable, but the maximum was much lower than expected. After checking the validity of the calculations, it was determined that the reason for this variation was due to the source of the image. To make image processing more feasible, Photomatix was used to create the HDR image used for testing, which has different intensity values than HDR images created using MATLAB. The minimum and maximum values for the average across red, green, and blue are correctly calculated and displayed.

Task 3:

Task 3 was implemented and tested without problem. When the user inputs their parameters for saturation, lightness, and number of tiles, MATLAB recognizes an incorrect input. If this occurs, an error message displays with the incorrect parameter and program terminates. Since the valid range of values for each parameter are displayed by the program, the user should have no difficulty entering accepted values. When the values are correctly input, the variables they are assigned to will be plugged into the images to be tonemapped.

Task 4:

Tone-mapping the image worked as expected, providing a visually pleasing result. The image quality may vary depending on user settings, but the recommended values will provide a good basis. As the user experiments more they can learn what to look for in a high quality tone mapped image and how to more consistently get those results.

Task 5:

The testing for this fifth task required ensuring that the calculations done on the final tonemapped image were reasonable. Four different methods were used to attempt to calculate the mean and standard deviation, until the correct calculation was found. The signal-to-noise ratio was much simpler to calculate and was accurate the first time.

Task 6:

This task required displaying the mean, standard deviation, and signal-to-noise ratio. This was a simple task and on the first attempt, the numbers displayed correctly.

Summary:

All tasks and tests for the user story were completed as outlined above. After completing all tasks, the software now successfully takes in a file path for an HDR photo, presents the average minimum and average maximum intensity values, and prompts the user to input parameters for tonemapping. Using those parameters, the software tonemaps the image and displays the resulting image along with statistics that provide feedback on the quality of the image.