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Progress Report

The goal of this experiment is to count the bacteria in the photographs and measure their length. The first image, confocal.mat, is provided in matrix format. Our approach is to import the image into MATLAB, convert to grayscale, then plot a histogram to view the distribution of shades in the image. If a pattern is observed, this will be used in setting the binary thresholding that is then applied to the image to convert it to binary. Once a binary image, the image will be cleaned up to isolate the bacteria, such as using open/close, erode, dilate, median, and/or area removal operations. The type of operation and amount of the operation applied (ex. iterations, structuring elements) will depend on whether we are counting bacteria or bacteria length, so we plan on having one image each. For the bacteria length image, it will then be skeletonized to calculate the length. The final images to count bacteria and bacteria length will be overlayed on the original confocal.mat image to see whether they visually capture the bacteria count/length well. The bacteria count number returned from bwlabel() in MATLAB will be compared with our hand-counted number of bacteria to verify that our approach yielded a reasonable count value. The bacteria length, obtained using the sum() function on the skeleton image in MATLAB, will be converted to an actual length (~um) using the ratio of pixel length : average length of an actual bacteria.

The above process will be repeated for the latticeLightSheet.jpg, with modifications to the import method (.jpg instead of .mat file) and binary operations used. There should not be a significant difference between the operations required to count bacteria numbers and bacteria length compared with confocal.mat, since both original images looked similar upon simple inspection. The histograms would be very useful in this case, because there may be significant underlying difference in what either image captures.

Currently we have performed the preliminary steps for preparing the confocal.mat image for bacterial number and length counting, converting it to grayscale and then binary. The struggle

now is splitting the individual bacteria to count them, since they are currently overlayed and of varying brightness, making the image difficult to threshold. Our next steps will be to analyze the histograms and experiment with different image point operations to produce a better quality image of the bacteria.