MATLAB Marina – Interpolation

1. Briefly explain how interpolation can be used to estimate unknown values in a set of data.

2. Briefly explain when the estimated values from interpolation are likely to be accurate.

3. Write a MATLAB program that will:
   - Load the measured flow data from the Microsoft Excel file `flowdata.xlsx`. The data is in two columns: height and flow. Each column of data has a text header.
   - Plot the flow data (height versus flow). The flow data should be plotted using circles for the measured data points and no line. Title and label the plot appropriately.
   - Use the MATLAB function `interp1` to estimate the flow for a height of 2.2 feet using linear interpolation.
   - Use the MATLAB function `interp1` to estimate the height for a flow of 2.2 feet using linear interpolation.
   - Use the MATLAB function `interp1` to estimate the flow for a height of 2.2 feet using cubic spline interpolation.

4. Write a MATLAB program that will:
   - Load the measured flow data from the Microsoft Excel file `flowdata.xlsx`. The data is in two columns: height and flow. Each column of data has a text header.
   - Estimate the value of the height for a flow of 7.8 ft^3/s.
   - Extrapolate the value of the flow for a height of 6.0 feet.

5. Write a MATLAB program that will:
   - Load the measured flow data from the Microsoft Excel file `flowdata.xlsx`. The data is in two columns: height and flow. Each column of data has a text header.
   - Plot the flow data (height versus flow). The flow data should be plotted using circles for the measured data points and no line. Title and label the plot appropriately.
   - From the plot determine whether linear or cubic spline interpolation would better fit the data.
   - Estimate one additional data point between each measured data point using the determined interpolation method.
   - Plot the original measured flow data along with the original data values plus estimated values on the same axes. Use circles with no line for the original data points and a solid line for original plus estimated points. Title and label the plot appropriately (a legend is a good idea here).

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