

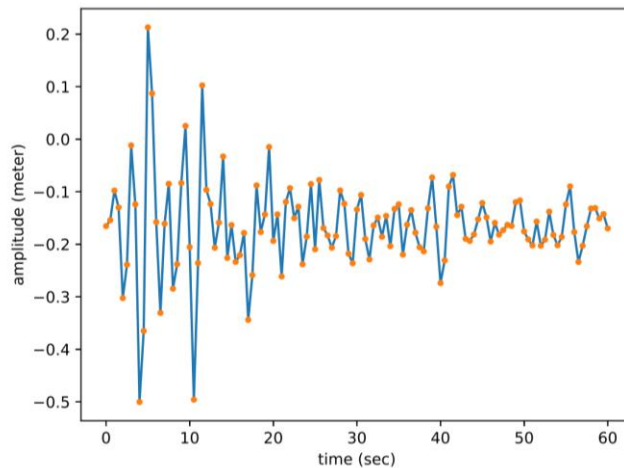
GLG490/598 Numerical methods

Homework #6

Due 11:59pm, 3/4/2021

(100 points)

Question: In this homework, you will use numerical methods to interpolate a time-series data. The data is named “HW06.origin.dat” under the homework folder. The plot of this data is shown below:



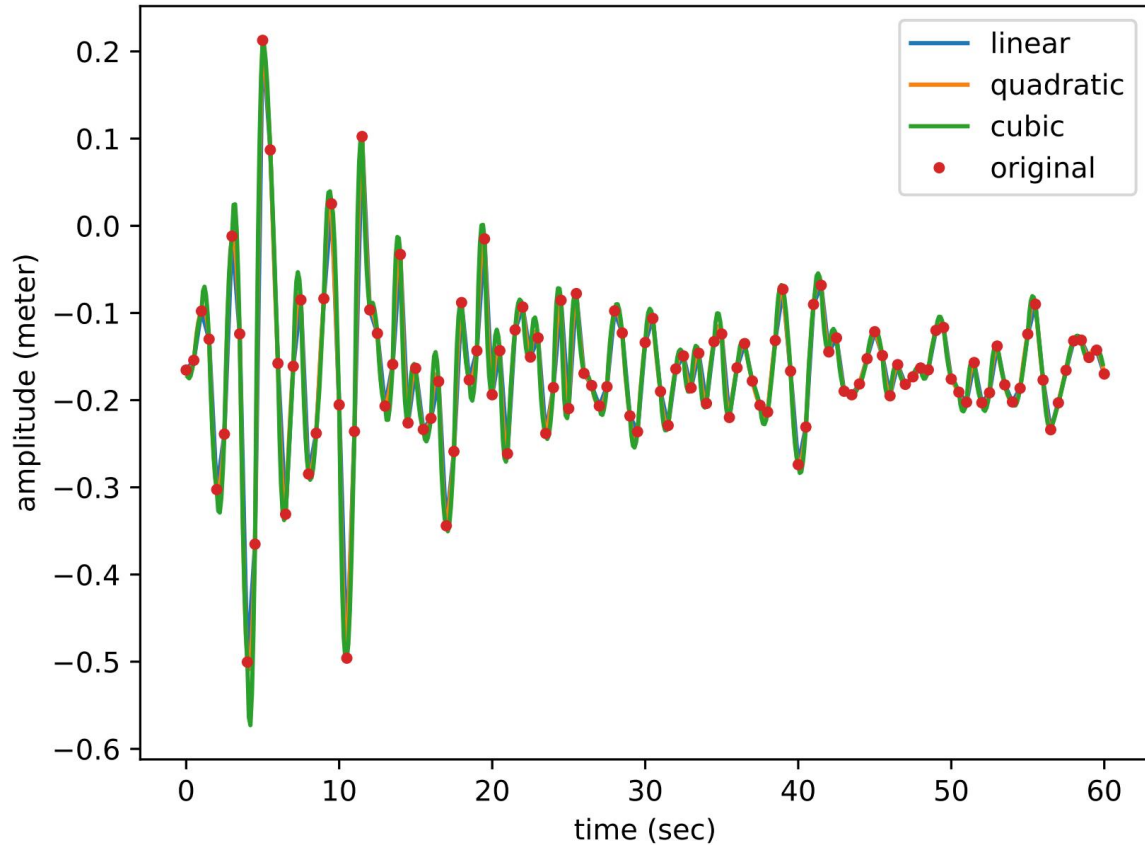
In the plot above, the orange dots are the data points. The data have a sampling rate of every 0.5 seconds.

Requirements:

- Write a C code to interpolate the data from $t=0.1$ to $t=59.9$, with a sampling rate of every 0.1 seconds.
- Use three different methods to do the interpolation, including linear interpolation (degree 1, $n=1$), quadratic interpolation (degree 2, $n=2$), and cubic interpolation (degree 3, $n=3$).
- Your code needs to output a data file with 4 columns with the format of (time, data with linear interpolation, data with quadratic interpolation, and data with cubic interpolation). Name the data file as “HW06.output.dat”. Below are the last few lines of my output data:

```
59.000000 -0.151050 -0.151050 -0.151050
59.100000 -0.149376 -0.146519 -0.149585
59.200000 -0.147702 -0.143417 -0.147505
59.300000 -0.146028 -0.141743 -0.145320
59.400000 -0.144354 -0.141497 -0.143541
59.500000 -0.142680 -0.142680 -0.142680
59.600000 -0.148148 -0.145291 -0.143247
59.700000 -0.153616 -0.149331 -0.145754
59.800000 -0.159084 -0.154799 -0.150710
59.900000 -0.164552 -0.161695 -0.158629
```

- Write a python code to plot the 3 interpolated data (in HW06.output.dat) together with the original data (in HW06.origin.dat). Plot the interpolated data as curves, and the original data as dots. Add legend to the plot. You should get similar plot as below:



How to submit your homework

1. Change the name of your C code as 'FirstName-LastName-HW06.c' and the python code as 'FirstName-LastName-HW06'. Please remove the .py extension in the python code for it to be able to send by email.
2. Send your code file to Mingming.Li@asu.edu and enter the email subject title as "Numerical Methods Homework 06".