

Homework 9

Phys 4350

Turn in your code as well as images of your plots. Remember to use axis labels. If a numerical answer is required, it should be printed out when the program is run.

1. Consider the data in the attached file, `data.txt`. This data is sampled from a periodic function $f(t)$ plus some high-frequency noise; the first column gives the time in seconds and the second column is the observed function value (which includes noise). Write a program to determine the periodic function $f(t)$ from which the data was sampled. First filter out the high-frequency noise. Then determine $f(t)$ based on the remaining frequency components. It's a sum of sine waves; print out the amplitude and frequency of each sine wave that makes up $f(t)$. Plot the original data overlaid with your function. You may use built-in Python functions to perform FFTs.
2. Consider the data in the attached file, `note.txt`. This data represents the waveform of a single note played on a piano. Write a program that plots the waveform, then calculates the Fourier transform, and plots the magnitude of the resulting coefficients. Based on these coefficients, determine what note was being played. (Use https://en.wikipedia.org/wiki/Piano_key_frequencies for the relationship between frequencies and musical notes.) You may use built-in Python functions to perform FFTs. The sampling frequency for the waveform is 44.1 kHz.