Indian Institute of Technology Jodhpur

Signals and Systems

EEL2010 Assignment 1

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1. We consider the scenario of predictive maintenance. It consists of continuous data collection and analysis of say an equipment installed in a manufacturing plant. Data collection may involve capturing signals (eg. audio, vibration patterns etc.) from the equipment under study. Analysis refers to making informed predictions about possible equipment failure, and is typically based on signal processing and data analytics. Such proactive approach for maintenance, as opposed to reactive maintenance, is expected to play a key role in the Fourth Industrial Revolution (Industry 4.0). Suppose it is known from prior experience that all frequency components in the signal captured from a properly functioning equipment should necessarily be ≤ 25 Hz. Using this information, your task is to analyze the provided signal $x[n]$ and predict if the equipment requires maintenance or not. Note that $x[n]$ was obtained by sampling a CT signal $x(t)$ at 100 Hz.

   Your submission should include: 1) description of your approach and thought process (i.e. what analysis you will do on $x[n]$), 2) implementation of your solution including code and all required plots/figures. Ensure that plots/figures have properly labeled axes. Any hint of plagiarism (copying from others) will lead to zero marks without any further recourse. [10]