TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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A Computation of the Electrical Impedance Function at Small Frequencies

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Abstract.

The impedance function describes how an electric circuit responds to alternating current of various frequencies. The function can be measured experimentally by applying an input voltage and measuring the output current. If one uses a discrete Fourier transformation (DFT) to obtain impedance or admittance at a small frequency f one needs to collect measurement data for a long period of time T, due to the DFT relation $f\,T = 1$. This presentation shows a new approach based on linear interpolation to estimate the impedance or admittance at low frequencies. In this new approach, the measuring period does not depend on the frequency and can help to reduce the measuring time signicantly when the frequency of interest is very small. This presentation also gives uniform bounds of the error of the modulus. The error could very small if we design proper input signal. The experiments in this paper shows how our new approach performs comparing with the exact impedance or admittance for certain circuits. The problem was suggested by Gamry Instruments, Inc. that manufactures electrochemical measurement devices.