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Physics

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Proposal for Research:

If granted permission, I propose to research a question not strictly of a physical nature: rather, I wish to explore more deeply the nature of Igor's (our data analysis program) various functionalities.

In a recent experiment, noise in the circuit (likely caused by improper shielding in some of our wires) prevented me from efficiently making use of Igor's implementation of the Fourier Transform. While Igor's Curve Fitting does allow for masking data points (an effective method for filtering noise out of consideration for the fit), masks are not available for consideration in the conversion to the frequency domain. Neither does a zero-valued data point work, not without altering the signal substantially.

Using oscillatory input signals and operation amplifier applications, such as adders (given two separate input frequencies) and integrators, I will collect a number of data samples, and use them in conjunction with theory to develop a more robust Fourier Transform implementation, capable of interacting with data masks and working with irregular time-steps, with as little interpolation as is plausible.

Given the nature of this proposal, if it is more fitting for the course, I would be happy to continue exploring operational amplifier applications through one of the postulated experiment laid out on the course website—namely, the exploration of a chaotic nature of the Lorenz Attractor, achieved through operational amplifiers and multipliers. Given the complex nature of the circuit, initial labwork will consist of careful building of the circuitry, and afterwards data collection which might grant insight into the complex nature of the resultant system. The question I might pose for study will be how does the system react to different input frequencies of analogue waves?