



Physics and Engineering - Unit 2 - Interfacing hardware and software

Unit Focus

During this unit, students will develop tools and techniques for bringing data generated in the real (analog) world into the computer (digital world). Real world data analysis often struggles to get high fidelity data into the computer; sampling rates can limit the precision of data and introduce inherent errors. Data can be read into analysis software either in real time, or subsequent reading of data that a data acquisition system stores in a file or on board in memory. Students will develop techniques and algorithms to interface their modeling system to standard data acquisition systems. Ultimately, students will apply their knowledge to solving a real-world problem involving data acquisition and analysis.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Next Generation Science <i>High School Engineering Design: 9 - 12</i> - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. <i>HS-ETS1-2</i> - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. <i>HS-ETS1-4</i> Madison Public Schools Profile of a Graduate <i>Critical Thinking</i> - Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) <i>Collaboration/Communication</i> - Product Creation: Effectively use a medium to communicate important information. (POG.3.2)	T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.	
	Meaning	
	Understanding(s)	Essential Question(s)
	U1 Discrete sampling of data may compromise information U2 Repeated iteration is required to build a robust system	Q1 How do I use tools and materials to carry out my test? How do I collect and record quality data? Q2 How do I explain my results? What questions do I wonder about now?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	K1 Raw data must be processed in order to produce a usable result K2 Our product is only as useful as the data that was collected K3 Sample rate influences the quality of digital data; a lower sample rate can reduce data fidelity	S1 Storing data in an array or list for future processing S2 Building tolerances into a model to account for variations in real world systems S3 Iterating on a model design to produce a usable product