

Title: Sensor-to-computer interfaces support experimental education

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Abstract:

Efficient education of mathematics is essential concerning many other natural science disciplines as well including physics, chemistry and even more. Natural phenomena are described by models that are formulated by the tools provided by mathematics, therefore education of natural sciences and mathematics are closely related.

Experimenting inquiry-based teaching/learning is a very useful way to help the pupils, students to understand natural phenomena, the construction of models and the use of mathematics better. Although many very useful computer simulation and mathematics software are available, it is also essential to perform real experiments. If the real world signals are converted into the digital domain they can be handled and visualized by software just as the signals generated by simulation. Note, that all models have certain limitations; measurements are never perfectly accurate therefore working with real signals helps to teach this very important fact typically forgotten by many teachers and lecturers. Today's computers, smart phones and properly chosen external devices provide several ways to interface sensors that convert displacement, acceleration, angular speed, pressure, temperature and many other signals to digital signals that can be used by the application. In the presentation we'll review the simplest, easy-to-use and easily available sensor-to-computer interfacing methods and show how the obtained digital signals can be used by open-source software. Our open source hardware solutions including sensor-to-USB interfaces will also be shown. Accuracy, limitations will also be discussed and some example experiments will demonstrate the use of the interfaces.