Java Based Signal Processing Education

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1. Introduction
University education in the 21st century is moving towards a technology-based distributed environment where lecturers and students interact with electronic courseware developed for web based education. The objective of this project is to develop Java applets and course materials for web based Digital Signal Processing Education.

Another advantage of using Java applets is that the ability to interact with user through the use of Graphical User Interface (GUI). The applet shown provides the user with GUI to allow a dynamic change of coefficients to observe the frequency and impulse response of a second order digital filter.

2. Java Applets as a Tool for DSP education
Using Java as a tool for teaching DSP has been in the mind of several researchers and academics since the introduction of Java technology by Sun Microsystems. This project is to realise the effectiveness of employing Java applets to illustrate difficult DSP concepts to students. The following are some of the applets developed by the project team.

3. Applet used to illustrate Sampling concept
One of the advantage of using Java applets is that it can be used for animations. The above applet make use of animation to display the visual effect of sampling in equal time intervals, with the opening and closing of a switch.

4. Applet used to observe Frequency and Impulse Response of a second order Digital Filter

5. Applet for designing Digital Oscillator
The applet shown allows students to learn how to design an oscillator by either changing the desired resonant frequency or by changing the coefficients of a second order digital filter. In addition, a self correcting feature is incorporated to allow either the coefficient b1 or the resonant frequency to be chosen at any point in time.

6. On-line Questions
Several DSP chapters to support Java web based signal processing education have been developed. At the end of each chapter, a set of interactive questions have been developed to test the understanding of the students. An example is shown below.

7. Survey
An on-line survey was incorporated in the project website to gather feedback from the students. The general opinion of students exhibit a positive attitude towards Java web based signal processing education.

Java web based Signal Processing Education is the future direction of where signal processing education is heading!