iJDSP — A Mobile Signal Analysis App

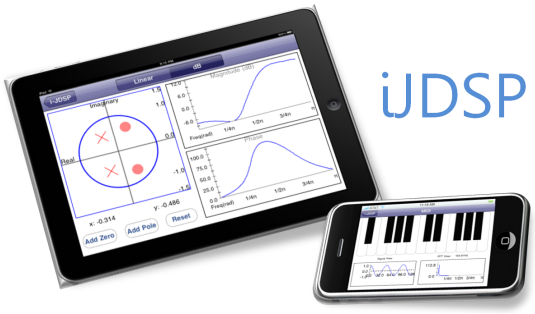
Developed at the SenSIP Center, Arizona State University.

Newsletter Date: September 20, 2012 Volume 1, Issue 1

iJDSP Overview:

- Mobile Block-oriented Programming
- Filtering and Spectral Analysis Functions
- Real-time Interface with Sensor Networks
- Tools for Education, Research and Outreach

iJDSP - An iPhone/iPad App



Mobile Signal Processing

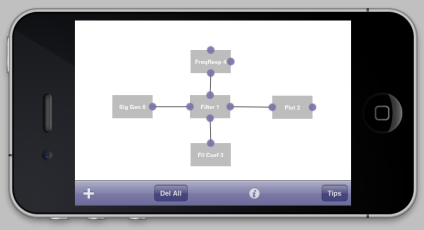
iJDSP is an application (app) that enables mobile simulation and visualization of Digital Signal Processing (DSP) concepts and algorithms on iOS devices such as the iPhone, iPod Touch and iPad. This app has been developed for education purposes at the SenSIP Center, ASU.

iJDSP has a rich suite of signal processing functions including FIR and IIR filter design algorithms, FFT, plot functions, *z*-plane and graphical convolution computations.

The ASU iJDSP app has been selected by the NEEDS panel as the **Premier Award winner for 2012.** The ASU development group will be recognized at the **IEEE Frontiers in Education (FIE) Conference Seattle.** The Premier Award is sponsored by John Wiley & Sons, Microsoft Research, the MathWorks, and TechSmith.

Free! App Download from iTunes

Category: Education
Released: Aug 03, 2012
Version: 1.0
Size: 5.5 MB
Requirements: Compatible with iPhone, iPod touch, and iPad. Required iOS3.2 or later.



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iJDSP

Mobile Labs and Assessments

ARIZONA STATE UNIVERSITY

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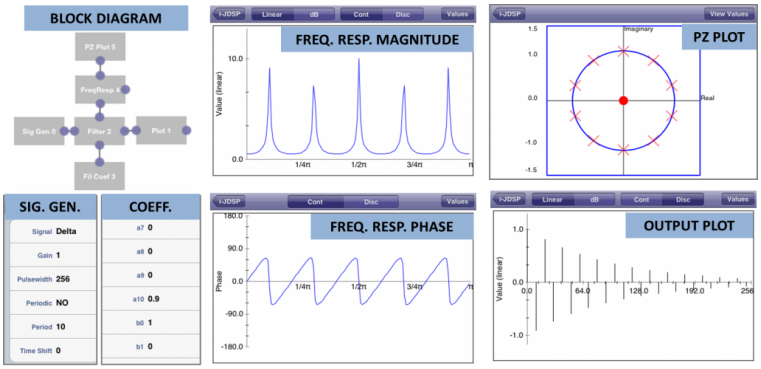
Mobile iJDSP Labs in Signal Analysis and DSP Courses



iJDSP is being used in the undergraduate DSP course (EEE 407) at Arizona State University. A typical exercise will require that the students setup the simulation block diagram, modify the parameters and observe the results.

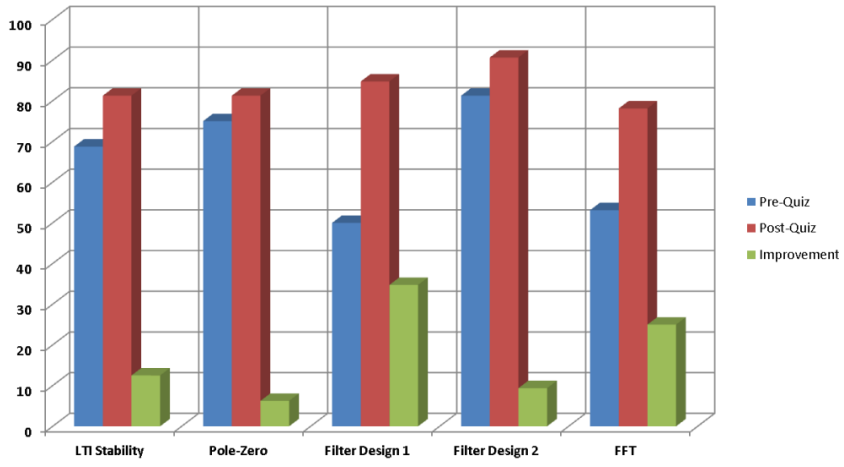
The topics covered in the undergraduate DSP course are:

- Discrete-Time Signals and Systems
- The *z*-Transform
- FIR and IIR filter design
- Fast Fourier Transform and Applications
- Multirate Signal Processing and QMF Banks
- Discrete-Time Random Signals

iJDSP Assessments

Technical and general assessments of the iJDSP application were carried out in the undergraduate level DSP course at ASU during the Spring 2012 semester. The evaluation session consisted of the administration of a pre-questionnaire followed by a lecture and demonstration of iJDSP. The students were then asked to perform hands-on exercises and respond to questions posed in a post-questionnaire. Comments about ease of use and convenience of the app were also collected from the students.

The graph illustrates improvement in student understanding of the different concepts before and after using the iJDSP visualization tools.



"iJDSP provides a user friendly and fun environment for learning." - ASU Graduate Student

ASU Undergraduate Student: *"The convenience of doing labs makes the app very attractive"*

iJDSP

Education, Research and Outreach

ASU Arizona State University

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Workshops & Outreach

Signal and Data Analysis Simulations (Spring 2012)

The iJDSP workshop was conducted in March 2012 to expose the utility of the software in various multi-disciplinary signal and data analysis applications.

Emerging Signal Processing Applications

The IEEE ESPA was held at Las Vegas, in January 2012. iJDSP was demonstrated at the conference as a part of the show-and-tell session. The iJDSP app was also demonstrated at the 2012 International Conference on Acoustics, Speech, and Signal Processing (ICASSP) in Kyoto, Japan.

iJDSP at the IAFSE Open House 2012

The objective of this outreach activity was to demonstrate signal processing and communications technologies in day-to-day applications and to introduce youngsters from K through 8th Grade to Engineering Sciences.

iJDSP for Sensor Networks Research

A hardware interface has been developed to enable iJDSP to acquire real-time data from sensors. This interface can be utilized to explore principles related to sensor data fusion and real-time signal processing.
The hardware used for data acquisition is inexpensive, and real-time computations are carried out using the resources available on the mobile device itself. The base station then communicates to the sensor nodes through the ZigBee wireless communication protocol.

Acknowledgements

The outreach activities were co-sponsored by **NSF** (Award No. 0817596) and the SenSIP Center at Arizona State University.

We would also like to thank **Sprint Communications** for providing us with tablets and smart phones for testing.

"I can use it anywhere, anytime"

- ASU Undergraduate Student

Publications and Contact Information

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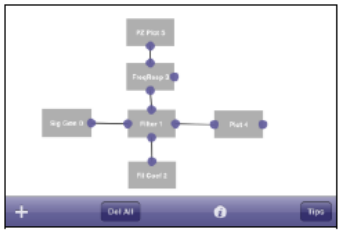
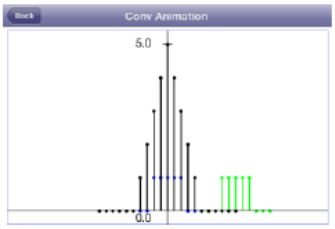
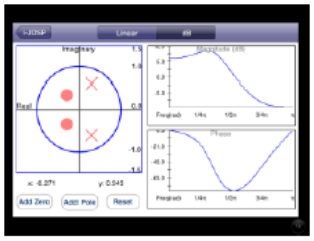
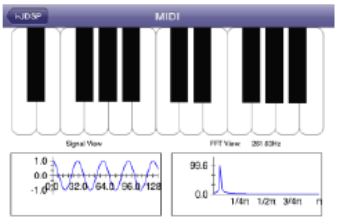

Simulator/Calculator



Lab/Visualization


Dashboard



Outreach

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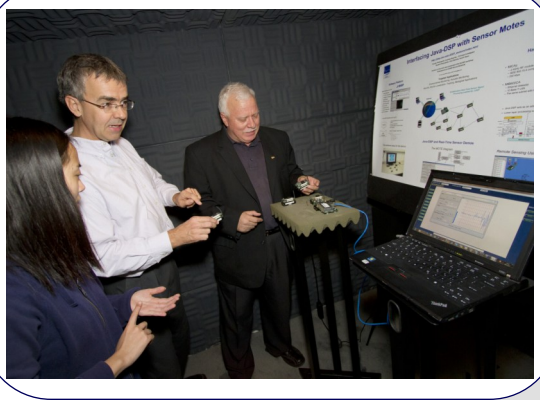
Launching on Android soon!

iJDSP Publications



[1] J. Liu, J. J. Thiagarajan, A. Spanias, K. N. Ramamurthy, S. Hu and M. K. Banavar, "iPhone/iPad based interactive laboratory for signal processing in mobile devices," *Proc. ASEE Annual Conference*, Vancouver, June 2011.

[2] J. Liu, A. Spanias, M. K. Banavar, J. J. Thiagarajan, K. N. Ramamurthy, S. Hu and X. Zhang, "Work in progress – Interactive signal processing labs and simulations on iOS devices,"*Proc. IEEE FIE*, Rapid City, Oct 2011.

[3] J. Liu, S. Hu, J. J. Thiagarajan, X. Zhang, S. Ranganath, M. K. Banavar, K. N. Ramamurthy and A. Spanias, "Interactive DSP laboratories on mobile phones and tablets," *Proc. IEEE ICASSP*, Kyoto, March 2012.

[4] A. Spanias, Digital Signal Processing; An Interactive Approach, 370 pages, Lulu Press http://www.lulu.com/content/2581497, ISBN: 978-1-4243 -2524-5, Morrisville, Sept. 2007.