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Signal Processing Demo: A web based interactive simulation tool for Continuous-Time Signals and Systems

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A Web-Based Interactive Simulation Tool for Continuous-Time Signals and Systems

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Abstract

- The current Signals and Systems classes are theoretical, lacking lab based applications showcasing how the theory relates to real world applications.
- A web-based interactive simulation tool was developed using Matlab's App Designer Toolbox.
- It can be used online or as a stand alone application.
- The simulation tool uses an interactive Graphical User Interface (GUI) to familiarize students with fundamentals in continuous-time signals and systems classes.
- Subjects covered include frequency spectrum analysis, amplitude modulation/demodulation and the effects of filtering.

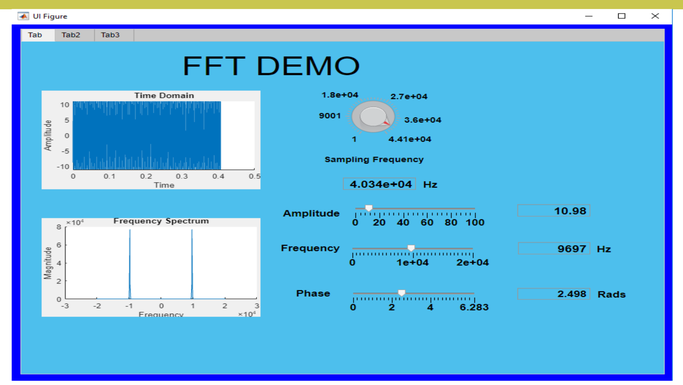
Objectives

- Improve learning through applicable experimentation.
- Enhance students knowledge of complex concepts in an engaging manner.
- Help students to develop an intuitive understanding of classroom theory through application.

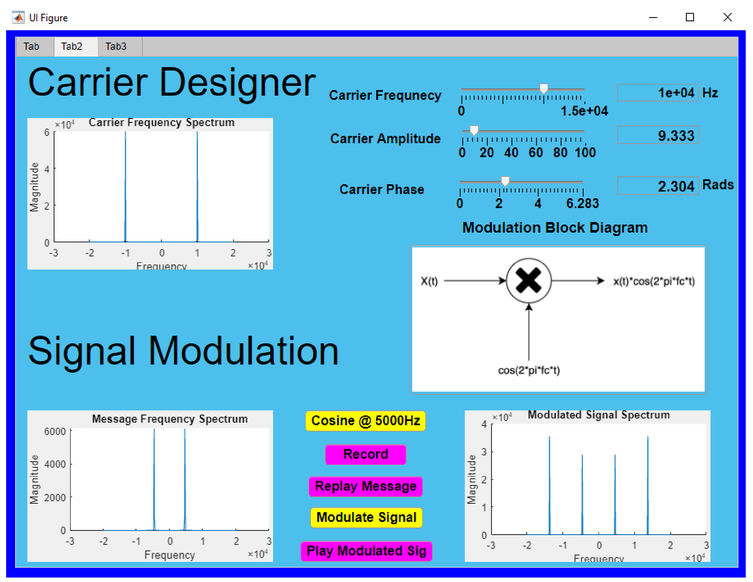
Features

- Can be used online or as a stand-alone application
- Parameterized Interactive user interface allowing parameter flexibilities allowing students to choose:
  - Sinusoidal frequency, amplitude and phase for spectrum analysis
  - Carrier frequency for signal modulation and demodulation
  - Cut-off frequency for a low-pass filter

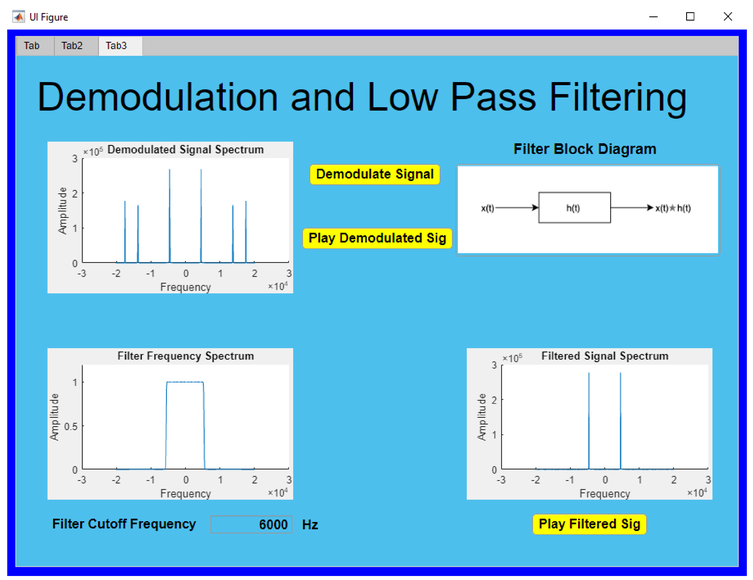
Tab 1



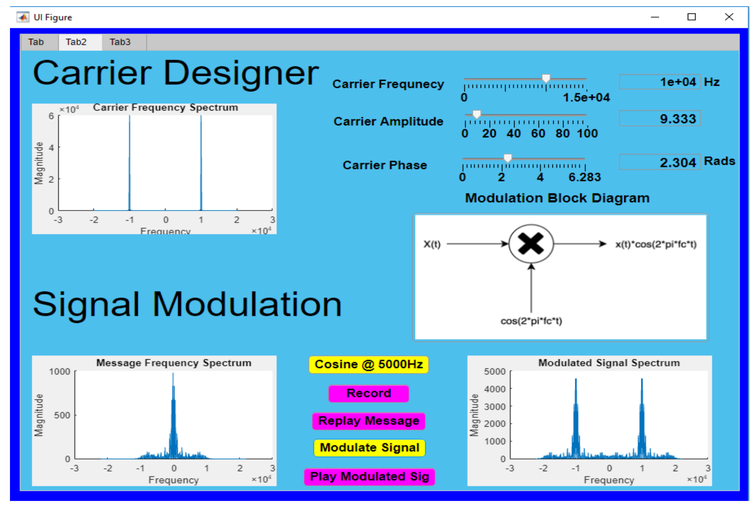
Tab 2 with 5K Hz Cosine Sig



Tab 3 with 5K Hz Cosine Sig



Tab 2 with Voice Recording



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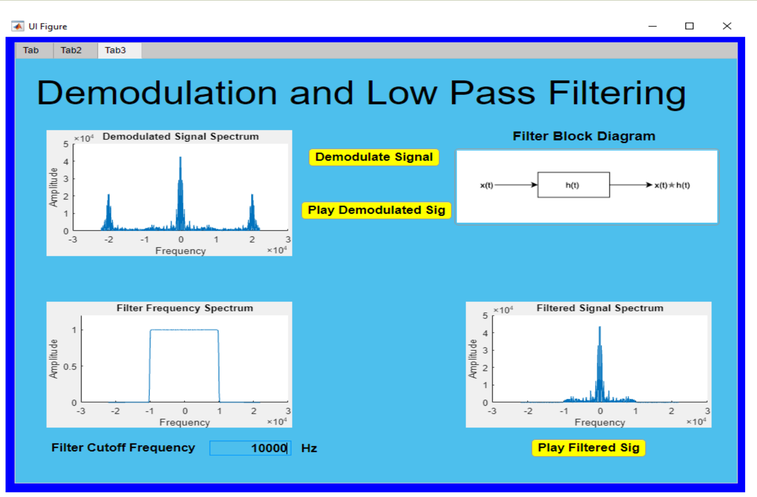

Conclusion

- The Signal Processing Demo provides an application based learning approach to Fourier Analysis, signal modulation/demodulation and low-pass filtering.
- The demo serves as a tool to enhance learning in Signals and Systems classes.
- Can be publicly accessed on the MathWorks website.