

This README file contains information about the folder mwc provided as part of the CTSS Sampling Toolbox written by Michael A Lexa, Mike E Davies, and John S Thompson, University of Edinburgh.

The folder contains 5 MATLAB m-files that simulate the sampling and recovery of a continuous-time spectrally-sparse multiband signal using the Modulated Wideband Converter (MWC):

mwc_demo.m
bandspare.m
mwc_sampling.m
mwc_recovery.m
RunOMP_Unnormalized.m

Technical information about the MWC is found in the report "Sampling Sparse Multiband Signals with a Modulated Wideband Converter" that is contained in the CTSS Sampling Toolbox Documentation folder.

These scripts are a research tool and by no means represent a finished software product.

To run the simulation execute mwc_demo.m from within MATLAB, i.e. type mwc_demo at the MATLAB command prompt. This script, in turn, calls bandspare.m to generate a (discrete) sparse multiband signal, calls mwc_sampling.m to sample it, and then calls mwc_recovery.m to recover the original signal from the MWC samples.

The multiband signal that bandspare.m generates can be thought of as being the Nyquist samples of a continuous-time multiband signal, i.e. as a signal that results from sampling a continuous-time multiband signal at the Nyquist rate. Hence, the simulation actually subsamples a discrete signal and recovers the Nyquist samples from the MWC samples.

There are several parameters that characterise the input multiband signal. These include the total bandwidth W , the number and maximum bandwidth of the occupied bands (K and B), and the centre frequencies of these bands. These parameters are set in mwc_demo.m and bandspare.m.

The parameter q specifies the number of channels in the MWC and M specifies the sub-Nyquist sampling rate: each channel samples at a rate that is M times slower than the Nyquist rate. The values of q and M are assigned in mwc_demo.m.

The script mwc_sampling.m accepts as input the simulated multiband signal and outputs the MWC samples.

The script mwc_recovery.m is the algorithm that recovers the Nyquist samples. The algorithm is that of Mishali and Eldar (see the references listed at <http://www.see.ed.ac.uk/~mlexa/CTSS.html>). In particular, the m-file RunOMP_Unnormalized.m called by mwc_recovery.m is authored by Mishali and Eldar.

The simulation outputs several plots to compare the time and frequency content of the original and recovered signals.

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Institute of Digital Communications, University of Edinburgh

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