Calculate speed of sound in material samples

Matlab-functions to read and interpret ultrasound pulse recordings and calculate speed of sound from the results.

All parameters and results are stored as fields in struct variable *par*.

Three files are needed for the calculations

1) Reference measurement in water without sample. Reflected and transmitted signals (*.wfm*)
2) Measurement with sample. Reflected and transmitted signals (*.wfm*)
3) Text-file with names of files to load and necessary measurement parameters

Fuction	**Description**
Main	
FindSpeedofSound	Process speed-of-sound measurement. Requires one measurement with sample and one reference measurement in water. Raw data file names and measurement parameters loaded from text-file with extension *.cpa*. Correct estimation depends on accurate values in the parameter file. Three values for speed of sound are calculated from three measurements 1) Propagation time difference with and without sample 2) Reverberations in reflected pulses 3) Reverberations in transmitted pulses
par=FindSpeedofSound(src,swap)	Batch-file for processing several measurements. Calls *FindSpeedofSound* with a list of parameter files (*.cpa*) Exports results to tab-separated text-file for import into e.g. Excel
Calculations	
par= timedifference(par)	Find time-difference between propagation times with and without sample
par= timedelay(par)	Find time-delay between reverberations, to calculate speed of sound in sample
Read and write data files	
par = readpar(src)	Read and interpret parameter file with measurement information
wfm= readwfm(file)	Read and interpret measurement file containing recorded time-traces
ExportSpeedofSound(fid, par)	Export speed of sound measurement results to tab-separated file that can be read in e.g. Excel
plotsignals(usfile)	Plot recorded time-trace. Intended for inspection of raw data
Utility files	
[cw S]= SoundVelocity(T)	Calculate speed of sound in pure water as function of temperature. Ref. Del Grosso, JASA, 1972
[d,cw]=soundspeed2distance(Temp, usfile,offset)	Calculate distance between transducers using speed of sound from water temperature
kimax=ParabolicMax(y,check)	Find maximum using subsample-interpolation and parabolic fit