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Sharanappa Hagargi

Analysis of the Teager Keaser Energy Operator and its Application in Sonar Signal Enhancement.

ABSTRACT - Masterthesis

The aim of this thesis is to use the TKEO (Teager Keaser Energy Operator) in getting back the original back scattered signal from sea bottom free of noise while retaining its peaks. Peaks are generated from the targets or particular things after signal hitting the sea bottom.

The TKEO used in this thesis is nonlinear in nature. Nonlinear filter is preferred over the linear filter because of its ability in retaining the peaks along with removing the noise. Whereas the linear filters are good at removing the noises but failing or partially able to retain.

TKEO has been implemented and proved for wide number of applications. In "on amplitude and frequency demodulation using energy operator" it can approximately estimate the amplitude envelope of AM signals and instantaneous frequency of the FM signals. When the signal consisting of both AM and FM components it can approximately track the product of their amplitude envelope and instantaneous frequency. In the "detection of transient signals using energy operator" the operator is used to detect the transient signal in the presence of the AM and FM interference. Here the operator is applied to slowly varying AM and FM interference. Transient occurs leading to the small deviation in the output. Transient signal can be measured from the rate of deviation in the Teager Keaser energy operator output. So from the previous proved results we seen that Teager Keaser energy operator is very good at the demodulation of the AM-FM signals.

TKEO has also been very effective in tracking the small change in the frequency of signal. When applied to exponentially damped signal or chip signal this operator effectively tracks the small changes in the frequency. TKEO is also very sensitive to noise because the operator involves the multiplication of the samples of the input signals both with itself and with the displaced samples of itself.

This thesis first analyse the previous researches of TKEO mentioned above and secondly getting back the original backscattered signal free of noise along with retaining peaks with or without modification of TKEO.