CFADAGA2004/266 Quadratic Time-Frequency Representations For Signals Passing Through Dispersive Systems

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The aim of this work is to study the propagation of an acoustic wave in porous media using quadratic time-frequency representations (QTFR), for example the Bertrand distribution. Because of the dispersive characteristic of such a system, the wave velocity in the porous structure is a complex function of the frequency, i. e., the energy of the signal carried by each frequency has is own velocity. So, a sample of porous medium is excited by an ultrasonic pulse, and the QTFR of the output signal is observed to evaluate the group delay law, function of the frequency, and then the parameters of the material. The relevance of such signal processing tools is their capacity to concentrate the energy of a signal in a two-dimensions plane (time-frequency, time-scale,...) along his group delay law. In the case of propagation in porous media, the group delay law is compared to a power law in the time-frequency plane. Finally, the properties of the Power Class of QTFR are used. This class of representations allows to generate a large number of QTFR and each of them matches with one adapted power law in terms of lisibility and the concentration of energy in the time-frequency plane. Hence, to choose the most relevant representation, concentration measurement tools as Renyi entropy are used. Here, the situation where a signal passes through a dispersive system which includes a power law group delay to the signals is considered. So, a QTFR which localizes efficiently this kind of signals is needed as well as the Wigner-Ville QTFR localizes the linear chirp signal.

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