Application of Wigner-Ville distribution to identify anomalies in GPR profiles

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Abstract An analysis in time and frequency, based on signal decomposition spectral analysis, is performed through the Wigner-Ville distribution (WVD) for GPR data. It calculates a cross-correlation between the original signal and the time-frequency components, for structural anomalies available in the information provided by the GPR related to the geology. We describe the application in a theoretical example representing a tunnel. Corresponding signatures are obtained in the time-frequency domain. A real application is presented over a test site, where a drum of known geometry has been buried. This is a special test site built in the facilities of the UNAM Magnetic Observatory at Teoloyucan, State of Mexico. The depth and dimensions are well controlled, and the results obtained are quite encouraging, since the WVD is capable of defining the morphological features related to such a drum. The results are interesting regarding the possibility of locating such structures.

Key words Ground Penetrating Radar (GPR); time-frequency analysis; Wigner-Ville distribution; signal processing