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Extension Imaging Algorithms for Super-Resolution Radar Imaging

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Abstract

Ultra Wide-band (UWB) radar technique is promising as various near field sensing applications, where a range resolution is considerably higher than that of an optical sensing. For example, it is applicable for target detection or identification techniques of robots, especially in dark smoke or night view at a disaster area. However, an imaging with radar is, in general, known as an ill-posed inverse problem, because received signals have an incomplete information for target reconstruction. While various imaging algorithms for radars have been proposed to resolve this problem, they require an intensive computation or insufficient resolution based on data synthesis. As a solution for these problems, we have already proposed high-speed imaging algorithm, Envelope [1]. In addition, by combining the range compensation method SOC (Spectrum Offset Correction), this algorithm accomplishes super-resolution imaging, where the accuracy for target reconstruction is around 1/100 wavelength [2].

Also, for practical applications, two extension algorithms are presented in this presentation. One is the algorithm based on the Direction Of Arrival (DOA) with fuzzy function, aiming at complex shape or multiple targets. The other is the shadow region imaging algorithm by using the multiple scattering data. Numerical simulations show that these algorithms remarkably expands the application range of UWB radar techniques.

References

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[2] S. Kidera, T. Sakamoto and T. Sato, "High-Resolution and Real-time UWB Radar Imaging Algorithm with Direct Waveform Compensations," *IEEE Trans. Geosci. Remote Sens.*, vol. 46, no. 11, Nov., 2008.