Coherent Radar Carrier-Frequency Estimation In PRF Diversity

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A pulsed radar uses coherence to increase its signal-processing gain and to measure the Doppler shift from a moving target. It uses diversity in its pulse repetition frequency (PRF) to resolve target range and Doppler ambiguities. These same characteristics can be exploited in electronic support to accurately measure a radar's carrier frequency. Such estimates can be used for passive emitter geolocation, for example. Extending recent work by the present authors, we show that frequency estimation for a radar employing scan-to-scan PRF diversity can be formulated as a nearest-lattice-point problem. Even where the pulse shape of the radar is not known precisely in advance, frequency-estimation accuracy in the absolute sense can be as high as in the modulo-PRF sense at a moderate signal-to-noise ratio from only a small number of collected pulses in consecutive scans.