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Application of Principle Component Analysis for Classification of Random Doppler-Radar Targets during the Surveillance Operations

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Abstract : During the surveillance operations at war or peace time, the Radar operator gets a scatter of targets over the screen. This may be a tracked vehicle like tank vis-à-vis T72, BMP etc, or it may be a wheeled vehicle like ALS, TATRA, 2.5Tonne, Shaktiman or moving army, moving convoys etc. The Radar operator selects one of the promising targets into Single Target Tracking (STT) mode. Once the target is locked, the operator gets a typical audible signal into his headphones. With reference to the gained experience and training over the time, the operator then identifies the random target. But this process is cumbersome and is solely dependent on the skills of the operator, thus may lead to misclassification of the object. In this paper we present a technique using mathematical and statistical methods like Fast Fourier Transformation (FFT) and Principal Component Analysis (PCA) to identify the random objects. The process of classification is based on transforming the audible signature of target into music octave-notes. The whole methodology is then automated by developing suitable software. This automation increases the efficiency of identification of the random target by reducing the chances of misclassification. This whole study is based on live data.

Keywords : radar target, fft, principal component analysis, eigenvector, octave-notes, dsp
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