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PROBABILITY OF DETECTION OF ULTRA WIDEBAND (UWB) MULTI-INPUT MULTI-OUTPUT (MIMO) RADAR CONSIDERING RADAR CROSS SECTION (RCS) CHARACTERISTICS OF VEHICULAR TARGETS

FADILLA 'ATYKA BINTI NOR RASHID

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ABSTRACT

Nowadays, ultra wideband (UWB) signals has become a solution to most important problems in observing radar target due to various advantages brought by its frequency diversity. UWB permits better data to be acquired due to frequency dependence and the high time resolution of the scattering centres over the extremely wide bandwidth. On the other hand, multi-input multi-output (MIMO) antenna systems have been developed in recent years to improve target detection and localization. MIMO radars exploit non-correlated channel co-efficient between signals from different transmitter and receiver pairs to improve the information received from the response. Motivated by the benefits of using UWB signals, this paper presents the probability of detection by using UWB MIMO radar while considering radar cross section (RCS) characteristics of vehicular targets. A new RCS model will be developed for wideband signal based on actual measurement data. Then, distribution fitting will be carried out to select the best fit to the wideband RCS data. Next, this study will study the detection performance of UWB MIMO radar integrated with the measurement-based RCS model; through numerical simulation of the radar performance. Simulation results indicated that the detection performance was better in terms of signal-to-noise ratio (SNR) when using full band UWB signal in MIMO radars, compared to using partial bandwidth.

Keywords - Ultra Wideband, UWB, Multi-input Multi-output, MIMO, Radar Cross Section, RCS.

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