ABSTRACT

This research is about an effort to increase the robustness of the Minimum Variance Distortionless Response (MVDR) algorithm to noise by using a chirp signal for direction of arrival estimation (DoA). DoA is a part of radar capability to estimate the angle of arrival on the object under observation. The conventional MVDR as proposed by J. Capon, was designed to work with the monochrome sinusoidal signal. Even though the conventional MVDR work on low SNR, however, the conventional method does not work well if chirp signal is used instead of monochrome sinusoidal signal. The usage of chirp signal is essential in the case of a very low SNR environment such as in long distance object detection, which is typically more than 10 km. The problem is how to modify the MVDR algorithm so that it can work well on chirp signal. In this proposal we offer a modified MVDR algorithm by adding the match filter and the phase detector components before the MVDR algorithm. Matched filter will responsible for the timing of the chirp signal detection, and the phase detector is to estimate the time delay estimation of each chirp signal from each antennas with a reference signal, which correspond to the phases. The estimated phases at each receiver will be fed to the MVDR algorithm. In technical aspect, the chirp signal is sent intermittently with a duration of 100 μs and repeated in time interval of 1 ms. The antenna sensor using an array of Uniform Linear Array (ULA) which consist of N-elements. The modification of MVDR algorithm is expected to improve the robustness of conventional MVDR algorithm that capable to detect accurate DoA in high noise environment, with a typical SNR up to -30 dB.

Keywords: Chirp, Modified MVDR, Matched Filter, Phase Detector, DoA