

ABSTRACT

In situations such as shootings or other dangerous events, knowing the direction of arrival of gunshots is important to identify the location of the sound source and take appropriate action. In this research, the ESPRIT (Estimation of Signal Parameters via Rotational Invariance Techniques) algorithm has been analyzed and implemented to estimate the direction of arrival or DoA (Direction of Arrival) of gunshots.

This research was conducted in several stages. First, prepare the microphone array that will be used. Then, take the recorded gunshot data that will be used as the input signal in the analysis. After that, process the data to produce an inter-microphone correlation matrix that will be the basis for the ESPRIT algorithm. The implementation of the ESPRIT algorithm will be carried out to accurately estimate the direction of arrival of gunshots.

The results of estimating the angle of arrival of gunshots show that the system has a fairly good level of accuracy, especially on the M4 weapon type with the most consistent and accurate angle detection performance among the three weapons tested, with the lowest average error at almost all angles. The Desert Eagle showed variable but still relatively accurate detection performance, especially at 180° angles, with very small errors. In contrast, the AK-47 had the highest average error across all angles, indicating that the detection system had the greatest difficulty in detecting the firing angle of this weapon.

Key Words: Gunshots, DoA, ESPRIT, Microphone Array