

ABSTRACT

The Free Papua Movement carried out by the Free Papua Organization (OPM) is very detrimental to the Indonesian state, especially the community around the scene. There are many detrimental actions such as arson to the shooting of civilians, members of the TNI/POLRI and even airplanes. The solution offered in this study is in the form of analyzing the direction of the gunshot sound using the allocation method. In this case, the allocation or deketing of the sound origin needs to be used to detect the origin of the sound of the shot.

For the sound source allocation method, there are many methods and parameters that can be used to determine the location of the sound source, but this research focuses on using the Frequency Difference of Arrival (FDoA) allocation method. The FDoA method was chosen to analyze the detection of the direction of the sound of gunfire, the FDoA method detects by analyzing the difference in the frequency of arrival received by each microphone. In addition, FDoA is known as Differential Doppler (DD), FDoA's performance depends on the accuracy of the signal time synchronization, not the length of the signal emission time, in addition to the FDoA technique requires the transmitting station or receiving sensor to move to generate (DD) required for FDoA measurements.

The results of this study show that the FDoA method can determine the direction of the sound source, because it takes advantage of the difference in the frequency of signal arrival between sensors to determine the location of the sound source. Based on experiments with different distances between microphones (30 cm, 60 cm, and 90 cm), the greater the distance between microphones, the greater the variation in the received. In addition, the angle calculation for single-tone sound shows consistency at 90° at each distance, while continuous sound shows significant fluctuations in the angle received by the microphone, which is affected by the sensitivity of the microphone, its position relative to the transmitter, and environmental conditions. This difference highlights the challenge of detecting the direction of the gunshot with a continuous sound compared to a single tone sound.

Keywords: *Gunshot, FDoA, Doppler Shift, SNR, MSE.*