

ABSTRACT

Accurate and reliable traffic monitoring systems are crucial for effective transportation management. This final project proposes a radar-based multi-vehicle tracking system that utilizes the IWR6843ISK millimeter-wave radar sensor for object detection. The data obtained from the radar is processed using the HDBSCAN (Hierarchical Density-Based Spatial Clustering of Applications with Noise) algorithm to identify and cluster data points representing vehicles. Subsequently, the Particle Filter algorithm is applied to track the movement of each detected vehicle, enabling robust tracking against noise and uncertainty in radar measurements. Test results demonstrate that the system achieves a vehicle counting accuracy of 98.6%. The tracking evaluation yields a low Mean Square Error (MSE) of 0.0946 for longitudinal motion and 0.2073 for lateral motion, proving the algorithm's effectiveness. The developed system successfully detects, clusters, and tracks vehicles in real-time with high accuracy, contributing significantly to the development of smarter and more efficient traffic monitoring systems.

Kata Kunci: *Multi-Vehicle Tracking, IWR6843ISK Radar, HDBSCAN, Particle Filter, Traffic Monitoring.*