ABSTRACT

The use of radar as a sensor in object classification systems has become a promising alternative to overcome camera limitations, such as accuracy degradation due to environmental conditions and privacy issues. This research aims to develop a vehicle and human classification system based on FMCW radar with point cloud data using a deep learning approach. The system is designed to perform accurate real-time classification, with a focus on intersection applications.

The research methodology involves collecting point cloud data from FMCW radar IWR6843 AOPEVM, which is then processed through preprocessing stages such as noise reduction, clutter removal, signal transformation, and data normalization. The processed data is used as input for a PointCNN-based deep learning model. The model is trained to recognize patterns in point cloud data to distinguish between vehicles and humans. The system is also designed to process data in real-time and display classification results on an LCD screen.

This research conducted training experiments on the PointCNN model with several windowing configurations and found that 20 timestamp windowing provided the best training performance with 98.81% accuracy. However, real-time implementation revealed performance differences compared to the training model results. Based on this finding, further experiments were conducted which demonstrated that windowing 40 provides a more balanced accuracy distribution across object classes, resulting in more consistent performance for real-time systems.

***Keywords**: Deep Learning, FMCW Radar, Point Cloud, PointCNN, Vehicle and Human Classification.*