ABSTRACT

This study developed a Human Activity Recognition (HAR) system based on FMCW radar for real-time human activity classification. The problem addressed is the need for a contactless activity monitoring system that does not require sensors to be attached to the human body and is capable of operating under low-light conditions. This research aims to develop a system that classifies human activities such as standing, sitting, walking, and falling by utilizing radar point cloud data as the primary source of movement information.

The acquired 3D point cloud data from the radar is processed using a windowing technique. Subsequently, the 3D point cloud data is transformed into a 2D tensor representation through a heatmap transformation method. After the 2D tensor representation is formed, a stacking process is applied to several important features, including Doppler-Range, Doppler-Time, and Range-Time. The processed 2D tensor representation is then used as input to train the classification model using a 2D CNN architecture.

The test results show that the developed system is able to achieve 2D CNN model training accuracy of 99.88%. In testing the implementation of the 2D CNN model in real-time with 30 trials on each activity, the system successfully classified standing and walking activities with 100% accuracy, sitting with 93% accuracy, and falling with 80% accuracy. These results indicate a strong potential for the system to be implemented as a contactless real-time human activity monitoring solution.

Keyword: *2D Tensor, 2D CNN, HAR, Point Cloud, Radar FMCW,*