ISBN: 978-1-7635532-5-5

2nd International Conference on Advanced Innovation Technology (AIT 2025)

Deep Learning-Based Multi-Object Detection and Velocity-Range Estimation Method for OFDM Radar

So-Yeon Jeon[1] and Eui-Rim Jeong[2]

[1]Department of Artificial Intelligence, Hanbat National University, Republic of Korea, jeonsso1109@gmail.com
[2]Department of Artificial Intelligence Software, Hanbat National University, Republic of Korea, erjeong@hanbat.ac.kr

Abstract: This study proposes a method for simultaneously estimating the number, velocity, and distance of multiple objects in an OFDM radar system using CNN and YOLO models. The proposed method processes OFDM radar signals to generate 2D spectrogram images, which are first input into a CNN to estimate the number of objects. The estimated number of objects and the 2D images are then fed into the YOLO model to predict the velocity and distance of the objects. Simulation results demonstrate that the proposed method achieves excellent performance in multi-object detection as well as in velocity and distance estimation. In particular, compared to conventional OFDM-based radar methods, adding a CNN-based object count estimation process improves the accuracy of multi-object detection. Moreover, it was confirmed that increasing the number of OFDM symbols and decreasing the number of objects enhance the performance of velocity and distance estimation.

Keywords: OFDM radar, CNN, YOLO, Multi-Object Estimation, Distance, Velocity

Acknowledgement

This work was partly supported by Institute of Information & communications Technology Planning & Evaluation(IITP) grant funded by the Korea government(MSIT) (No. RS-2024-00405377, Development of 6G Sensing-Communication Integrated Propagation Channel Model and Modular Beamforming Measurement System).