Radar hand gesture recognition based on three-dimensional united attention network

lei yang[1], Wenpeng Zhang[2], Weidong Jiang[2], and Wei Yang[2]

[1]College of Electronic Science, National University of Defense Technology
[2]National University of Defense Technology College of Electronic Science and Technology

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Abstract

Radar-based dynamic gesture recognition has great potential in human-computer interaction (HCI) applications. With the development of wideband radar, the radar signal of hand gestures is often represented by the three-dimensional (3D) range-Doppler-time cube, which is mainly processed by multichannel two-dimensional (2D) CNNs and 3D CNNs. However, the utilization and fusion of different kinds of features in existing networks is simple and not well optimized. In this paper, an efficient attention method named three-dimensional united attention (3D-UA) module in 3D space is proposed. The 3D-UA module applies a multi-scale pyramid convolution spatially, extracts channel attention weights on feature maps and captures the global temporal cues simultaneously. Furthermore, a network named 3D-UANet is proposed by replacing the 3x3x3 convolution with the 3D-UA module in the 3D-ResNet. 3D-UANet can efficiently extract the range-Doppler-time features of gestures. Experimental results show that the proposed method has good generalization performance on data from subjects in complex scenes.

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