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RESEARCH ON IMAGE DATA PROCESSING BASED ON IMPROVED TRANSFORMER SEMANTIC COMMUNICATION

Abstract

Semantic communication is a new communication paradigm, whose core aim is to realize intelligent communication by extracting the semantic information about the data that needs to be sent and transmitting it to the receiver. With the continuous development of Deep Learning, semantic communication has been further developed and gradually applied to the Internet of Things, remote sensing image and other fields. In this paper, to solve the problem of large amount of image data generated in earth observation and limited spectrum bandwidth resources, we propose an improved semantic communication model based on Transformer structure. Our goal is to enable image data to communicate well under harsh transmission environment and reduce the amount of data required for transmission through image semantic feature extraction. In this paper, different from the traditional CNN used to extract semantic features, Transformer structure is adopted as the image semantic feature encoder. The Transformer structure can better train the large amount of data and extract better image semantic features, and the multi-layer self-attention mechanism can better capture the correlation between semantic features. Then, in order to improve coding benefit, we reduce the quadratic complexity of the self-attention mechanism itself to linearity, thereby improving the image data processing speed of Transformer model. At the same time, aiming at the negative impact of semantic noise on semantic communication, we use random masking strategy to reduce the impact of semantic noise. Due to the strong correlation between the features of the image, the missing face can be recovered from the adjacent face, and the influence of semantic noise can be eliminated to a certain extent by masking a part of the face. We carried out experimental simulation in BigEarthNet dataset and compared the designed system with BGP, JPEG and other image coding methods, which verified that the method can effectively alleviate the problem of excessive data volume and improve the performance of image data communication.