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Contrastive Learning for Unsupervised Object Segmentation in Sequential Images

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Abstract : Unsupervised object segmentation aims at segmenting objects in sequential images and obtaining the mask of each object without any manual intervention. Unsupervised segmentation remains a challenging task due to the lack of prior knowledge about these objects. Previous methods often require manually specifying the action of each object, which is often difficult to obtain. Instead, this paper does not need action information of objects and automatically learns the actions and relations among objects from the structured environment. To obtain the object segmentation of sequential images, the relationships between objects and images are extracted to infer the action and interaction of objects based on the multi-head attention mechanism. Three types of objects' relationships in the object segmentation task are proposed: the relationship between objects in the same frame, the relationship between objects in two frames, and the relationship between objects and historical information. Based on these relationships, the proposed model (1) is effective in multiple objects segmentation tasks, (2) just needs images as input, and (3) produces better segmentation results as more relationships are considered. The experimental results on multiple datasets show that this paper's method achieves state-of-art performance. The quantitative and qualitative analyses of the result are conducted. The proposed method could be easily extended to other similar applications.

Keywords : unsupervised object segmentation, attention mechanism, contrastive learning, structured environment
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