

Utilizing hierarchical extreme learning machine based reinforcement learning for object sorting

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Abstract

Automatic and intelligent object sorting is an important task that can sort different objects without human intervention, using the robot arm to carry each object from one location to another. These objects vary in colours, shapes, sizes and orientations. Many applications, such as fruit and vegetable grading, flower grading, and biopsy image grading depend on sorting for a structural arrangement. Traditional machine learning methods, with extracting handcrafted features, are used for this task. Sometimes, these features are not discriminative because of the environmental factors, such as light change. In this study, Hierarchical Extreme Learning Machine (HELM) is utilized as an unsupervised feature learning to learn the object observation directly, and HELM was found to be robust against external change. Reinforcement learning (RL) is used to find the optimal sorting policy that maps each object image to the object's location. The reason for utilizing RL is lack of output labels in this automatic task. The learning is done sequentially in many episodes. At each episode, the accuracy of sorting is increased to reach the maximum level at the end of learning. The experimental results demonstrated that the proposed HELM-RL sorting can provide the same accuracy as the labelled supervised HELM method after many episodes. (C) 2018 The Authors. Published by IAASE.

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