Jagged Robotic Motion Generation by Deep Segmented DMP Networks*

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Abstract

With the advancement of technology in the domain of robotics, robot automation has been getting more popularity in the industrial domain. Nevertheless, the usage of robotics is often still limited to controlled environments such as factories to ensure the safety of its environment. To deal with this problem, path planning methods could be employed to validate robot motions before it was executed, one of them being Dynamic Movement Primitives (DMP). In recent years, several machine learning methods has been utilized to predict the parameters which defines DMP attractor landscape, including deep learning method such as Convolutional Image-to-Motion Encoder-Decoder Network (CIMEDNet). While CIMEDNet can be used to learn a mapping of input to its corresponding DMP parameters, we found that it has difficulty learning parameters with large interval such as jagged motions. In this study we propose a new Deep Learning network architecture called Deep Segmented DMP Network (DSDNet) which implements motion sequencing to tackle the large interval problem. In the evaluation, when trained on artificial data, DSDNet achieves a success rate of 99.23 % on the cutting task compared to CIMEDNet's success rate of 33.14 %. It also successfully performs the pick-and-place task unlike the other method. Furthermore, when trained on the real data, DSDNet shows the best reconstruction accuracy given the limited amount of data.

Keywords:

Imitation Learning, Dynamic Movement Primitives, Cooking, Sequencing

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