World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:12, No:10, 2018

An Efficient Motion Recognition System Based on LMA Technique and a Discrete Hidden Markov Model

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Abstract : Human motion recognition has been extensively increased in recent years due to its importance in a wide range of applications, such as human-computer interaction, intelligent surveillance, augmented reality, content-based video compression and retrieval, etc. However, it is still regarded as a challenging task especially in realistic scenarios. It can be seen as a general machine learning problem which requires an effective human motion representation and an efficient learning method. In this work, we introduce a descriptor based on Laban Movement Analysis technique, a formal and universal language for human movement, to capture both quantitative and qualitative aspects of movement. We use Discrete Hidden Markov Model (DHMM) for training and classification motions. We improve the classification algorithm by proposing two DHMMs for each motion class to process the motion sequence in two different directions, forward and backward. Such modification allows avoiding the misclassification that can happen when recognizing similar motions. Two experiments are conducted. In the first one, we evaluate our method on a public dataset, the Microsoft Research Cambridge-12 Kinect gesture data set (MSRC-12) which is a widely used dataset for evaluating action/gesture recognition methods. In the second experiment, we build a dataset composed of 10 gestures(Introduce yourself, waving, Dance, move, turn left, turn right, stop, sit down, increase velocity, decrease velocity) performed by 20 persons. The evaluation of the system includes testing the efficiency of our descriptor vector based on LMA with basic DHMM method and comparing the recognition results of the modified DHMM with the original one. Experiment results demonstrate that our method outperforms most of existing methods that used the MSRC-12 dataset, and a near perfect classification rate in our dataset.

Keywords : human motion recognition, motion representation, Laban Movement Analysis, Discrete Hidden Markov Model
Conference Title : ICIAP 2018 : International Conference on Image Analysis and Processing
Conference Location : Paris, France
Conference Dates : October 29-30, 2018