Faster, More Accurate Method for Action Classification in Gesture Recognition

Action recognition technology, in particular gesture classification technology has numerous applications, ranging from television, mobile electronics, computer, and video game control interfaces, to robotics and biometrics, to sign language translation and image processing. Indeed, touch-less, gesture based human-computer interaction is believed to be the next solution to consumer demand for new user experiences and increased mobility during use. However, due to the diversity and complexity of human motions, methods for reliably classifying human gestures remain an obstacle to widespread incorporation of this technology into commercial products.

Past efforts to address this problem have been multifaceted, incorporating everything from simple ARMA modeling, to complex multilinear algebra-based approaches. In multilinear algebra based approaches, videos are represented as high order tensors. Previous methods then often learn a projection to characterize a lower dimensional tensor subspace and apply discriminant analysis. These learning-based methods tend to be computationally complex, require large amounts of training data, and are not highly generalizable.

Researchers at Colorado state university have developed a fast, accurate, non-trained method for action classification. Characterizing a video as a data tensor, they relate it on a product manifold through a High Order Singular Value Decomposition (HOSVD). The geodesic on the product manifold is computed as the Cartesian product of conical angles from corresponding factor manifolds. Since their method is non-trained, it avoids the complexity and volume of training data inherent to learning-based algorithms. Moreover, since classification is based on the intrinsic geometry of videos expressed through product manifolds, no training is required. Thus, it avoids the problems of complexity and volume of training data inherent to learning-based algorithms, as well as the generalizability problem associated with these algorithms.

Evaluating on the Cambridge gesture, UMD keck gesture, KTH human action, and UCF sport data sets, our recognition rates are comparably to the current state-of-the-art methods which often require intensive training from data. This new method is non-trained, computational efficient, and easy to combine with more advanced classifiers for enhanced performance.

**Features and Benefits**

- Faster, more accurate, non-trained method for action classification in gesture recognition applications
- Applications in electronics and computer interfaces, robotics, biometrics, sign language translation, and image processing
- Simple method that can be combined with more advanced action classifiers for enhanced performance

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