Chapter 7

Conclusion and Future Direction

This chapter summarises the work reported in this dissertation and give direction for future works. The thesis presents a recognising system of Sattriya dance single-hand gestures. A dataset of single-hand gesture (Asamyukta hastas) is created as part of the research work. The thesis also presents an empirical study on recognition of Sattriya dance using statistical moments. A two level classification method and a hierarchical method with more than two-level are also presented. Experimental results on the dataset created as part of this research work are also presented.

7.1 Conclusion

Following are the major contributions of this research.

- A Sattriya dance single-hand gesture (SSHG) dataset is created for the benefit of research community working in this area. The data set is well organized in terms of RGB image, grey-scale, binary image and boundary and will be useful for anyone working with hand gestures in dance and beyond. The original dataset includes 1450 original instances of 29 classes. The number of instances were increased using different image distortion method and finally the dataset includes 44,950 (43,500 noise images + 1450 original images) images. Moreover, this dataset will also be relevant to other classical dances because several hand gestures of Sattriya dance, included in this dataset, are similar to hand gestures of other Indian classical dance forms with minor variation.

- An empirical analysis of state-of-the art classifier for recognition of hand gestures using existing features has done. Here, both SSHG dataset with and without noise are used for experiment. Four feature set: Huś invariant moments (FS1), Zernike moments (FS2), Legendre moments (FS3) and geometric (FS4) features are used. Analysis on the five state of the art classifiers viz., k-nearest neighbor, Bayesian network, naive Bayes, decision tree and Support Vector Machine (SVM) are presented. It is observed that the features set containing Legendre moments gives better performance than the other feature set. The results also indicates that recognition accuracy for geometric feature set (FS4) gives low performance but it can be improved. The reason may be some of the hand gestures are misclassified because of the fact that most of the single-hand gestures (Asamyukta hastas) are very similar to each other. Thus, our next work focuses to improve the accuracy of geometric feature set with new classification approach.

- A simple two-level classification method is proposed using geometric features for single-hand gestures (Asamyukta hastas/mudras) recognition of Sattriya dance . In the first level, the twenty nine hastas are categorized into three groups based on their structural similarity. In this level SVM classifieris used. Then, in the next level decision tree classifier is used to recognized the hasta image as one of the hastas of the group identified at first level. The proposed method uses Medial Axis Transformation (MAT) as it gives skeletal of the images. Though the classification accuracy for first level is satisfactory but the classification accuracy for second level is not very good. Thus, our future work focuses on the identification of more discriminate features from these images so that a better accuracy can be achieved.

- To improve the recognition accuracy of two-level classification method, some more discriminant features are explored and a hierarchical classification method is proposed. The algorithm attempts to narrow down the search space at each level of the hierarchy till a hasta is completely recognized at a leaf node. An entropy based similarity measure is also introduced to measure the correctness of performing an Asamyukta hastas image. The explored features for hierarchical classification also can be used for similar type of application.

7.1.1 Future Direction

The following are some of the possible directions for future research works in this field:

- Extension of the dataset by including more instances and more features.
- Inclusion of full boby gestures in order to assist self learning and e-learning of Sattriya dance.
- To extend the work using deep learning method for better recognition accuracy.

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