

SPORTS STROKES IDENTIFICATION AND CLASSIFICATION IN VIDEOS USING SPATIO TEMPORAL FEATURE EXTRACTION

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Abstract

In this research, a novel approach for stroke classification in sports using video based technologies is introduced. With the proposed approach strokes can be identified and classified in near real time from streaming videos. The approach uses a windowing approach to identify stroke play events and then uses human motion modeling and analysis (HMMA) techniques to extract spatio-temporal features from videos. The spatio-temporal time series datasets are used with deep neural networks (LSTM variants) for classification of strokes. Proposed approach can be used with multiple sports like cricket, tennis, badminton, table tennis, baseball etc. In this thesis, implementation of the proposed approach with two different sports (cricket and tennis) is discussed.

Three LSTM variants (LSTM network, Bi-directional LSTM network, CNN- LSTM network) have been tested in order to find the most suitable neural network. All trained classifiers in both case studies achieved over 95% average accuracies with the proposed approach. Bi-directional LSTM network has achieved the best accuracy for the classification task in both case studies. The proposed approach has the potential to be useful in areas like augmented coaching, television broadcasting, sports analytics etc. Future enhancements to this proposed approach will include use of the proposed approach for augmented coaching with mobile technologies.

Keywords: Human Activity Recognition (HAR), Human Motion Modeling and Analysis (HMMA), Deep learning, Long Short Term Memory (LSTM), Augmented Coaching, Sports Engineering, Sports Analytics