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TENNIS STROKE CLASSIFICATION SYSTEM

A dissertation by

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Abstract

Human Action Recognition (HAR) has become a significant domain since it is an efficient mechanism that recognizes human activity. Though HAR has been utilized in several other fields, this research is focused on the step detection of tennis strokes using HAR. Video analysis is an improved method to detect stroke steps without involving any device which will interfere with the player or the racquet resulting in a change in player performance. This method can be applied to video recordings recorded without any special equipment, only using a smartphone or a conventional consumer camera. Identifying the stroke steps and analyzing the performance is essential for a novice player and the coach.

This research demonstrates the individual step detection is a feasible task with a considerably large dataset. Convolutional Neural network (CNN) and ImageNet VGG19 model architecture have been used to train the models. The dataset was created by combining UCF 101, THETIS, YouTube videos, and manually recorded videos since the lack of tennis videos is available. The batch processing approach has been utilized to overcome storage problems. The rolling prediction averaging mechanism has been employed for reliable and accurate prediction.

The output of the system is stroke type and stoke steps of specific tennis strokes. The tennis step prediction ensures if the frames are in a sequence. Moreover, this research detects the steps of Serve, Forehand, and Backhand used by the athletes consistently when playing tennis. The results indicate an accuracy of 66% and 78% for stroke and step detection, respectively.

Keywords: Human Action Recognition (HAR), Tennis strokes, Tennis steps, CNN

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