Application Concept - Health & Wellness Category

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Exercise and Sports is an essential part of people's lives but the lack of infrastructure and proper guidance most people are devoid of the benefits one can get out of them. The lack of trained professionals to guide individuals for training for sports and exercise is a big hurdle. To overcome this hurdle I have worked towards building an application which takes into account all these points and tries to provide the best solution possible. The application which is focused towards Exercise is an Automated Exercise Trainer app which takes the video of the person performing the exercise and which guides the doer in doing so. It will be equipped with detection and classification of exercise. It will also provide feedback in terms of score which will help the doer in assessing his/her work. A small feedback with what improvement he/she can do in the posture will also be included in the feedback. The repetition count will also be provided in case of exercises like push up and other such repetitive exercises. The application is also focused towards sports. It will be built keeping in mind that the number of trained coaches are very less and so if we can provide some deep insights which are beneficial to the player and can act as an aid to the coach who is unable to grasp those technical details by their sight. Using Computer Vision and Machine Learning techniques to give the most accurate statistics about the game which will help the player in improving his/her game. Every game has some object involved which gives the statistics of the shot played, speed, angle, point of hit, point of bounce, and so on. The important restriction here is to implement all these things without the use of sensors and just with the use of a mobile phone camera. Machine Learning and Deep Learning techniques will be used to identify the object and track it's trajectory, the depth and distance traveled along with other such minute details which a 2D image is insufficient to portray. I have successfully obtained such information using certain state of the art algorithms.

The application will include the pose estimation, exercise detection, classification and correction of exercises, extraction of body angles, scoring of exercises based on performance and calculation of various other parameters such as Rep Count. This project will make the use of various libraries and machine learning algorithms. The model will be trained for a long time to get the desirable output. The Openpose library will be used for the human pose estimation. This is a single person human pose estimation model using openpose library. Also I will use a Dynamic Time Warping algorithm for calculation of the cost between testing video and training videos. This algorithm is used for 2D Pose Estimation as well as 3D Pose Estimation. I will make the use of Chaquopy Library for making the python code of the project run into Android Studio.

The application will also include the ground mapping or court mapping and calculation of some parameters used in games such as point of hit, point of bounce, speed, angle, trajectory etc.

Here I will be identifying and calculating several game parameters. Also the application will include object tracking and object detection. This application will also include use of several libraries such as OpenCV for object tracking. The YOLO Model will be used for object detection. And also several machine learning algorithms will be used such as Depth Estimation Algorithm for the estimation of several game parameters such as calculation of speed, point of hit and bounce point. For graphically representing the bounce point in the court I will use perspective transform technique called homography transform which converts 3D court into a 2D representation. Player detection will be done using detectron which is a pretrained library by FacebookAI.

I will provide a fully automated computer vision and AI-based personal training assistant that tracks and analyzes movements and objects to provide meaningful insights on technique correction, injury prevention, and external performance metrics (shot angle, speed tracking etc.), in real-time. I will improve movement-based tracking by removing sensors and working through minimal cameras. This technology aims to empower the coaches and athletes by giving them detailed insights to train more efficiently. The main advantage in using this application is that this application will provide all these insights without using any sensors and just using the moderate resolution cameras of the mobile phones mounted at strategic angles.

The end product of this project is delivering a fitness application wherein the application can detect all exercises using my pretrained model. This application will be used by any person to perform the exercise remotely, just the person needs to have a good camera and this application.