Exercise Pose Detection and Correction

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Abstract: *Regular physical activity can improve your muscle strength and boost your endurance; but, lifting weights requires proper technique in order to protect yourself from injury and to get the most out of your workout. Improper exercise form can make is highly inefficient and hazardous. In this report we propose a software application that detects users pose and gives personalized, detailed feedback so that user can correct his form. Our application uses OpenPose library which is the state of the art in pose estimation to detect a user's pose, then calculates the vector geometry of the pose to provide valuable feedback. We recorded around hundreds correctly and incorrectly done exercise videos to train our ML model. We use geometric heuristic algorithm for giving personalized feedback as well as Dynamic Time Warping which is a machine learning algorithm for measuring correctness of exercise. Our application can be run on any PC with GPU and windows or Linux Operating system.*

Keywords: Dynamic Time Warping, Vector Geometry, 2D Human Pose Estimation, 2D Foot Key Point Estimation, Real-time, Multiple People, Part Affinity Fields, etc.

REFERENCES

[1] Chen, Steven, and Richard R. Yang. "Pose Trainer: correcting exercise posture using pose estimation." arXiv preprint arXiv:2006.11718 (2020).

[2] Rishan, Fazil, et al. "Infinity Yoga Tutor: Yoga Posture Detection and Correction System." 2020 5th International Conference on Information Technology Research (ICITR). IEEE, 2020.

[3] Zheng, Ce, et al. "Deep learning-based human pose estimation: A survey. arXiv preprint arXiv:2012.13392 (2020).

[4] Cao, Zhe, et al. "Realtime multi-person 2d pose estimation using part affinity fields." Proceedings of the IEEE conference on computer vision and pattern recognition. 2017.

[5] Zell, B. Wandt, and B. Rosenhahn. Joint 3d human motion capture and physical analysis from monocular videos. In CVPR Workshops, 2017.

[6] G. Papandreou, T. Zhu, N. Kanazawa, A. Toshev, J. Tompson, C. Bregler, and K. Murphy. Towards accurate multi-person pose estimation in the wild. In CVPR, 2017.

[7] Jin, Sheng, et al. "Whole-body human pose estimation in the wild." European Conference on Computer Vision. Springer, Cham, 2020