

Scientists develop method to track human movements more accurately

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Scientists have developed a data-driven method to better detect and track human movements for use in technologies such as at-home personal training videos or monitoring at-risk elderly patients.

The scientists published their results in *IEEE/CAA Journal of Automatica Sinica (JAS)*, a joint publication of the IEEE and Chinese Association of Automation. The collaborative research team includes scientists from the University of North Texas, the North China Institute of Aerospace Engineering and Hefei University of Technology.

"Our goal in this paper [was] to address tracking of human subject movement with high accuracy and consistency," said Xiaohui Yuan, an associate professor at the University of North Texas and a visiting professor at the China University of Geosciences. "This is beyond tracking a person or a car in a surveillance video or tracking the pose of a person to estimate his or her actions."

Yuan points to conventional tracking methods in which the most important identification is the center of the body. In those methods, once the body's core is identified, the location of extremities can be approximated. Yuan's method inverts these traditional methods.

Through the use of a time-of-flight camera, the entire range of view is scanned by each laser, rather than each laser only scanning in its pre-determined boundary. The camera measures depth of objects from the camera, and can isolate background, stationary objects from the human

subject. Then, using a three-dimensional point cloud created by pulling the subject's silhouette from the human, it identifies five extreme points: the head, hands, and feet. Once those points are marked, the joints can be identified.

"In computer vision-based physical evaluation and in training, the accuracy of body part position must be ensured," Yuan said. "In addition, given that our depth imaging device can acquire only surface data of a 3D volume, a detected extreme point could become invisible after an action, [such as] rotation, which makes the consistency of detection critical."

In previous iterations of this [motion capture technology](#), since the camera focused on the body's core, changing an arm's position from side to front could cause incorrect feedback or even a system error.

"The extreme points and joints in a depth image of a human body can be identified with a satisfactory accuracy and consistency by optimizing the geodesic distance and geometrical properties," Yuan said. "No template is required in this process, which makes the proposed method validated to any human figures and poses."

The researchers are now working to improve the robustness and efficiency of their method to better facilitate real-time analysis.

More information: Xiaohui Yuan et al, Automatic feature point detection and tracking of human actions in time-of-flight videos, *IEEE/CAA Journal of Automatica Sinica* (2017). [DOI: 10.1109/JAS.2017.7510625](#)

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