

Real-Time Virtual Footwear Try-on Enabled by Deep Learning

Footwear has become fashion merchandise with a need of personalized design due to the progress in global economics. Previous studies have realized the idea of real-time virtual footwear try-on in augmented reality by developing its functional prototype. However, the use of depth camera imposes serious limitations on the effectiveness and practical value of the try-on function. This study aims to overcome this problem by proposing a novel research methodology. This methodology performs 3D recognition, tracking, and positioning of a human foot in one single color image only using the RGB information. Such 3D reasoning capabilities allow a shoe model to be precisely projected onto the image and overlaid on the human foot. The virtual try-on motion is created by processing each image frame in this manner. We adopt deep learning techniques to create spatial reasoning intelligence. A large amount of training data will be systematically generated for constructing a convolution neural network (CNN) model. The training data consists of two different sets, artificial and real data, produced by computer graphic rendering and manual annotation, respectively. The CNN model will learn to estimate 3D pose of human feet presenting in a color image with random background. The research outcomes will have both technical innovation and practical value by improving the performance of virtual footwear try-on. The methodology enabled by deep learning will increase the computation efficiency of the try-on function by eliminating the lengthy calculation process required by 3D registration based on depth data. It also reduces the sensitivity to the uncontrolled lighting condition in real scene. More importantly, the virtual try-on function implementing the proposed methodology only needs a regular RGB camera instead of a special depth camera, thus giving the function deployment a high flexibility. Consequently, the virtual try-on function can support both e-commerce and mobile commerce and thus show a great potential of augmented reality applications in business sectors.

Keywords: Augmented reality; virtual try-on; 3D recognition and tracking; deep learning; pose estimation