TBIS

**Topic of the Speech:**
Virtual Clothing and Virtual Human Body

**Professor Yueqi Zhong**
Donghua University
China

**Professor Yueqi Zhong** is regarded as a specialist in the area of virtual clothing and virtual human body. He joined the faculty of the College of Textiles, Donghua University in October 2005 on completion of his postdoctoral research at the University of Texas at Austin. Previous to this he completed his Ph.D degree at Donghua University in 2001.

His research continues to address topics on virtual clothing, online sizing, fit evaluation, and in the area of on virtual human body towards E-commerce. He was granted NSFC (National Natural Science Foundation of China) funding three times to support his research work on digitalizing the physical world in the cyberspace. He was also the PI of many projects granted at the Level of Province and Department. In 2014 he was awarded the nationwide prize for his contribution to the textile and apparel industry. His patents on solving the problem of “virtual reality towards online dressing” won him the prize of Shanghai Science and Technology Award in 2013.

## ABSTRACT SUBMISSION

-For invited speaker only

# Virtual Clothing and Virtual Human Body

Yueqi Zhong[1,2*], Duan Li[1], Ge Wu[1], Peng-Peng Hu[1]

[1]*College of Textiles, Donghua University, 2999 Renmin Rd, Shanghai, 201620, China*
[2]*Key Lab of Textile Science and Technology, Ministry of Education, 2999 Renmin Rd, Shanghai, 201620, China*

[*]Presenter's email: zhyq@dhu.edu.cn

**ABSTRACT (NO MORE THAN 500 WORDS:)**

A successful virtual try-on system often requires the modeling of virtual clothing and the measurement on the virtual human body. In our practice, the task of clothing modeling has been divided into two different topics, i.e., dressing and retargeting. For the dressing simulation, we introduce two different approaches. The first solution is to generate the virtual clothing from images, and the other is to reconstruct the three-dimensional clothing from a full-body scanner.

In the image-based approach, we started from taking photos of the flattened real garment and then used the planar shape to obtain "meta-patterns", which were sewn and draped around the virtual human body to generate various dressing results. As an effort to maintain the shape accuracy, Position Based Dynamics (PBD) was employed in the sewing procedure, while strain limitation was emphasized in the draping procedure via global optimization.

For three-dimensional garment/human body scanning using multiple RGB-Depth cameras, the major challenge is to calibrate the extrinsic parameters of each camera. We proposed an improved method to enhance the accuracy based on virtual checkerboards. Laplace coordinates were employed for point-to-point adjustment to further increase the accuracy of shape scanning.

After shape generation, another task of virtual try-on is to retarget the virtual clothing onto various body shapes with various postures. As an effort to probe the possible solutions, two different methods were fully investigated. In the first method, retargeting was regarded as the problem of skin deformation. We scanned the subject with and without layered garments by fitting a statistical body model on it to generate an articulated skin model. The skinned character was controlled based on the motion capture data and the multi-layered garment model was controlled by blending the movements computed by physical simulation and linear blend skinning. In the second method, retargeting was considered as a 'tailoring' problem. Both the virtual garment and the human body were decomposed based on the feature lines defined by automatic landmarking. The patches of the 3D garment were positioned around the human model by setting up the correspondence via feature matching. Virtual sewing was engaged to obtain the final results of retargeting.

Automatic body measurement is the key to tailoring, mass customization, and fit/ease evaluation. The major challenges include finding the landmarks and extracting the sizes accurately. In this work, we also proposed a new method of body measurement based on loop structure. The scanned human model was equally sliced into layers consist of various shapes of loops. The semantic feature analysis was regarded as a problem of finding the points of interest (POI) and the loop of interest (LOI) according to the types of loop connection.

Various virtual dressing results were provided to validate the performance of our solution in tackling the problems faced by virtual try-on. The experimental results on body measurement also proved that the proposed methods can be used to locate the landmarks and to extract sizes on markless human scans robustly and efficiently.