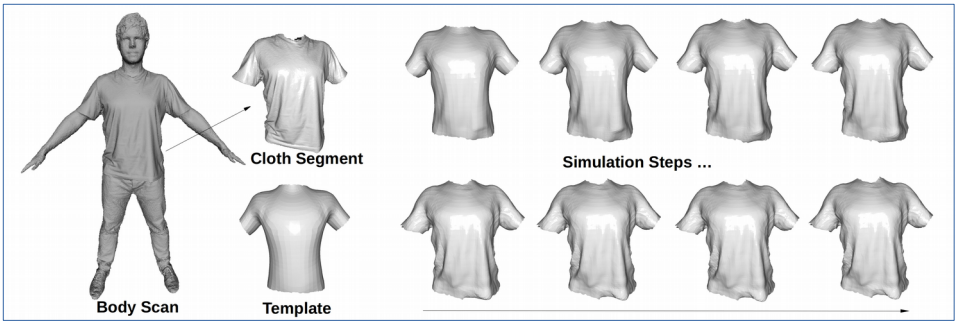
Student: Sikang Yan,
Supervisors: Sk Aziz Ali (DFKI GmbH), Dr.-Ing.Wolfgang Dornisch

Master Project + Seminar (12 CP)
(Seamless Cloth Simulation with High Geometric Fidelity)

Description

This master project + seminar work is purposed to implement (in C/C++) and evaluate simulation process on garments matching with high fidelity details like foldings, wrinkles and body pose based variation. A current particle dynamic system results plausible deformation but realistic fold patterns generated from body-pose based variations and motion ill pose the problem. Target is to match cloth realistically (Future work could be to extend this matching in real time by solving system of equations in GPU using CUDA - C++)



Tasks

- ***A set of simulation data (see fig.) will be provided*** where a template garment (e,g. Shirt, pant, trouser of a subject) is matched with target scan. Compute the deformation and displacement gradients per point and visualize with meaningful color-coding
- The simulation steps are guided by physics based dynamic model. Improve the dynamics to tackle high fidelity or cloth wrinkle pattern, self collision and occlusion scenarios
- Regularize the gradients additionally to improve the final matching
- Evaluate the final results on several types of garments for different subjects and accumulate the results in a dictionary pattern
- Test the above steps when data are represented in cylindrically unwrapped space
- Thorough study of related articles and final report writing + presentation (one intermediate and one final)

Related Articles

[1] DeepWarp: DNN-based Nonlinear Deformation (https://arxiv.org/pdf/1803.09109.pdf)
[2] Gravitational Approach for Point Set Registration (https://av.dfki.de/publications/gravitational-approach-for-point-set-registration/)
[3] NRGA: Gravitational Approach for Non-Rigid Point Set Registration (https://av.dfki.de/publications/nrga-gravitational-approach-for-non-rigid-point-set-registration/)
[4] Wrinkling Coarse Meshes on the GPU (https://pdfs.semanticscholar.org/edfc/917c2041b9de4c25666182b200096c9fb9ab.pdf)
[5] Nonlinear Material Design Using Principal Stretches (http://run.usc.edu/isotropicMaterialEditor/XuSinZhuBarbic-Siggraph2015.pdf)
[6] DeepWrinkles: Accurate and Realistic Clothing Modeling (http://openaccess.thecvf.com/content_ECCV_2018/papers/Zorah_Laehner_DeepWrinkles_Accurate_and_ECCV_2018_paper.pdf)
[7] Animation Wrinkling: Augmenting Coarse Cloth Simulations with Realistic-Looking Wrinkles (http://www-ljk.imag.fr/Publications/Basilic/com.lmc.publi.PUBLI_Article@12af671f1f1_1358f03/animation_wrinkling.pdf)
[8] Simulation of Clothing with Folds and Wrinkles (https://graphics.stanford.edu/papers/cloth2003/cloth.pdf)