Transferring clothing to new characters

Master thesis proposal

Advisors : Marie-Paule Cani, LJK/Evasion & Alla Sheffer, UBC Vancouver, visitor LJK

E-mail : Marie-Paule.Cani@inrialpes.fr, Tél. : 04 76 61 54 32

2D patterns to define virtual clothing   .   Different morphologies

Context and objective

Being able to use a variety of dressed characters is important for most 3D graphics applications, from 3D feature films to games. However, modelling clothing is one of the most time consuming and skill-demanding task in the generation of new characters: garments have to be defined through their 2D patterns, on which sewing lines are specified (note that this step requires clothing design knowledge); then, physically-based parameters have to be specified, and a simulation is run to finally position the cloth over the 3D character. If a character with a different morphology has to be dressed, this process is usually re-started from scratch: indeed, virtual characters may vary in shape much more than real humans do, so the garment would not fit or would look very different if the initial pattern was directly reused after some simple scaling.

The goal of the project is to automatically transfer existing 3D clothing, designed to fit a given character, to a new character or different morphology. This will be done by automatically deforming the 2D pattern of each garment while insuring that the piece of clothing will "look similar" on the new character – i.e. will cover the same portion of its body and move the same way under animation, which is related to its looseness with respect to the virtual character.

Main steps

The input is a dressed character model with the associated 2D clothing patterns, and a target character that may either be a deformed version of the first one or have pre-set correspondences with the first model. The user may be asked to specify specific feature points of these models (e.g. the positions of the knees, wrists, base of the neck, etc).

Starting with a scaled version of the 2D patterns computed from the new distances between feature points, an iterative deformation method will be defined to progressively optimize the patterns: each stage will be aimed at reducing the difference between the local stretch-tensor [1] of the deformed garment over the new character, compared to the stretch tensor on the input one. Distance to the body will also be considered in loose regions in order to get a garment that looks similar [2].
In addition to validation based on stretch tensor map, some animations will be computed to visually validate that the resulting clothing "moves the same way" that the input one.

Références

[1] Animation Wrinkling: Augmenting Coarse Cloth Simulations with Realistic-Looking Wrinkles. Rohmer Damien, Popa Tiberiu, Cani Marie-Paule, Hahmann Stefanie, Sheffer Alla. ACM Trans. Graph., 29 (5), 2010. Special Issue: SIGGRAPH Asia 2010..

[2] A sketch-based interface for clothing virtual characters. Turquin Emmanuel, Wither Jamie, Boissieux Laurence, Cani Marie-Paule, Hughes John F. IEEE Comput. Graph. Appl., 27 (1), 72–81, 2007.