Master 2 Internship subject:

Finding 2D pattern elements from the 3D garment shape

Hosting institute:

ICube Laboratory (Le laboratoire des sciences de l'ingénieur, de l'informatique et de l'imagerie : The Engineering science, computer science and imaging laboratory) at the University of Strasbourg is a leading research center in Computer Science, with more than 300 permanent researchers, with the recently opened AI graduate school supported by the French government.

Work place and salary

The internship will take place in MLMS (Machine Learning, Modeling & Simulation) research team located at the hospital site of the laboratory, 10 min walking distance to the heart of the Strasbourg city center, which is a UNESCO world heritage site.

Salary: 600€ /month approximately (before tax) for a duration of 6 months (adjustable).

Supervisors:

– co-supervisors: Hyewon Seo, Arash Habibi (ICube, Univ. Strasbourg)

Staring date:

Janvier – Avril 2022.

Contexte:

Cloth modeling and simulation is an important classical problem in computer animation, where 2D pattern editing, pattern sewing, drape simulation, and physics-based simulators are sequentially applied to dress the body model, and to obtain realistic secondary motion of the cloth with respect to the body movement. 2D pattern editing and sewing to obtaining a 3D cloth mesh is a time-consuming task by experts. Being able to compute 2D patterns for different human bodies and cloths will not only improve the efficiency of the virtual human generation process, but also affect the fashion industry by making fast garment generation and editing more feasible.

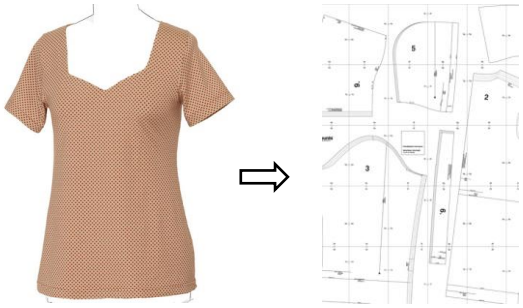

Fig1. In order to obtain a 3D cloth mesh (left), one works on the 2D patterns (right) first, which are then seemed together according to the sewing information. In our work, we will study the inverse problem.

In this study, we are interested in solving an inverse problem for 2D garment computation of a 3D cloth mesh that fit to different body sizes and shapes. To make the problem simpler, we will start by considering 3D cloth meshes prior to be fed into a physics-based simulator. No previous graphics research has studied the pattern, to the best of our knowledge, with a few exceptions where they deploy the 3D-to-2D flattening problem to derive 2D patterns from 3D mesh.

Objectifs:

We are interested in solving inverse design problem of clothing. That is to say, given a 3D cloth mesh, find 2D patterns and sewing information that will reproduce the given 3D cloth mesh. To simplify the problem,

the mesh is assumed to be in its pre-simulation form, i.e. wrapping around a wearer's body mesh without any contact, ready to be sent to a physics-based simulator for the computation of its rest shape.

There are only dozens of 2D pattern−3D mesh pairs readily available, unfortunately. Even when they are available, the sewing information necessary to compute the 3D pre-simulation form from the 2D patterns is not always known in a priori, with dozens of exceptions. Once the sewing information has been identified, on the other hand, the seeming process can be geometrically modeled based on some heuristics and geometrical constraints.

We will approach the problem with the following ideas:

1. Identification of seeming relations among 2D patterns can be automated using geometric constraints and different heuristics. For the sake of computational efficiency, we will parameterize the 2D patterns with a compact number of control points.
2. Once the sewing relation is identified, we can compute the 3D cloth mesh in its simulation-ready form.
3. The reverse problem, i.e., calculating 2D patterns and sewing information from the 3D mesh of the garment, is more difficult work, but can be simplified by assuming that the corresponding 2D patterns are known. In such cases, the respective dimensions and the relative position of the 2D pattern elements must be computed in order to reconstruct the target 3D cloth mesh.
4. We will further improve our method by designing an algorithm capable of selecting the necessary patterns.

We are considering a deep learning-based approach in this task, especially for the realization of point 4.

Candidate profile

— Master student in Computer Science or in (Applied) Mathematics

— Solid programming skills: Python/C++

— Background in geometric modeling

— Experience in deep learning (Pytorch or Tensorflow)

— Les compétences en physiques ne sont pas requis

Application

Send your CV and your academic transcripts (Bachelor and Master courses) to ahabibi@unistra.fr and seo@unistra.fr. And