PhD subject:

Generation of 3D Dynamic Human Body Meshes with Clothes

Figure 1: We will develop and train a generative model for 3D dynamic human body meshes.

Hosting institute

ICube Laboratory (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

The thesis work will take place in the MLMS (Machine Learning, Modeling & Simulation) research team of the ICube laboratory (The Engineering science, computer science and imaging laboratory) of the University of Strasbourg, a leading research center with more than 300 permanent researchers. The workplace is located on the hospital site of the laboratory, a 10-minute walk from the heart of downtown Strasbourg, listed as a UNESCO World Heritage Site.

Supervisors

– director: Hyewon Seo (ICube, Univ. Strasbourg)

– co-supervisors: Frederic Cordier (Univ. Haut-Alsace), Cédric Bobenrieth (ICAM Strasbourg-Europe)

Staring date

October 2024

Work description

Human motion generation is one of the most challenging and long-sought aspects of character animation, with immense potential for real-world applications. It aims to generate realistic human pose sequences that meet one or more user-defined constraints, for animating targeted 3D body meshes. Substantial progress has been made in motion data collection technologies and generation methods, laying the foundation for increasing interest in human motion generation. In particular, recent advances in deep learning have contributed to significant strides in this field, enabling the development of models that can generate realistic motions that are appearance-preserving and rich in diversity, with various ways to condition it. However, with a few exceptions, the majority of prior works focus on the generation of 3D skeletal pose sequences [1, 2, 3], resulting in inherent limitations stemming from the skeletal representation.

In this study, we aim to address the challenging problem of 4D (3D+time) geometry modelling in the context of 3D human motion generation. Our specific aims are as follows:

1. Representation of human motion as 4D geometry, as a better alternative to the skeletal representation.
2. Motion generation with identity awareness, serving as a means to control the motion, ensuring that it reflects the anatomical characteristics of the target body.
3. A generative model for clothed human bodies through a seamless representation of cloth geometry with respect to the body mesh.

The project will be realized by building upon a well-established 'de facto' body model [4], our previous work [5, 6], as well as publicly available 3D shape motion capture datasets [7] and 3D garment databases [8, 9].

Candidate profile

− Master student in Computer Science, Electronic & Electrical Engineering, or in Applied Mathematics

− Solid programming skills: Python/C++

− Proficiency in Deep Learning techniques

− Background in Geometric Modeling and Statistics

− Good communication skills

Application

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

Bibliography

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[7] N. Mahmood, N. Ghorbani, N. F. Troje, G. Pons-Moll and M. Black, "AMASS: Archive of Motion Capture As Surface Shapes," 2019 IEEE/CVF International Conference on Computer Vision (ICCV), 2019.

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[9] H. Zhu, Y. Cao, H. Jin, W. Chen, D. Du, Z. Wang, S. Cui, and X. Han. 2020. Deep Fashion3D: A Dataset and Benchmark for 3D Garment Reconstruction from Single Images. In European Conference on Computer Vision (ECCV), 2020.