

Blending-Based Personalised Human Motion: an Application to Walking

Type d'offre : **Master Recherche**

Lieu de travail : **Rennes**

Thème de recherche : **Perception, cognition, interaction**

Projet : **MIMETIC** - <http://www.irisa.fr/mimetic/>

Responsable scientifique : ludovic.hoyet@inria.fr

Subject

Over the last decade, developments in character simulation have expanded the possibility to use virtual characters in various applications. Apart from the obvious video game and movie industries, such characters are now also used in many other applications, e.g., training, surgery, e-learning, ergonomics or urban planning. In particular, more and more applications require to display large numbers of characters, which to be plausible need to display personalised motions, e.g., depending on their morphology, sex, or emotional state.

Because we all move differently in real life, creating such personalised variations is crucial for the realism of virtual scenes. [MLD+08,O'Su09] Typically, approaches targeting the creation of variation rely on learning statistical models [MXH+10]. However, such approaches quickly become intractable to use, as a specific model needs to be learned for every type of motion to consider. They also do not easily allow to control the type and amount of variation to create, which makes personalisation extremely difficult. Instead, we propose to use another traditional approach in character animation, namely a blending-based approach [MKMA04], to create variations. Basically, several motions are linearly combined to create a new motions, e.g., combining a walking and a running motion to create a jogging motion. If a reference motion is available, differences to this reference motions can also be linearly combined in an additive fashion. Such an approach is typically used to create transitions between motions in video games, e.g., from standing to walking, or to synthesise in-between motions, e.g., walking at different speed.

In this internship, we therefore want to explore the possibility of creating personalised human motions using a blending-based approach, where personalisation will be described by variations to a reference motion, and linked to high level parameters (e.g., morphology, age, sex). In particular, we will use results from a study we previously conducted, where we explored the factors that make biological human motions to be recognizable and appealing [HRZ*13]. Amongst others, we found that average motions, created from averaging the walking motions of 15 actors, were always considered to be amongst the least distinctive and most attractive, and will therefore explore the value of using such average motions as references for blending.

This internship will therefore involve:

- Developing a framework for analysing, synchronising and blending walking motion capture data,
- Exploring different methods for computing a reference walking motion (e.g., average, median, neutral),

- Designing experimental protocols to evaluate the space of reference motions that are visually indistinguishable by viewers,
- Integrating these results in a demonstrator for creating personalised walking motions based on individual parameters (e.g., morphology, age, sex).

Environment

The candidate will work in the MimeTIC team in the joined Inria / IRISA research centre located in Rennes. Inria (www.inria.fr) and IRISA (<http://www.irisa.fr/>) are amongst the leading research centres in Computer Sciences in France, and the MimeTIC team is internationally recognised in the fields of Computer Graphics and Virtual Human Simulation. Research activities in MimeTIC focus on simulating virtual humans that behave in a natural manner and act with natural motions.

Requirements for candidacy

- Strong programming skills (C/C++ recommended)
- Basic knowledge of computer animation and graphics
- Interests in user experimentation

Keywords and References

Virtual Characters, Human Motion, Perception, User Experimentation

- [HRZ*13] L. Hoyet, K. Ryall, K. Zibrek, H. Park, J. Lee, J. Hodgins and C. O'Sullivan. 2013. Evaluating the Distinctiveness and Attractiveness of Human Motions on Realistic Virtual Bodies. In *ACM Transactions on Graphics* 32(6).
- [MXH+10] W. Ma, S. Xia, J. Hodgins, X. Yang, C. Li and Z. Wang. Modeling style and variation in human motion. In *Proceedings of the 2010 ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, 2010.
- [MLD+08] R. McDonnell, M. Larkin, S. Dobbyn, S. Collins and C. O'Sullivan. Clone Attack! Perception of Crowd Variety. In *ACM Transactions on Graphics (SIGGRAPH 2008)*, 27(3), 2008.
- [MKMA04] S. Ménardais, R. Kulpa, F. Multon and B. Arnaldi. 2004. Synchronization for dynamic blending of motions. In *Proceedings of the 2004 ACM SIGGRAPH/Eurographics Symposium on Computer animation (SCA '04)*.
- [O'Su09] Carol O'Sullivan. Variety is the Spice of (Virtual) Life. *Lecture Notes in Computer Graphics (Motion in Games'09)*, pp 84-93, 2009.

Contact

We are looking for motivated candidates, please send CV, motivation letter and any relevant material to ludovic.hoyet@inria.fr