Human Movement Adaptation Using a Novel Distance-Based Approach

Type d'offre : Master Recherche
Lieu de travail : Inria Rennes, équipe MimeTIC
Thème de recherche : Perception, cognition, interaction
Projet : MimeTIC
Responsables scientifiques : Antonio Mucherino / Ludovic Hoyet

Subject

In our everyday life, we are used to perform repetitive actions, such as seating and getting up, or entering our car, or even dancing our favorite dance. When our environment is subject to changes (the chair may have an untypical shape, the car might be smaller, the borders of the dancing floor could be too tight), we still manage to gracefully adapt our movements to the new environment features.

This kind of motion adaptation problems have a strong impact in game industry, because, in modern games, users have the possibility to modify game characters, as well as the environment where they play. A predefined action needs therefore to be adapted in real-time to the several situations that may occur [SHH*13]. Another important application is ergonomics, where working places are designed with the main aim of taking into account human factors.

The main focus for this internship will be the exploration of a novel distance-based approach for human movement adaptation. Given a scene with a character performing some actions in a predefined environment, the main idea is to represent the character and the environment with weighted undirected graphs which include information about their topology. The movement is then represented by a "mesh" including distances between character and environment at each time frame.

The real challenge consists in reconstructing a given scene with modified character and/or environment features. Compared to previous approaches using an "interaction mesh" created from a Delaunay triangularisation [HKT10,AKC13], which suffer from a lack of temporal continuity, the research will be oriented towards tools that were previously developed for the distance geometry problem [MLLM13,LLMM14] to target interactive applications. Distance geometry consists in identifying the graph embedding in a given Euclidean space that is better able to satisfy a predefined set of distance constraints, and was previously successfully applied on large data set such as molecule configuration estimation.

Environment

The candidate will work 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. The work will be supervised by members of the MimeTIC team, internationally recognised in the fields of Computer Graphics and Virtual Human Simulation.

Requirements for candidacy

- C/C++ recommended
- Strong background in mathematics
- Previous experience in character animation would be an advantage

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

Keywords and References

Character Animation, Human Motion Adaptation, Distance Geometry, Interactive Applications

[AKC13] R. Al-Asqhar, T. Komura, and M. Choi. 2013. Relationship descriptors for interactive motion adaptation. In Proceedings of the 12th Symposium on Computer Animation (SCA '13).

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[LLMM14] L. Liberti, C. Lavor, N. Maculan, A. Mucherino. 2014. Euclidean Distance Geometry and Applications. SIAM Review 56(1), 3-69.

[MLLM13] A.Mucherino, C. Lavor, L. Liberti, N. Maculan (Eds.). 2013. Distance Geometry: Theory, Methods and Applications, Springer, 410 pages, 2013.

[SHH*13] H. Shum, L. Hoyet, E. Ho, T. Komura, F. Multon. 2013. Preparation Behaviour Synthesis with Reinforcement Learning. Proceedings of the 2013 International Conference on Computer Animation and Social Agents.

Contacts

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