Thesis project at Gleechi AB
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Optimal Hand Rigging for Interaction Animation

About Gleechi:
Gleechi is a Stockholm-based startup that has developed the first software to make it possible to animate hands that can move and interact freely and realistically in games and Virtual Reality. The technology is based on 8 years of robotics research, and the company now has customers including one of the top 10 largest VR developers in the world as well as a world-leading automation company. Gleechi has received several awards, including Super Startup of 2015 by Veckans Affärer and ALMI Invest and Winner of the european competition EIT Digital Idea Challenge 2015.
Video demo: https://www.youtube.com/watch?v=xkCt17JHEzY

Introduction:
With the recent growth of virtual reality (VR) applications there is a demand to create highly immersive environments in which the avatar that the user embodies reflects any kind of actions in the virtual world as precise as possible. The major action humans use for interacting with the world is grasping of objects with their hands. Until now, the visual representation of grasping in VR has been resolved by very simple means only, such as attaching a rigid hand to the object that does not adapt to the shape, or manually animating a sparse set of grasps for pre-defined objects, or just not showing hands at all. Initial experiments have shown that hands that are too human-like, or hand that do not match the the players' expectations in appearance or behavior, often leads to a loss of the feeling of presence (i.e. making the players feel they are not really in the game). The effect is closely related to the "Uncanny Valley" effect, which refers to when features look and move almost, but not exactly, like natural beings, it causes a response of revulsion among the observers.

Description:
Gleechi provides a software solution called VirtualGrasp which makes it possible to animate natural looking grasping interactions in real-time based on the constraints of the virtual world (such as shape of objects, kinematics of the hand, etc). This solution is not a hand tracking algorithm, but a tool that animates a given hand model. In VR applications, an important measure of success for such a system is to create hand and finger motions that both satisfy the physical constraints placed by the object, and are natural and realistic to the human eyes. To fulfill these requirements, the first step is to obtain a hand model with good skeleton structure, and attach the skin to the bones so that the surface of the hand model moves correctly with the skeleton joints. These processes are called "Rigging" and "Skinning" [1].

While there exist many hand models, they are often created with different non-standard rigging techniques to fulfill their specific purpose of skinning and animation. A common example of this is when game developers add additional intermediate bones in the hand, with the only purpose of getting a better surface deformation when the joints move. However, to enable efficient automated hand animation solutions like VirtualGrasp, one needs to have a standardized hand model upon which one can generate realistic animations for different hand-object interaction actions. The goal of this thesis is to create an automated rigging system, which takes an input as either a 3D hand mesh without any skeleton, or a hand model with existing rigging, and provide an output with optimal rigging structure following a standardized hand model.

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Tasks:

- Summarize state-of-the-art of auto-rigging techniques, and investigate which method is best for hand rigging.
- Design and implement a suitable algorithm for hand rigging.
- Test, optimize and evaluate the implemented process.
- Summarize and discuss the findings in a report / thesis.

Supervisor at Gleechi: Dr. Kai Hübner

References:

[1] A wiki article about skeletal animation
[2] Virtual Human Modelling and Animation for Real-Time Sign Language Visualisation
[3] Automatic rigging and animation of 3D charactors, Siggraph 2007
[4] Automatically rigging multi-component charactors, EuroGraphics 2012

Application info:

Last apply date:	2017-07-31
Project work period:	Estimated to be 2017 Sep - 2018 Feb
Assignment type:	Degree project
Credits:	30 hp
How to apply:	Please email us your CV, transcript and an one-page personal letter.