# Thesis project – A GPU- Based Implementation of Position Based Skinning

Scientific question:

Skeletal animation is a widely used techniques for animating articulated characters, such as humans and animals. In skeleton-based animation, skinning is the process of defining how geometric surface of a character deforms according to a function of skeletal poses. One of the fundamental aspects when animating articulated characters is the production of flesh-like deformations for the soft tissues when the character is moving. Creating believable and compelling skin deformations is the central challenge of animated feature films, computer games, and interactive applications. Position based skinning technique is a two-layered deformation framework, which is able to mimic the macro-behaviors of the skin and capture secondary effects, such as volume conservation and jiggling, while minimizing the manual post-processing time. Position based skinning combines widely known and relatively simple techniques, linear blend skinning and position based dynamics. In linear blend skinning, the basic operation is to deform the skin according to a given list of bone transformations (Fig. 1). Position based dynamics on the other hand is a popular approach used for animating constrained particle systems representing soft bodies, rigid bodies, and fluids.
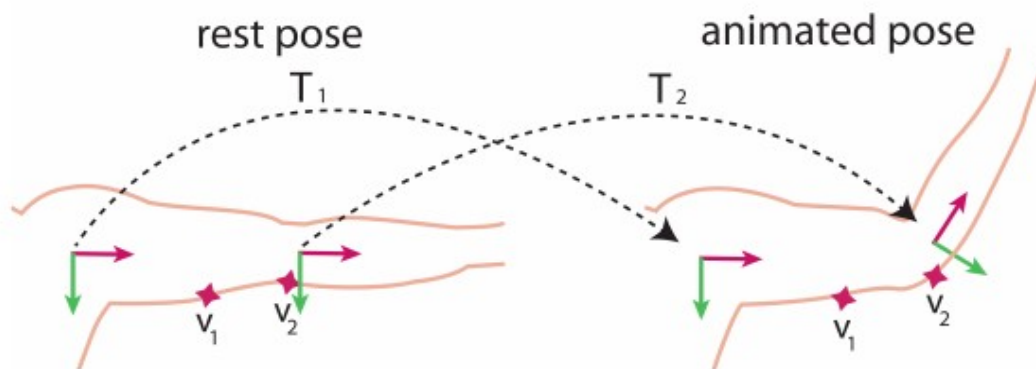
Figure 1: An example that illustrates the main concept of LBS. There are two transformations T1 and T2, corresponding to the transformations of shoulder and elbow joints from the rest pose to an animated posture.

The research project:

The aim of this project is to improve the performance of position based skinning by creating a GPU-based implementation. Solving the position based skinning constraints on the GPU will lead to considerably increased performance, especially in case of a fairly high number of constraints and HQ meshes.

What will you learn:

Animating virtual characters using physics based simulation, skeletal animation, mesh deformation, and student will gain experience in GPU programming.

Whom are we looking for:

This project is intended for those who are passionate about bringing virtual characters to life. You will need a solid background in Computer Graphics and Computer Programming (in particular programming OpenGL in C++, GPGPU/ CUDA) and a good three-dimensional imagination.

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