CAGD Group
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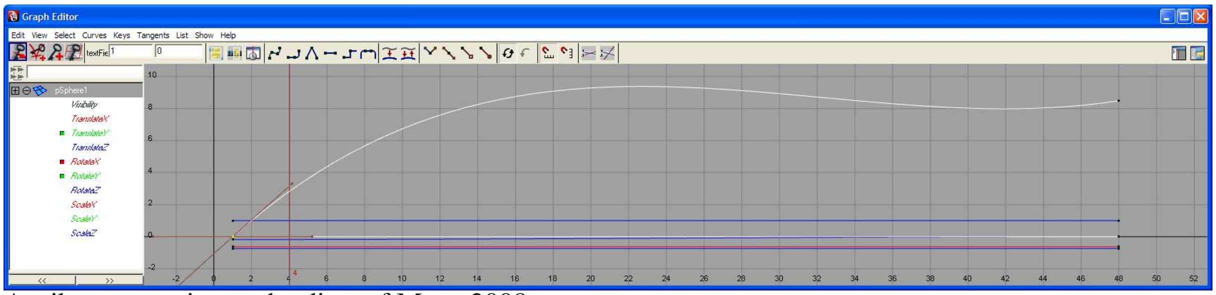
Access Map (Building 21)

Master's thesis in France ?!
Haptics-assisted animation generation

For the tuning of an object animation in an animation system (like 3DStudio MAX or Maya) the derivatives of an attribute curve are very important. Currently, the interfaces implemented in some animation systems require an expert user to achieve good results. In this work, we want to improve this by a haptic guidance of the user when changing the parametrization of an attribute curve. At the beginning, the manipulated curve is a simple line segment.



Attribute curve in graph editor of Maya 2008

Work Description

The base system for exploring a cubic Bézier curve in a Windows environment (C++, GLUT) will be provided to get you started. This works with the Novint Falcon, see http://home.novint.com/ and http://www.youtube.com/watch?v=ik_pbsig1pA, as a 3DOF haptic interaction device. As work program, we propose the following steps

1. Specify a class of functions, mapping a parameter interval $[a,b]$ onto itself, to be used for the reparametrization of the line segment. Polynomial Bézier or B-spline curves would be classic candidates. The question is to use higher degree curves or adding further segments to the curve of same degree, in order to get more control points?

2. Then, implement exploration of the line segment so that the exploration can be sensed in a tactile way. Is it better to vary the tangential speed along the curve or to place sensor points in equal distance on the parameter interval?

3. Compute the arc length parametrization of the curve and approximate it in your class of reparametrization functions.

4. Deform the reparametrization curve directly using the haptics device, and try to realize guidelines for well parametrized curves. For example, the curve should start with slow speed (ease-in) and slow down again (ease-out), or run out at maximum speed. The user should be guided by the haptics device to input good curves according to the guidelines.

5. Integrate your test environment into a plugin for the animation system of Autodesk Maya or Autodesk 3D Studio MAX (Optional).

Links

Curves and Surfaces for CAGD – A practical guide Gerald Farin, 5th Edition, Morgan-Kaufmann Publishers 2002.

Prerequisites

You are about to finish your studies in applied mathematics or computer science and have basic knowledge and interest to learn more about Bézier and B-Spline curves,
good knowledge of programming in C/C++.

Periode

between march and mid-july 2009

Financing

ERASMUS

Application

CV (with a list of your classes and projects), and a letter of motivation to send to the below contact.

Contact

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To learn more about the CAGD team of the Laboratoire LAMAV in Valenciennes,
see http://www.univ-valenciennes.fr/lamav/cgao/.