1. Introduction

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This report refers to a work based on a paper from Lucas Kovar, et. al\ref{motiongraphs}, particularly the path synthesis technique described there. Motion Graphs is a method for creating realistic, controllable motion. In Kovar's work a directed graph is automatically generated, this graph contains pieces of original motion and automatically generated transitions. The authors also presented a general framework for extracting a particular graph walk that meet the user's specifications, and apply this framework to a specific problem with different styles of locomotion and arbitrary paths. \\

Path synthesis relates to this final step in the proposed framework, where a user specifies a path and a graph walk is performed in order to generate the locomotion that best suits the path. The goal is to integrate this specific module into a larger virtual character locomotion system. Ideally the user defined path should be approximated by a spline and then a search in the motion graph should be done in order to find a set of motion capture data that minimizes the error. This error is the sum of the squared differences between the defined path and the path that the animation will produce, for that it is used the arc-length distance of the paths. \\

The OGRE engine will be used as the basis for the entire project. A scene with a model is generated where the user can input the desired path to traverse. Once the program finds the set of motions that respect the rules explained above, it is rendered on the scene

1. Implementation details

The implementation can be divided in some different parts. Each one is a fundamental operation off the whole system. The whole process works as follow:

[FLUXOGRAMA DO FUNCIONAMENTO ver 2.3.2]

* 1. User path definition

User path definition is the step where the user defines a simple path which the avatar would ideally travel. In reality, as we will see, this is not so simple to implement. The user defined path is a sequence of vectors between points chosen by the user in the application screen (figura XPTO).

[figura do ecrã com algumas linhas]

[NUNO: falar da implementação das linhas ]

* 1. How to use animations from motion graphs

Trough motion capture data, one can create animations. To use these animations in the Ogre graphics engine, the following steps must be made:

[descrever os passos para usar a animação no ogre]

* 1. How to choose the correct animation

To choose the correct animation, first we must assert which animation is more suitable to follow the path defined by the user. This can be done, by defining that each animation will have an error. This error corresponds to the relation between the desired path and the actual path the animation follows (image XPTO). We then choose the animation with a smaller error, which is the one that will follow a path similar to the one defined by the user.

[Imagem de exemplo]

* + 1. Error formulation

[VER NO ARTIGO E COPIAR]

* + 1. How to effectively calculate the error in ogre
* Para cada animação, calcular o arclengh
* Projectar o arclengh no user path
* Calcular o ponto no limite do arclenght
* Usar a equação parametrica da recta para calcular o ponto
* Calcular a distancia entre o ponto obtido e o ponto onde a animação parou

[descrever em detalhe os pontos no fluxograma]

* 1. How to put stuff in motion (for each segment of the user defined path, we have the corresponding animation with the lowest error)

1. Conclusion