# A Platform Independent Architecture for Virtual Characters and Avatars *

Marco Gillies[1], Vinoba Vinayagamoorthy[1], Dale Robeterson[2], and Anthony Steed[1]

[1]Department of Computer Science, University College London, London, UK,
[2] BT plc, Adastral Park, Ipswich IP5 3RE, UK
{m.gillies,v.vinayagamoorthy,a.steed}@cs.ucl.ac.uk,
dale.e2.robertson@bt.com

We have developed a Platform Independent Architecture for Virtual Characters and Avatars (PIAVCA). This is a character animation system that aims to be independent of any underlying graphics framework and so be easily portable (it currently runs on the DIVE virtual environment frameworks and BT plc's Tara graphics engine). PIAVCA supports body animation based on a skeletal representation and facial animation based on morph targets. We intend to make PIAVCA available on an open source licence for use by the academic community (NB we hope this will be done by the time of the conference).

PIAVCA aims to be highly flexible and extensible. One way in which it achieves this is via the "Motion Abstraction". This is a single abstraction that represents any type of animation of a character. Different implementations of the abstraction can provide very different sources of animation, for example motion capture data, procedural animation or real time tracking data. The abstraction itself is very simple, each motion has a number of "tracks" each of which has a value that varies over time. The fundamental operation is to query the value of a track at a given time. This operation is entirely abstract so there is no representation specified for a track. The values of a track could be stored (for example for motion capture data) but it could be computed on the fly. Tracks are typed representing either scalar floating point data, vector positions or quaternion rotations. This allows our abstraction to represent both body animation, with tracks corresponding to joints in the skeleton and their values being rotations (there is also a position track for the root of the character) and facial animation where each track corresponds to a morph target and the value is a floating point weight. Currently we have a number of sources of animation, for example an importer from BVH motion files, and a procedural gaze engine. However, the real power of the motion abstraction is that is becomes possible to implement transformation on animations without knowing what the source of the animation is, or even without knowing whether it is a body or face animation. We have implemented a number of transformations on single motions (e.g. scaling, altering the speed, looping) and on multiple animations (e.g. smooth transitioning, interpolation motions, performing different motions on different parts of the body, generating random sequences from a given base set of motions). All these transformations

* This work has been supported by BT plc and European Union FET project PRESENCIA, IST-2001-37927

are themselves implementations of the motion abstraction, making it possible to pass the result of one transformation to another one. This makes it possible to create complex motions through multiple stages of transformations. The motion abstraction also makes PIAVCA highly extensible as new transformations or sources of animation merely have to implement the motion abstraction in order to be completely interoperable with existing ones.

PIAVCA also contains a number of other features that make it simple to use. It has a queue that makes it possible to smoothly sequence motions. It is also possible to play a number of "background motions" concurrently with other motions, for example, to provide variety and idling behaviour. PIAVCA has been used for a number of immersive virtual reality studies and we have developed a TCL-based framework for quickly creating experiemenation scenarions.