Intelligent Expression-Based Character Agent Systems

Steve DiPaola

Simon Fraser University Surrey
250 -13450 102 Avenue
Surrey, BC V3T 0A3 Canada
sdipaola@sfu.ca

1 Parameterized Approach

By using parameterization techniques which model artistic, living or cognitive systems it is becoming possible to create new types of behavior and expression character systems. These techniques are allowing virtual agent creators to incorporate models of expression, emotion, behavior and even human creativity into their work. Additionally, rather than simply using realism as a goal, is it becoming possible to computationally model knowledge from other expression-based sources including artists, musicians and designers, to go beyond communication to creative expression.

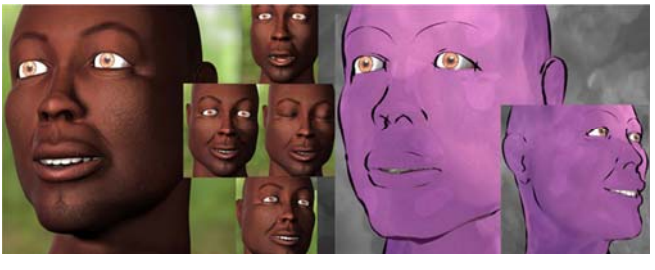

Fig. 1. iFace: parameterized systems for muscle, personality, expression and creative depiction

In this paper, a modular multi-dimensional parameter space for character agents is described as an underlying structure that allows for this knowledge-based approach, especially in the areas of faces[1], characters, personality[2], biological creatures (i.e. whales behaviors in a pod) and depiction as well as higher level constructs like creativity[3]. Once a parameterized knowledge space is created, it optionally possible to control the parameter space with artificial intelligence techniques [4].

The basis of this approach creates a low level set of parameters that are object-oriented, encapsulated and mathematically rigorous—aligned to the knowledge being gathered. These can be thought of as letters in a specialized alphabet, which form the basis for words and phrases (high-level components). These low-level dimensions (e.g. axes) create a large knowledge space that can be accessed through higher-level constructs, which are solely composed of the lower-level parameters often with logical,

Zs. Ruttkay et al. (Eds.): IVA 2009, LNAI 5773, pp. 3–4, 2009.

spatial and temporal attributes. For example, in our iFace facial agent system, low-level muscle parameters can be built up into a more semantic 'smile' parameter and 'smile' with other parameters and temporal considerations can be built up into 'joyousness'. We use this approach with facial agents to create expression, personality and creativity depiction types (figure 1).

Most computer-based communication and information systems, such as websites and applications are informational in nature. However, people use more socially-based techniques to convey their message – they rely on their passion for the subject, narrative techniques, flexible content depending on audience or audience feedback, eye contact, humor and voice modulation. Similarly, expressive character systems used by game and agent designers can introduce more engaging characters that can change expressions more intelligently, demonstrate personality traits and have expressive behavioral interactions with the user and other agents (e.g. whales).

We believe that hierarchical parameterization can provide a comprehensive and effective agent system via: (1) the use of higher-level parameters which apply lower level ones in combination and with constraints, and (2) defining time-based parameters that control actions. For example, we have used this method for: parameters that control how expressions group into behaviors, creating a personality type of a face agent; an artificial intelligence systems for 3D whales that exhibit natural behaviors in a whale pod; and genetic algorithms that work with facial type parameters for evolving faces in the game "The Sims" (figure 2A and 2B).

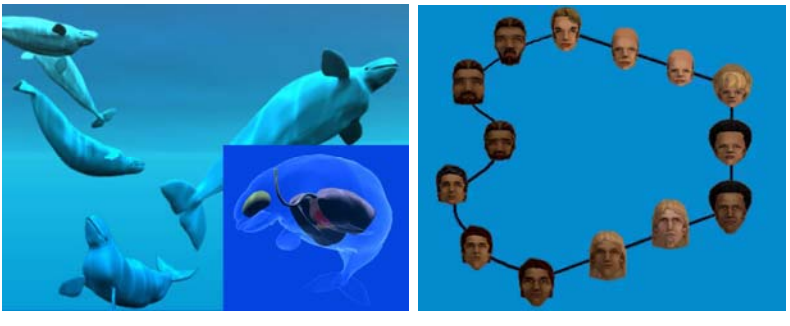

Fig. 2. Artificial intelligence: A) whale pod behavior, B) genetically evolved "The Sims" faces

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