

GALA 2008 submission document

**Title:** Alfred – a System for Intuitive Facial Expression Control

**Track:** Student

**Category:** Tool

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**Process of development:** The facial expressions and the controller-system were developed between May and July 2008 as part of the author's master thesis. The 3d character was developed prior by the author for demonstrating the shading abilities of the Horde 3D Graphics Engine by Nicolas Schulz.

**Resources used:**

1. Autodesk 3D Studio Max & Luxology modo for 3D graphics generation, <http://www.autodesk.com> & <http://www.luxology.com>
2. Adobe Photoshop for 2D graphics generation, <http://www.adobe.com>
3. Microsoft Visual Studio 2008 for programming, <http://msdn.microsoft.com/>
4. Horde 3D Graphics Engine, <http://www.horde3d.org/>

**Resources required:** Alfred was developed and tested on a PC with Windows Vista Prof., AMD Sempron 3600+, 1.5 GB RAM, ATI X1250 graphics card. For advanced skin shading a PC with Windows XP Prof. OS, Intel Pentium D 3.0 GHz, 2 GB RAM, nVidia Quadro FX 4500 graphics card was used.

For user input an Xbox 360 – Game Controller and P5 Data Glove is required.

## **Alfred** – a System for Intuitive Facial Expression Control

### **1. The application and context of the work**

Alfred is a Facial Animation System designed to create facial expressions for Animated Agents in an easier, more intuitive and faster way than conventional animation tools. The project uses a gamepad and a data glove for user input. The user input can be interpreted with three different methods.

Alfred uses the Facial Action Coding System (FACS) by Paul Ekman and Wallace Friesen for the description and creation of the facial expressions. The tool is a standalone application based on the Horde 3D graphics engine. While used to control one specific virtual character at the moment, it can be easily reconfigured to control any FACS-based character face.

### **2. Novelty**

Although facial expressions have become more and more important in animated characters, most facial animation tools are using conventional GUIs for the animation setup. Especially morph-target-based systems like Poser or Valve's Faceposer rely heavily on the use of sliders.

Alfred tries to overcome the limitations and complexity of these animation tools by using hardware controllers (gamepad or dataglove). The user can choose between different modes of inputs: direct control of the action units, modifying of basic emotions or blending basic expression. These hardware controllers have the advantage that they allow the editing and mixing of multiple animation parameters at the same time. Furthermore they provide haptic control of these parameters, allowing the user to focus on the character's expression and not on the animation system.

### **3. The architecture**

Alfred's architecture is based on two independent modules: The first module processes the user input and interprets it into action units. The following controls & interpretation models are available:

- Direct control of the action through a conventional slider-based GUI
- Direct control of three different face regions through the analog-sticks of a gamepad
- Choosing a basic facial expression and modifying it by an adapted and reduced set of action units (analog-sticks of gamepad)
- Blending two or more basic facial expressions (analog-sticks of gamepad)
- Direct control of six different facial regions through the finger bend of a dataglove. The glove's spatial position is used to select the facial regions.

This module also contains a constraint system for the facial expressions which allows only anatomically possible expressions.

The second module translates the action unit into facial expressions and renders the graphic output. Both modules communicate via UDP socket.

The created facial expressions can be saved and loaded in a XML format. The configuration of the controller, the basic expressions and their reduced controller sets are based on data from the "Facial Expression Repertoire" Database.

### **4. Performance**

The software runs smoothly on one single PC with a modern graphics card. Most capacity is used by the rendering module. The controller module itself requires very little capacity.

A user evaluation of the different input methods is in progress. The system received a positive feedback from professional CG artists at Chimera Entertainment. Especially the animation control through gamepad and the blending of basic emotional expressions were received well.

**References**

- P. Ekman and W. Friesen. Facial Action Coding System: A Technique for the Measurement of Facial Movement. Consulting Psychologists Press, Palo Alto, 1978.
- D. Thalmann, Using Virtual Reality Techniques in the Animation Process, Virtual Reality Systems (Earnshaw R., Gigante M., Jones H. eds.), Academic Press, pp. 143-159, 1993
- “Facial Expression Repertoire” Database, <http://research.animationsinstitut.de/>