Low Cost Avatars Animation System from Real Images Compliant MPEG4

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ABSTRACT

In this paper we present a low cost system to capture, modelization and animation of avatar face with a few control points based in FAP´s MPEG4 coordinates. A Facial Animation Engine is designed as high-level interface for the synthesis and animation of virtual faces that is in full compliance with MPEG-4. We implement the MPEG-4 standard specifications for the adaptation and animation of 3D wire-frames models with respect to the reproduction of two characteristics: realism in adapting the model geometry to the characteristics of any specific face and realism in performing facial expressions. Starting from a facial wire-frame model and from a set of configuration files, the developed system is capable of automatically generate the animation stream of FAPS (Facial Animation Parameters). Our system uses an Interpolation approach to emulate the behavior of face tissues. The final objective is to use the system in real time environments and for portable PDA, mobile phone applications or virtual reality applications.

Keywords

Calibration, FAP´s, MPEG4, Facial Animation Engine, Real time Applications, Interpolation.

1. INTRODUCTION

The realistic capturing, modeling and animation of the human face is one of the most elusive goals in computer vision and animation. We focus on the delivery of real time (and hence low bit rate) facial animation for use in collaborative virtual environments.

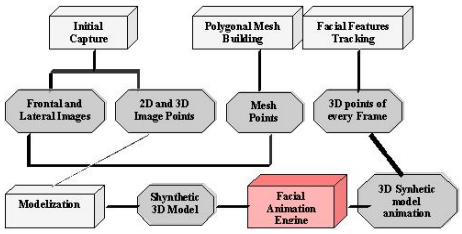

Figure 1. Whole facial system

Our objective is to achieve the best results possible using relatively low cost, widely available equipment. No Facial markers are providing the control points for facial analysis and later model deformation. At the moment the system select some points in a automatic way (lips corners, eyebrows, etc..) and other in a manual initialization procedure. Also the focus is on recognizing lip movement for vocal communication and major expressions such as smiling, frowning, surprise etc. Figure 1 explains the whole system.

2. MPEG-4 FAP's AND MODELITZATION MODULE

The MPEG-4 Facial Animation standard specifies a face model in its neutral state. 84 Feature Points (FPs), used to provide spatial reference to specific positions on a human face and 68 Facial Animation Parameters (FAPs), that move the FPs producing the animation. Feature Points are arranged in groups like cheeks, eyes, head, etc.

In this module, a *realistic* face model is constructed from a frontal and a lateral photography of a person.

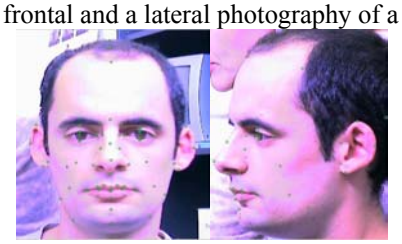

Figure 2. Frontal and a lateral picture of person

We take two pictures with two cameras that are calibrated using the Tsai calibration method. Once we have the two pictures, we can reconstruct the 3D FDP points from one side of the face. The user selects (we are working in a automatic version of key points detection using computer vision techniques) the FDP points of one side of the face. After that, the 3D

coordinates of the FDP points of the right side of the face are reconstructed using the calibration of the two cameras. Then, the FDP points of the left side of the face can be reconstructed using symmetry. We have defined a very simple symmetry plane, with the points 11.1 (forehead), 2.1 (chin) and 9.3 (nose). We get 75 of the 84 FDP points of the face. The points are joined in triangles. The result can be seen in the wireframe model. Also we can apply a texture onto the wireframe model.

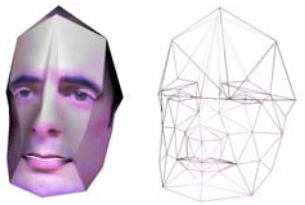

Figure 3. Result model.

2.ANIMATION MODULE

The Facial Animation Engine is designed to provide a high-level interface for building MPEG-4 compliant animated models. This interface is composed with the cores mechanisms responsible of the facial animation and is capable of animating a facial wire-frame starting from its geometric description and from the associated semantic information. The geometric description of the model to be animated is a fully compliant VRML file. In this way, we only heed the "geometrical" information on the face like vertices, triangles structure and, optionally the texture node with the information about the texture image to apply and the texture coordinates.

We define some FAE requirements to take into account for the system we have developed:

- The Facial Animation Engine has to be independent of the shape and size of the model to be animated.
- It has to be able to load the geometric description of the facial model from a VRML file.
- The animation rules for each FAP has to be able to be defined whatever is the geometric wire-frame model to be animated.
- The system has to be able to create a full animation between different predefined expressions.
- The animation technique to be used has to be the Interpolation between predefined points.
- The system has to be able to generate the animation choosing among three interpolation techniques: lineal, polynomial and spline.

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3.SOME RESULTS, CONCLUSIONS AND FUTURE WORK

We define an implement a low cost FAE using real image capturing, without any marker on face.

In the figure 4, we can see a mobile phone with the image general with our system, is similar in size to one SMS and with a MMS we can send also the texture. In any case, after the initial process only we need to send the changing points in animation. We are working hard to define a application in Java specially dedicate to mobile requirements to using the owns mobile camera we can do all the process.

Figure 4. Mobile phone with the image general with our system

We have described an implementation of a Face Animation Engine compliant with MPEG-4 capable of animating a generic facial wire-frame by providing the usual geometric parameters together with some semantic information on the wire-frame.

Many aspects are still to be improved. Implementation of the movements affecting other parts of the face. The portability of the system is also another of the tasks to be exploded. The ability of the system to be exported to Internet and to the mobile networks will multiply the number of applications to be used.

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