

INFORMATION OF THE DOCTORAL THESIS

Thesis title: *"Development of 3D facial expression techniques"*

Speciality: Information System

Code: 9.48.01.04

PhD. Candidate: Huynh Cao Tuan

Scientific supervisors:

1. **Assoc. Prof. Do Nang Toan, PhD**

2. **PhD. Nguyen Thanh Binh**

Training institution: Posts and Telecommunications Institute of Technology

THESIS CONTRIBUTIONS

(1). Proposing a face detection solution in an image based on the basic idea of performing binary layering for each area of interest combined with video segmentation technique based on feature subtraction..

(2). Proposing the technique of locating the control points based on the Active Appearance Model (AAM) and estimating facial expressions that were located in the control point set. Instead of statistics and discrete selection of a number of shape features by hand, the author automatically selects the geometric features randomly and organized under the decision tree model to perform the estimation facial expression.

(3). It is proposed to use 3 types of shape features: LINE_LINE, TRIANGLE_TRIANGLE, LINELINE_LINELINE. The reason for choosing these three types of shape features is because facial features are different, but always have an attached relationship that forms lines or triangles that follow a similar pattern. For example, the position of the eye, nose and mouth is always correlated.

(4). Proposing automatic technique to determine the set of control points to serve the model deformation correction based on the analysis of a set of observational models of the object of interest. Combined with deformation rectification algorithm and a set of variation models to evaluate the rectification quality.

APPLICATION AND FUTURE WORK

Application

The results of the thesis can be integrated into real-time application systems such as 3D editing with real actors, or in virtual interactive game systems, or video calls with effects fun application ... or build a virtual announcer system ...

Future work

Although the thesis has proposed the solution of 3D facial expression, the process of simulating expressions after being estimated on the 3D face model is accurate and reasonable in the context. There is still no way.

(a) A typical example is when a person is smiling but his lips are sharp and his eyes are congenitally down, the system can estimate happiness and sadness, or when the person is angry but shows a lot. through the color of the facial skin (red), not really through facial gestures and thus the estimation of the expressive state will no longer be accurate, leading to a false simulation of the state..

(b) Currently, the system undergoes many image processing stages from face detection to determination of the control point set, then estimates the features and finally interpolation to emulate expression. That way, discrete processing slows down the entire system.

**Confirmation of representative
Scientific supervisor**

PhD. Candidate

Assoc. Prof. Do Nang Toan, PhD

Huynh Cao Tuan