Head Movement and Facial Expression Transfer from 2D Video to a 3D Model

by
Mairead Grogan

Supervisor: Dr. Rozenn Dahyot

Master of Science in Computer Science (Interactive Entertainment Technology)

2013

The realistic transfer of facial animation from a face in a 2D video to a 3D model has proved to be a persistent challenge in recent years. In this thesis we propose a method which transfers both the head movement and facial expressions of a person in a 2D video to a 3D model. Our method uses corresponding feature points on both the 3D model and 2D face to calculate the rigid head pose of the person in the video. This pose is given by a rotation and a linear transformation. Once these parameters are calculated, they are used to transform the 3D model so that the head is in the correct position. The next step is to transfer the expression of the 2D face onto the rotated 3D model. The facial expression is represented by the displacement of the current set of feature points in the 2D video relative to a set of reference feature points. We assume that these facial expression feature points only move in 2 dimensions. We then use the displacement vectors to transform the corresponding feature points on the 3D model. These newly transformed feature points are used to drive a Laplacian deformation which computes the positions of the remaining non-feature points on the 3D model. The final results constructed using this algorithm are both accurate and realistic. This method improves upon previous research in the area which assumed that the head remained static throughout the video. The simple acquisition system of the input video data ensures that this technique could be implemented in applications where motion capture or 3D scanning systems are unavailable. Our method can be used in a wide range of applications including character animation for 3D films, online avatars, expression exaggeration and reconstructing a video sequence from multiple viewpoints.

Link to Youtube video: http://youtu.be/S528aTR0Cmc