Spectators, a joy to watch

Ionut Damian, Kathrin Janowski and Dominik Sollfrank

Institute of Computer Science, Univeristy of Augsburg,
86135 Augsburg, Germany

1   The Scene

The tennis game that is described in the xml is a double, thus there are four tennis players on the court. There is a handful of spectators that are really excited about the game. The spectators have different preferences about the teams that they favor or are neutral. To vary the mood-states, each spectator has an euphoria factor that determines how much a change in the mood-state will affect it. The mood-state of a spectator is shown with expressive facial expressions and some typical animations. Additionally to the animations and expressions the mood-state is expressed by speech as well.

The moods that are expressed are euphoric, happy, slightly happy, neutral, slightly sad, sad and disappointed. The division of these fields is not uniformly distributed. The neutral field is bigger than others so that not every score will result in a change of the mood-state if it is currently neutral. The fields for the extreme values euphoric and disappointed is quite small so that even a simple point may result in a change. Another factor that

Fig. 1. The scene with some spectators.

results the mood-state is the importance of the scene. The effect of a score in a match ball is much higher than a 15-15. From time to time, a spectator will not just look at the ball, but look at a specific player. This results in a behavior variant in the spectator crowd and thus in a more natural appearance of the scene. To make the scene more convincing, a referee is integrated that comments the current score via text-to-speech as you know it from TV.

2   The System

Parsing and simulating events The given XML file offers rich information about the tennis game. It is split into information about the four players, the ball and the score. The entries consist of an index and a start and end value. In the beginning, all the information from the XML file is read into vectors. The information about the ball is only given by actions and vague positions with height and side. A major part of this work is to interpolate the position values

of the ball between the given positions. This interpolation is necessary because otherwise the spectators would not be able to follow the ball.

Inverse kinematics The gaze behavior of the spectators is done via inverse kinematics. Inverse kinematics is the process of determining the parameters of a jointed flexible object (a kinematic chain) in order to achieve a desired pose. The GameIKComponent, which was developed for the Horde3D GameEngine [1], the so called Cyclic-Coordinate Descent (CCD) method. This method has many advantages, one of them being the ease with which one can extend its range of use beyond simple IK [4]. Another functionality of the GameIKComponent, called IK_Gaze, allows moving the eyes and head of a character. It is based on an adjusted version of the CCD algorithm. The gaze problematic can be viewed as a more specific case of inverse kinematics, and therefor treated in a similar way by manipulating a predefined kinematic chain until the last node of the chain (called end effector) points towards the target, in this case, until the eyes look at the target. The fact that it uses an iterative algorithm with simple loops makes IK_Gaze a reliable, real-time method of animating characters. IK_Gaze gives us a realistic way of porting the human gaze action on virtual characters. Emotions, conversations and other social behaviors become more human-like.

The spectators As our Tennis Spectator, we chose a cartoon character called Ritchie, of whom an older version has already been used for various projects. The new model uses the Facial Action Coding System (FACS) for facial animation, which was developed by Ekman and Friesen [3]. In FACS, expressions are split into Action Units (AU) which mostly correspond to the movement of a particular face muscle. By recombining these Action Units, complex emotional and conversational signals are created. This method allows for more flexible and predictable animation than blending between basic emotions of the whole face, since all parts are assigned individual deformations. Consequently, possible conflicts between contrary movements (such as a smiling mouth speaking an O) can be avoided by choosing either of them or fine-tuning their respective intensity. An even more important benefit is that new, more specific facial expressions can be easily composed based on parameters. The Ritchie model was created using Autodesk's 3ds Max, with Biped animations for gestures and Morph Targets for the required AUs. These were created consulting mainly the Facial Expression Repertoire [2], which provides video examples for almost all AUs, as well as a library showing how to combine them to produce a wide range of emotional expressions.

References

1. Augsburg University. Horde3D GameEngine, 2008. `http://mm-werkstatt. informatik.uni-augsburg.de/projects/GameEngine/`.
2. Filmakademie Baden-Wuerttemberg. `http://research.animationsinstitut.de/`.
3. Paul Ekman and Wallace Friesen. *Facial Action Coding System: A Technique for the Measurement of Facial Movement.* 1978.
4. Jeff Lander. Oh my god, i inverted kine!, 1998.