

KinEmotion: Context controllable emotional motion analysis method for interactive cartoon generator

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Figure 1: (Left) Background is controlled by user's posture / (Right) Printed copies of generated cartoons

1 Motivation

Recently, cartoon contents are applying to various media like interactive systems. In a near future, the desire of user may become to immerse their live experience into a cartoon content deeply. In automatic cartoon generation environment using NUI (Natural User Interface) like Kinect, we can comprehend the importance of linking emotion expression with user's posture. Its story and impression are uncontrollable, if the system could not choose a suitable effect for each user motion. The system should have story driven method to protect the interpretation of the world, even if there is its original piece of manga.

2 KinEmotion: simplified algorithm for posture-emotion controller

We have developed AccuMotion algorithm to recognize accumulated motion for NUI game play in past research. AccuMotion obtains similarities with a target motion and a key motion from current posture. The timing difference of key and target motion can realize an intuitive input and an expression of user sensory for energy accumulation. This method is useful for presentation and operation for home electronics as well as a game play. However, cartoon is story driven world interpretation. The evaluation function needs to output a grade value instead of binary to perform one's physical emotional expression with a suitable visual. It is ideal if we can acquire human emotion using kinematics from Kinect. However, it is unreasonable to analyse the human emotion that will be infinite including context in real time. We propose "KinEmotion" algorithm for this issue. It is an extension of AccuMotion. A consecutive evaluation output is operated from each joints' inner product with signed weight coefficients. For example, "a hero posture" can be expressed as five dot products from both elbows, both sides, and tilt of the back.

It is able to design emotion evaluation function to fit in an expected range if we give suitable signed weight coefficients for a target emotion. The teaser image is example which assigned the evaluation function to three conditions like Blank-Flash-Breakdown. A background changes continuously when user bends underarm and an elbow. The background effect and words balloon are automatically layout and they follow the movement of the user cartooned

$$f_{elb}(t) = \frac{V_1 \cdot V_2}{|V_1| \times |V_2|} \quad (-1.0 \leq f_{elb} \leq 1.0)$$

$$f_{axi}(t) = \frac{V_3 \cdot V_4}{|V_3| \times |V_4|} \quad (-1.0 \leq f_{axi} \leq 1.0)$$

$$f_{pet}(t) = \frac{V_5 \cdot V_y}{|V_5| \times |V_y|} \quad (-1.0 \leq f_{pet} \leq 1.0)$$

$$E(t) = C_1 \cdot f_{elbL}(t) + C_2 \cdot f_{elbR}(t) + C_3 \cdot f_{axiL}(t) + C_4 \cdot f_{axiR}(t) + C_5 \cdot f_{pet}(t)$$

C_n : contribution ratio for each joints, Zero means the joint is not used to an emotion.

Figure 2: The evaluation function of KinEmotion

avatar. The function can be described as a dynamic effector which can be configured with contribution ratio for each joints. It is easy to understand to control linked posture-emotion for artists instead of complex mathematics. Through the natural experience of the user, it can perform physical emotional display freely.

This algorithm is design abstraction then the story can be written by scripting. The designer assigns frame cuts, image file names and evaluation function with signed weight coefficients to prepare a dynamic scenario instead of hard implementation.

3 Manga Generator: a demo system

We have applied KinEmotion to a demonstration system "Manga Generator". It is a game-style attraction system. Player is making a pose to accord a story which is prepared for beforehand freely. The player can take the generated cartoon by printed copy and it is the only unique cartoon in the world. It have been tested in several public events and TV programs by thousands of visitors. All the player moved their body to a story naturally. It realized a failless game system then it got positive evaluation from all attributes. In a student competition, IVRC2012 final stage, it was chosen by 19 percents of 1,122 public visitors as the best one from 11 projects. In the near future, the technique of KinEmotion is not only an attraction but also will be applicable in the recognition of the feelings of the people who are in the space of the entertainment system.

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