

Face Tracking for Augmented Reality Game Interface and Brand Placement

Yong Jae Lee¹ and Young Jae Lee^{2,*}

¹ Tongmyong University
leeyj@tu.ac.kr

² College of Culture and Creative Industry,
Jeonju University, Korea
leeyj@jj.ac.kr

Abstract. This paper proposes the AR game interface which is more faster and emotive by using an intelligent autonomous agent. As the operation of AR game has designed in accordance gamer's face tracking, this study applied the movements on game. Since the nature of the game requires the real-time interaction, CBCH algorithm has been selected for face recognition. In case of failed face tracking, the interface agent has been used to provide the gamer with the sound information to be helped with situation perception. Furthermore, re-tracking has been enabled so that the proposed algorithm could help the gamer to be able to effectively react to the attack. This paper also looked at the design for the new beneficiary model for the game industry through interdisciplinary research between game and advertising. In conclusion, application to the 3D ping-pong game brought about effective and powerful results. The proposed algorithm might be used as fundamental data for developing the AR game interface.

Keywords: AR game interface, face tracking, agent, 3D ping-pong game.

1 Introduction

With advanced technologies in computer hardware and software, technologies involving game production and game interface are rapidly developing. Recently various and natural interfaces which do not use keyboard or mouse have been developed and in use. Among these, experience-based interface using gamer's motions is in wide application for AR or functional games [1-11].

The AR game allows the gamer to enjoy the exercising effect since it is based on the motions of the body. This kind of game has the advantage in that the gamer could stretch the stiff body after hours of computer use while enjoying the game [1].

However, most of the games which have now been developed for PC use are designed to use limited hardware such as keyboard, mouse and joystick, which is the main cause for confinement to limited space and less sense of reality. Other interface

* Corresponding author.

gadgets such as haptic gloves or glasses and HMD interface have also their own drawbacks several ways: they cause discomfort since they have to be worn on the user's body; they use wires which can bother free movements of the user; they are expensive to be bought for the purpose of playing the game. [1] If we can only use human movements to control the game without the need for keyboard or sensor-mounted gadgets, we could make the computer user-friendly with more human interface, not to mention enhancing the sense of reality for the game. [2] Thus, for the purpose of this research 3D ping pong game has been developed with no other interfaces except for the webcam and the paper proposes the game interface using gamer's face recognition. When face recognition fails, the interface agent appears and tells the gamer about the current situation with accompanying message. The algorithm for re-recognizing the face has also been proposed and the following experiments proved its performance and validity.

2 AR Games and Agent

AR(Augmented Reality) focuses on enhancing fun through the interactive experiences within the environment which combines the elements of the virtual reality and the real-world. There has been steady attempts to introduce the augmented reality into the game technology, as we can see in the examples of bowling game and car racing on the table. "Eye of the Judgement", the card game for PlayStation 3 by Sony is the AR game released in 2008, which shows 3D virtual characters on the table by using card recognition technology[2-6]. There is also a game which is played interactively in a limited space with many markers installed on the ceiling recognizing the hands of the user [1].

Interface agent is also called user interface. Interface agent is the agent which is autonomous and with reinforced learning ability designed to provide more convenient computer-using environment. Interface agent also presents more familiarity to the computer user by introducing human or animal images. Through technologies such as 3D animation, sound synthesis and lip animation, the interface agent provides the environment in which the user might feel as if he or she is conversing with other people or personified animals while using the computer. Peedy of MS and Genie of Argo are the examples. Peedy, the Microsoft agent character, can understand human speech and react to it. Multimodal agent interfaces provide the user with the environment enabling easy input [7-8].

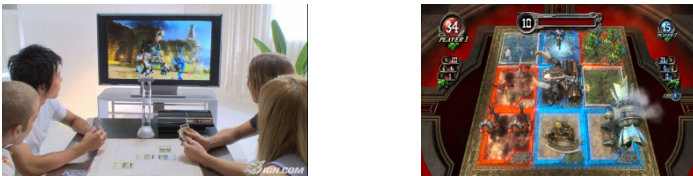


Fig. 1. Eye of Judgement of SONY Corp

3 Proposition of the Algorithm and Experiments

3.1 Proposition of the Algorithm

CBCH(Cascade of Boosted Classifier Working with Haar-like Feature Algorithm)[9-11], which is proposed here, works like this. The image input through the webcam is recognized by using CBCH and the coordinate values of the face is changed into the coordinate values for the game interface. In the 3D ping-pong game presented here, the bars for offense and defense are matched with the coordinates and the bar movements are controlled by the face movements. The collision sensing algorithm can detect the collision of the ball and the bar whose action and reaction is to be realized in consideration of the directions of the movement vector. If the face recognition fails in the next frame, the agent notifies the gamer of the situation with sound and text more than once.

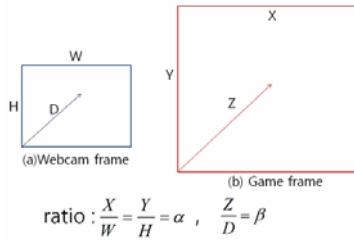
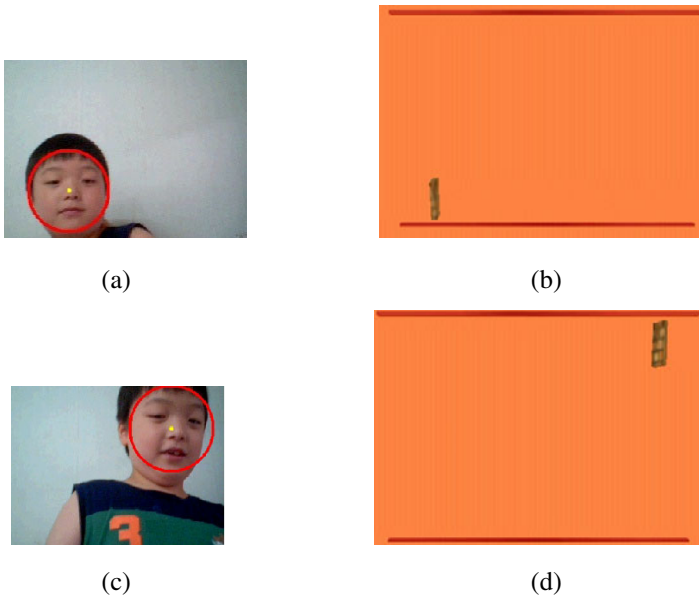
3.2 Ping-pong Game

For the purpose of the research, the 3D ping-pong game has been custom-produced by using Irrlicht engine, Visual C++, and SAPI(speech engine). It is to be noted that the agent has been used to notify the gamer about the situation regarding face recognition.

The background of the game is 800 * 600 sized and 32-bit graphics. Two bars for the offense are based on the faces of the gamer 1 and the gamer 2 respectively. To make the ball three-dimensional, we used the cube scene node and the spare scene node functions of the Irrlicht engine. We made the ball and the bars spin toward the y axis to enhance the sense of reality and to attract the attention of the gamer respectively. Square collision method has been selected for the collision algorithm of the bars and the ball since it assures rapid detection. Background music and sound effect have been added for the game immersion effect. The moment of the collision has been given special auditory effect to emphasize that the 'spinning' ball hits the bar. The agent used for the game is Genie of Argo(Figure 3.)

3.3 Experiment 1 Frame Design

The Experiment 1 is about the frame design for the game image using the webcam image and the resulting image has been checked. In Figure 2, we modified the coordinates for the webcam and the game image by using the constant values of alpha and beta and tested the locations on Experiment 1 image. To apply the designed frame in the game, Experiment 1 tested the correspondence between the bar and the face interface. Fig. 3(b) shows the resulting movement of the bar to the corresponding left bottom on the game scene after we had moved the face(game interface)to the left bottom in Fig. 3(a). In Fig. 3(c), the face(game interface) moves to the right top which makes the bar in Fig. 3(d) move to the corresponding right top on the game scene. The two cases confirm that the movement of the face triggers the reaction of the bar, which moves to the corresponding location on the game scene. Therefore, the Experiment 1 verifies that gamer's face could be used as the valid game interface.

**Fig. 2.** Frame Image**Fig. 3.** Experiment 1 Image

3.4 Experiment 2

Experiment 2 is to identify the function of the agent in notifying the gamer when CBCH face recognition algorithm fails. In Fig. 3(a), the face recognition fails and the Genie in Fig. 3(b) appears and tells, with the accompanying text, the gamer to adjust. The gamer, upon hearing the message, adjusts the face(the game interface) and moves the face(Fig. 3(c)) to defend not to lose score(Fig. 3(d)). Fig. 3(e) shows defense and offense and Fig. 3(f) is the resulting image. As shown, the role of the agent is very important in scoring and defending.

3.5 Experiment 3. Brand Placement on Game

Experiment 3 showed the possibilities of interdisciplinary studies between game and advertising by placing particular brand on the AR game interface. Recently, interdisciplinary studies are drawing scholar's attention in many fields. That's why the

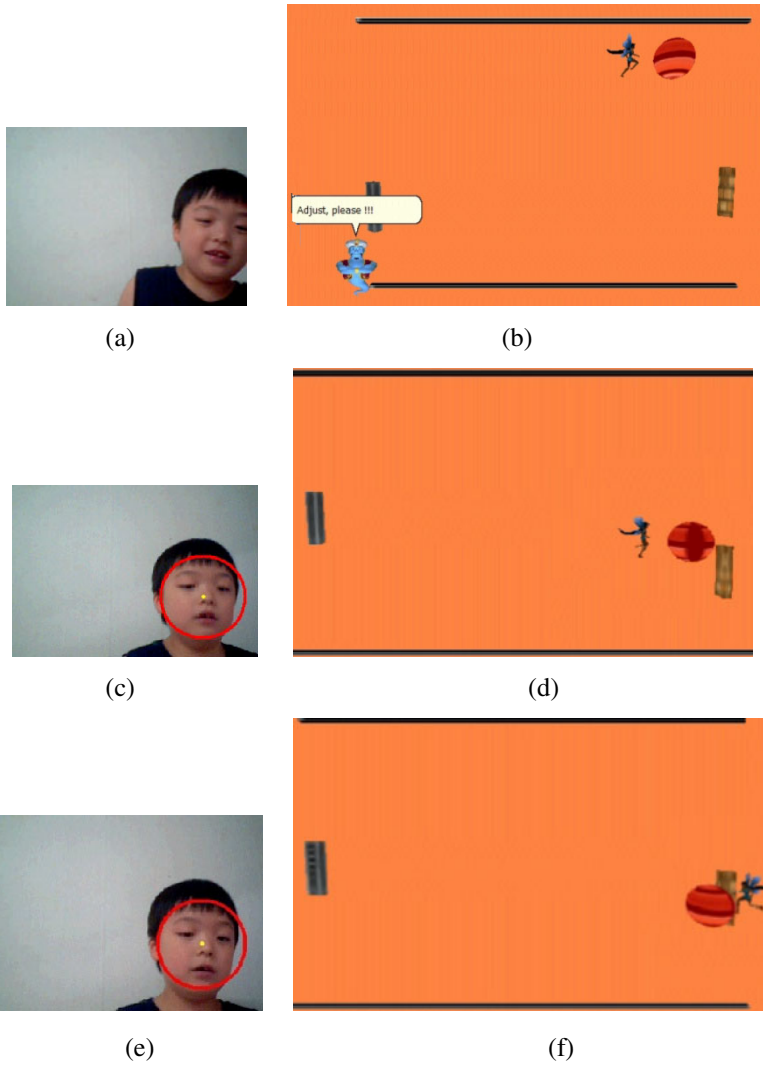


Fig. 3. Experiment 2 Image

convergence is getting more important concept in multimedia. In game industry, a new beneficiary model such as brand placement can be a successful way to guarantee their business. And also, prior researches have found out the synergy effects could be maximized by integrating these two academic fields. In other words, advertising tools including brand placement can be developed as an innovative beneficiary model for game industry.

In summary, brand exposure on game can serve as an opportunity to raise the brand awareness and preference for the sponsor and the game company can reap profits. It can also raise the enjoyment level for the game user, making its realization highly probable.

8. Lee, Y.J., Lee, Y.J.: The Application of Agent and Advertising in 3D Sports and Game. *Journal of the Korea Institute of Marine Information and Communication Sciences* 14(10), 2269–2276 (2010)
9. Viola, P., Jones, M.: Rapid object detection using a boosted cascade of simple features. In: *IEEE Conf. on Computer Vision and Pattern Recognition*, Kauai, Hawaii, USA (2001)
10. <http://www.lienhart.de/ICIP2002.pdf>
11. http://cafe.naver.com/opencv.cafe?iframe_url=ArticleRead.nhn%3Farticleid=1328