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Automated Customizing System for Effective Expression of Emotion

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Abstract

Amidst today's game environment that is becoming increasingly fluid, there has been ongoing research on how to apply emotional expressions to game characters as an active response to the game environment. However, most studies have so far dealt with the subject matter of developing a model for artificial emotions, but from an engineering perspective only. To instill emotions in game characters, it is clear that an engineering-based model that enables a game character to express artificial emotions is required. At the same time, all actions taken by a user through his or her character must also be expressed by the character emotionally. In addition, emotional engineering technology can be applied to not only characters within a game, but also to topography, sound, costumes and interactions. This application can also help enhance the user's engagement. However, compared to packaged/console games, emotional engineering is very rarely applied to characters in an online game. This study first compares and analyzes automated character customizing systems in use today. These systems allow for the application of emotions to characters in packaged/console and online games. Then it proposes a prototype of an automated character customizing system to which physiognomy is applied based on then users' behavioral type within an online game. Finally, the need for the proposed system is validated through a survey.

Keywords: Characters, Customizing, Emotional Engineering, Physiognomy

1. Introduction

1.1 Background of Research

Capitalizing on recent advancements in games, various new attempts are being made in the gaming world. One such attempt has resulted in the birth of game characters that visually resemble real-life people. Furthermore, vigorous efforts are being made to instill emotions in characters using avatars or emoticons on different platforms.

Indeed, numerous studies on how to enable game characters to express emotions as an active response to a fluid, constantly changing game environment are being conducted. However, most of the studies have so far dealt with the subject matter of developing a model for artificial emotions, but from an engineering perspective only.

To instill emotions in game characters, it is clear that an engineering-based model that enables a game character to express artificial emotions is necessary, but at the same time, all actions taken by a user through his or her character must also be expressed by the character emotionally. In addition, emotional engineering technology can be applied to not only characters in a game but also to topography, sound, costumes, and interactions. This application can help enhance the user's engagement. However, compared to packaged/console games, emotional engineering is very rarely applied to characters in an online game.

This study aims to compare and analyze automated character customizing systems in use today. These systems allow for the application of emotions to characters in packaged/console and online games. Then the study proposes a prototype of an automated character customizing system to which physiognomy is applied to an online game

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1.2 Relevant Research

1.2.1 Physiognomy

Based on English dictionaries, physiognomy can be defined as the face or countenance, especially when considered as an index to the character and as a concept related and similar to phrenology or anthroscopy1.

The term's definition in a Korean dictionary can be translated as "physiognomy is an act of judging one's destiny, lifespan or personality based on his or her facial features"2.

1.2.2 Customizing

The term "customizing" comes from "to customize," which means "to make something as ordered." In other words, it means that a user configures or changes the functions of the hardware or software according to his or her preferred way of use and taste. For instance, a user can "customize" a software program by assigning functions that he or she frequently uses onto specific keys or on a menu tool bar to create an environment that is easier to use. In addition, when a user modifies a work-related system of standard specifications – be it an application or a package – in such a way to better support his or her actual work, this modification is also considered "customizing"[1].

1.2.3 Character Customizing System and its Type

A character customizing system helps a user create characters within a game. Such a system gives a user freedom to choose what they want. Thanks to the functionality and individuality that the system offers, the users can create their own distinctive, unique character, which in turn serves to increase the users' overall engagement in the game that they are playing.

In this study, a Character Customizing System is shortened to an abbreviation – CCS. CCSs have existed ever since games were created and then characters were introduced within the games. According to the "Naver Game Smart Finder" database, this system has allowed users to play a computer game with existing, pre-created characters from "Treasure Strike Full Swing," which started its service in 1971. Since then, games have advanced drastically, and various CCSs can be found in them.

As of now, CCSs can be categorized into "select systems," "parts systems" and "transform systems" and their respective descriptions and representative games under each system are listed in Table 1.

1.2.4 Automated CCS

Automated CCS refers to a system in which characters are not created through a primary customizing system, but are created and then modified through a user's action or interactions with a third party within the game (e.g., battle, falling into water).

2. Analysis of Existing CSS

2.1 Comparative Analysis of Automated CCS for Different Game Platforms

There are many elements in a game to which automated character customizing can be applied. Such elements include wounds and injuries inflicted during a battle, damage to a character's outfit and damage to a character's weapon. While in a routine environment, a character's behavior may change due to the social action or the character's physical condition, and the character may have a different expression on the face to show his or her mood.

Table 1. Classification of customizing systems

Systems	Explained	Represent game
Selection system	When creating a character, this system allows a user to select from characters that have been already created by the development team.	Dungeon and Fighter, Lineage, etc.
Part of the system	When creating a character, this system allows a user to choose from images for each part already created by the development team and to assemble the chosen parts into a complete character.	World of Warcraft, Dragon Nest, etc.
Transformation system	When creating a character, this system lets a user directly create each part with a controller or control keys to make a complete character.	Aion, C9, Blade and Soul, etc.

In this paper, existing automated CCSs in games that are categorized by genre were analyzed and compared.

As shown in Table 2, automated CCS is rarely applied to online games compared to console or packaged games.

For online games in which communication is activated on a real-time basis, the drastic shortage of characters' behavioral change or expression on the face in response to changes in the status compared to a console or packaged game, except for social actions, indicates that online games are not living up to their unique characteristics.

3. Automated Emotional CCS Based on Physiognomy

3.1 Design and Proposal for an Automated Emotional CCS within Online Games

Based on the comparative analysis above, this study aims to propose a new concept of applying emotions to an automated CCS used in an online game.

The proposed automated CCS prototype allows game characters to change their facial expressions and body shapes by applying emotions based on physiognomy in response to actions taken by game users through the characters, such as battles, social actions, or special skills.

The automated CCS proposed in this study is a prototype and is geared to changes in the facial expressions of game characters in relation to battles, social actions and use of special skills.

3.2 Analysis of Personality based on the Shape of Head Using Physiognomy (Emotion) and Ways of Application in a Game

To design the proposed prototype, this study first analyzed how a character's head shape automatically changes in response to five actions (on a quest, acquisition of gold and an item, participation in a party/raid, use of emotional expression, and use of special skills) taken by a user through a game character, as shown in Table 3.

Table 2. Comparative Analysis of Automated CCS

Game		Character's interaction with external events				External interaction for different characters					Routine activities		
		Change due to wound	Change in outfit condition	Injury (fracture, amputation, etc.)	Damage to weapon	Change due to wound	Change in outfit condition	Injury (fracture, amputation, etc.)	Damage to weapon	Interaction with external objects/ environment	Action	Changes in behavior depending on changes in condition	Changes in expression depending on the mood
Console	Never dead	X	O	O	X	X	O	X	X	O	X	O	O
	Dead or alive 5	O	O	X	X	O	O	X	X	O	X	O	X
	GTA5	O	O	X	X	O	O	X	X	O	O	O	O
Package	Tomb Raider	O	O	X	O	O	O	X	O	O	O	O	O
	Dayz	X	O	O	O	X	O	O	O	O	O	O	X
	Assassin's Creed	O	O	X	O	O	O	X	O	O	X	O	X
Online	Blade and Soul	X	X	X	X	X	X	X	X	O	O	O	X
	World of Warcraft	X	X	X	X	X	X	X	X	O	O	X	X
	Echo of Soul	X	X	X	X	X	X	X	X	O	O	X	X
	Icarus	X	X	X	X	X	X	X	X	O	O	X	X
	Mabinogi Heros	X	X	X	X	X	X	X	O	O	O	O	X

Table 3. Five actions and analysis of personality/ temperament

Five actions	Quest	Gold / item	Party / Raid	Emotions	Expertise
Personality / temperament	Loyalty	Justice / riches	Will	Wisdom / social	Gifted / Talented

The personality and temperament based on facial features using physiognomy, and the ways of application in an online game are analyzed, as shown in Table 4.

3.3 Proposal for an Automated, Emotional CCS Prototype

The customizing system for Icarus Online was used as a customizing program for the study's prototype.

This shows that freedom allowed for character creation has been enhanced to a degree that is sufficient, even for an automated CCS.

With the customizing system for Icarus Online, about 60 features of a character including the shape of the face, eyes, eyebrows, nose, mouth, body shape and pupils can be changed.

In this prototype, the maximum degree of shift for each feature was set between +100 and –100 and the degree of change in response to the game's actions was set between +1 and –1, as listed in Table 5.

However, in this study, the degree of change for each action was adjusted to be at its maximum, so that it can be compared to when the degree is 0 as a default value.

3.4 Analysis of Automated Emotional CCS Images Due to Specific Actions within a Game

The study's analysis was performed using the proposed CCS. Figure 1 shows the images of a character whose facial features changed automatically as a result of a specific action that the character took within a game using physiognomy. The facial features created in this way are eyes, nose, mouth and eyebrows that change automatically based on five elements – loyalty, wealth, will, wisdom/ social action and talent/skill.

Table 4. Analysis of personality and temperament based on facial features using physiognomy and ways of application in an online game [3]

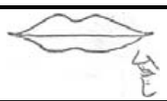
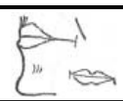
Application in an online game	Quest	Gold / item	Party / Raid	Emotions	Expertise
Personality /temperament	Loyalty	Riches	Will	Wisdom / Social	Gifted / Talented
Eye					
Form	獅子眼	鴻眼	虎眼	鳳眼	龍眼
Eyebrow					
Form	短促秀眉	柳葉眉	劍眉	清秀眉	龍眉
Nose					
Form	盛囊鼻	虎鼻	龍鼻	猩鼻	伏犀鼻
Mouth					
Form	龍口	虎口	仰月口	彎弓口	牛口

Table 5. Automated emotional CCS upon performance of a quest

Feature	Eye					Eyebrow			Nose					Mouth					
Changeable part	Size of eye	Size of eye ball	Epicanthal folds	Location of epicanthal folds	Lateral canthus	Angle of eyebrow	Inward angle of eyebrow	Upper eyelid location	Lower eyelid location	Thickness of nose bridge	Length of nose bridge	Height of nose bridge	Height of nose tip	Size of nose	Nosewing	Size of mouth	Thickness of upper lip	Thickness of lower lip	Shape of upper lip	Shape of lower lip	Size of mouth
Quest	–55	–10	30	70	–20	–40	–10	0	20	–30	–5	0	–20	–5	30	40	20	20	–20	–30	55
Gold / item	–30	–20	30	100	40	–10	–40	–40	–10	40	–5	40	–60	40	–60	60	–50	–60	–70	50	50
Party / Raid	40	–30	–100	60	–30	0	–35	35	–20	–50	30	50	–70	–40	20	40	–100	–100	100	30	0
Emotions	25	–30	50	–50	15	20	0	–30	20	–80	20	60	30	–70	–40	0	–100	–100	89	30	–100
Expertise	40	–15	0	40	50	–30	0	–20	0	0	30	0	40	20	0	–30	50	50	–30	–30	0

4. Experimental Results

4.1 Analysis of Survey

4.1.1 Research Design

In order to determine whether a character created by physiognomy can represent his or her intention to the user in accordance with the pre-configured emotions for specific actions, five dependent variables were set, including the use of special skills (talent/skill), the use of emotional expression (wisdom/social action), participation in party/raid (will), acquisition of gold/item (wealth) and performance of a quest (loyalty), while a character's gender is set as a moderating variable to see if it resulted in any difference. Table 6 shows the model used in this study.

The survey is largely divided into two parts, with the first part including two items on the study's theoretical background and the other part involving five items chosen by users for specific actions among the images created based on physiognomy.

Question category 1: Respondents' awareness of the study's theoretical background

Question 1-1	Users' awareness of a system to change a game character's external features
Question 1-2	Users' awareness of physiognomy

Question category 2: Users' choice of images created based on physiognomy

Question 2-1	Talent/skill chosen from the created images
Question 2-2	Wisdom/social action chosen from the created images
Question 2-3	Will chosen from the created images
Question 2-4	Wealth chosen from the created images
Question 2-5	Loyalty chosen from the created images

4.1.2 Survey Method

100 people in their teens, 20s and 30s who are frequently exposed to games participated in the survey. The majority of them were students from the Department of Game Design, and the survey's results were used as a sample.

Frequency analysis, cross tabulation and reliability analysis were used for this study's analysis.

First, Frequency Analysis
Second, Cross tabulation
Third, Reliability Analysis

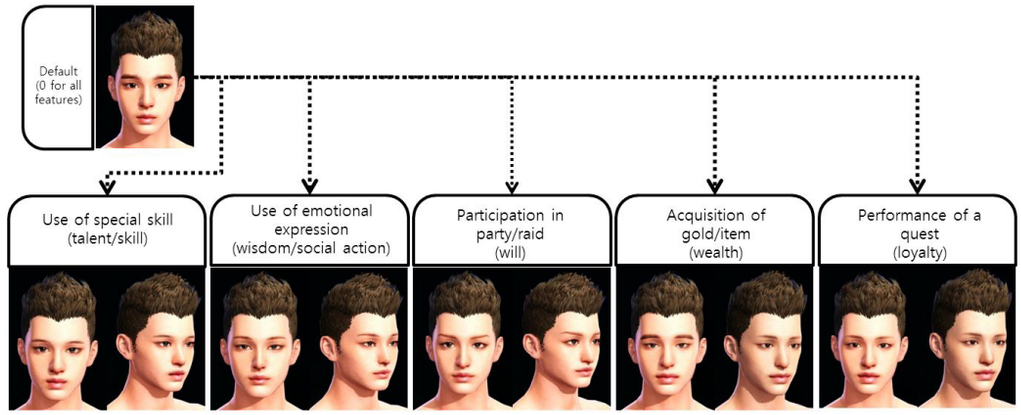


Figure 1. Analysis of changes in character image resulting from special actions taken within a game

Table 6. Model for Research

Images of automated character customizing based on physiognomy	Suggestion of a special action	Gender Male/ Female	User's choice

Table 7. Survey period and response rate

Type	Survey period	Survey response rate	Survey method
Main survey	2014.7.28~8.1	100%(100)	Survey questionnaire

As for reliability, an analysis is considered reliable when a value of over 0.6 is more or less obtained by using Chronbach's α coefficient. Meanwhile, SPSS WIN22 was used for statistical analysis.

4.2 Analysis of Survey Results

In this study, the answers to five questions that are closely related to this study's purpose were analyzed. As shown in Table 8 above, at least over 64% of the respondents chose a character's face that has been changed (based on physiognomy) as a result of a specific action within a game.

Chronbach's α was used for the coefficient to determine the reliability of the analysis. In social science, due to the lack of a precise standard to determine reliability, a measurement indicator is considered more or less reliable when the value is over 0.6. As such, in this study, too, a value over 0.6 was considered reliable. A tool for measurement based on internal consistency was used to validate the analytical results, and the level of reliability was found to be satisfactory at Chronbach's α: 0.868 for all five items.

Table 8. Survey results

No. of Cases	Male	Female	True	False	Case	
					Valid	Missing Value
8	66.00%	34.00%	71.00%	29.00%	100.00%	0.00%
9	66.00%	34.00%	64.00%	36.00%	100.00%	0.00%
10	66.00%	34.00%	74.00%	26.00%	100.00%	0.00%
11	66.00%	34.00%	67.00%	33.00%	100.00%	0.00%
12	66.00%	34.00%	84.00%	16.00%	100.00%	0.00%

8. Please choose one character from the two below who you think appears to possess the talent and skill to use special skills within a game.
9. Please choose one character from the two below who you think appears to possess wisdom and social skills to show emotional expressions more often within a game.
10. Please choose one character from the two below who you think appears to possess a strong will to actively participate in parties/ raids within a game.
11. Please choose one character from the two below who you think appears to possess wealth by acquiring lots of gold and items within a game.
12. Please choose one character from the two below who you think appears to possess loyalty by performing many quests within a game.

This indicates that most respondents found that emotions resulting from specific actions are well expressed on the face of a character.

5. Conclusion

In this study, automated CCSs for each game platform were compared and analyzed. It was found that automated CCS functionality was substantially insufficient in online

games despite them having the most active interactions among the users than any other game platform.

The automated emotional CCS suggested in this study is only a prototype and as such, the range of user actions or the scope of the character's head shape was quite narrow. For this study to continue in the future with prototypes, it is necessary to expand the quantity of analysis to both the user's action elements and the characters' temperament based on the facial features using physiognomy. Also, researchers must realize that a character's facial features should change within a recognizable range for users by applying maximum and minimum values to changes being made. In addition, researchers should keep in mind when they analyze the temperament of a character based on physiognomy that multiple temperaments are included in one shape and that while each feature has a meaning, it is necessary to also consider the overall harmony of the different features on a character's face.

Should the study continue in the future, resulting in an actual automated emotional CCS, it may be possible to apply fatigue or stress elements from an extended game play to a character. This can be used as a measure to promote proper game use among gamers, as opposed to a forced regulation from outside the game, since they watch how their characters change due to their own actions within a game. Furthermore, game developers can use CCS elements as long-term elements for contents, which can serve to heighten users' engagement in the game that they are playing.

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