

Analyzing the Effects of Virtualizing and Augmenting Trading Card Game based on the Player's Personality

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Abstract—In this paper, we focus on the Trading Card Game (TCG), which offers two versions of playing. One is the version of the TCG played with paper-based cards, and the other is the TCG played on a computer. We discuss the lost reality and the lost enjoyment by playing the computer based TCG compared to the paper based one. For analyzing the virtuality in the computer game, we propose a scenarios-based analysis based on the player's personality. We believe that the personality analysis described in the paper is useful to analyze the human social relationships in various games and social media, and also clarifies the possible obstacles and reasons for dissatisfaction in using social media and playing computer based games for each type of personality.

Our study also claims that computer technologies can solve the problems caused due to the virtuality introduced in a game by using augmented reality techniques. We present *Augmented Trading Card Game (Augmented TCG)*, and describe the results of some experiments with it that show how some problems and pitfalls of the remote trading card game play on the Internet could be improved. We believe that the case study and the scenario analysis given in this paper would be useful to improve the current realizations of games.

Keywords - Virtualization and augmentation; Personality; Game design; Augmented reality; Scenarios-based analysis.

I. INTRODUCTION

Our daily life becomes more and more virtual by making the surrounding daily artifacts more intelligent [6, 14]. Our definition of virtual is something that does not really exist, but has a real effect on our daily life as if it exists. *Jean Baudrillard* explains our consumption behavior as we consume symbols associated with things, not the things themselves [3]. Since the symbolization of things will accelerate by embedding computers in our life, our virtual consumption will progress rapidly.

The impact of introducing virtuality in our daily life has not been discussed well, although digital books have become very common everywhere, and virtual worlds like *The Elder Scrolls V: Skyrim* [26] are creating almost indistinguishable real worlds within a computer. Specifically, it is an important issue to discuss the effects of replacing real things with virtual things by using computers. In recent games, physical tangible things are replaced by virtual things in the computers, and multiple players can enjoy easily a remote game play without meeting each other. Even though the rules of a game do not change, the play

style significantly changes according to the game's realization method. However, currently, there is no good way to analyze the effects of the different realization methods in a systematic way.

In this paper, we mainly consider the effects of virtualization in the *Yu-Gi-Oh!* trading card game [27] as a case study of the virtualization of daily objects. The *Yu-Gi-Oh!* trading card game (TCG) as shown in Fig. 1 is a turn based game that uses paper cards and is played in a one-to-one or two-to-two manner. A player collects cards by buying packs of cards that contain sets of randomly chosen cards or by exchanging cards with other players. *Yu-Gi-Oh!* cards are categorized into three types: monster cards, spell cards and trap cards. A player chooses his/her favorite cards, and constructs his/her own original deck, which consists of at least 40 cards. We call the battle with *Yu-Gi-Oh!* cards a duel. Each player starts a game with a certain number of points called life points and performs the duel by summoning his/her monsters, battling against the opponent player with his/her monsters or using spells and traps. Depending on the action taken and the outcome of it the life points decrease or increase. If the life points of a player become zero or the player cannot draw cards from his/her own deck any more, then that player loses the duel and the game ends.



Figure 1. Playing Trading Card Game.

There are several versions of the *Yu-Gi-Oh!* TCG that can be played on personal computers and allow players to play

the game remotely. The cards are represented in the computer virtually, and players manipulate the cards using a mouse. A single player can also play the game, and in such case the duel is performed “against the computer”, i.e., the game AI. In this paper, we focus on a version of the game that is played on *Nintendo DS* as a computer-based TCG. We call this version the *DS version* and it can also be either played by one person with the game AI as an opponent or by two people, who play against each other by connecting two *Nintendo DSs* through WiFi connection. Also, we call the version of TCG that uses paper-based cards *the paper version*.

For analyzing the player’s behavior in the *DS* and the *paper version*, we classify the *Yu-Gi-Oh!* TCG players based on the three personalities proposed by *Karen Horney* [7]. For each personality we first create a scenario that describes the typical behavior of the corresponding player. Then, we discuss how the scenarios change in case of the paper and the *DS version*. The *Yu-Gi-Oh!* TCG involves various sources of pleasure besides just playing, such as, completing collections of cards, structuring decks, communicating with other players, trading, battling and making links to *Yu-Gi-Oh!* TV animations and *Yu-Gi-Oh!* comics. However, players with different personalities focus on and enjoy different aspects of the game. That is why it is important to analyze the effects of the different realizations of the game for the different players’ personalities.

There are two main contributions of our research. The first contribution is to propose a scenario-based analysis of a computer game based on the player’s personality. In our research, we also show that *Yu-Gi-Oh!* TCG offers multiple ways to play the game, and these ways are identified by analyzing the player’s personality. We believe that the personality analysis described in the paper is useful to analyze the human social relationships in various games and social media, and also clarifies the possible obstacles and reasons for dissatisfaction in using social media and playing games for each type of personality. As a second contribution, our study claims that computer technologies can solve the problems caused due to the virtuality introduced in a game by using augmented reality techniques. We present *Augmented Trading Card Game (Augmented TCG)*, and describe the results of some experiments with it that show how the pitfalls in the remote trading card game on the *DS version* could be improved. We believe that the case study and the scenarios analysis given in this paper would be useful to improve the current realizations of games.

The remaining sections are structured as follows. In Section II, we present some related work to our research. Section III introduces scenarios of trading card game plays based on three personalities, and in Section IV, we analyze the scenarios and how the virtuality is introduced when implementing the remote trading card game on the *DS* version. Section V presents *Augmented TCG* that augments the trading card game by using augmented reality technologies, and shows how the augmentation influences the game play according to the player’s personality. Finally,

in Section VI, we conclude the paper and show some future directions.

II. RELATED WORK

In this paper, we adopt the *Karen Horney’s personality theory*, but we also consider using other personality theories to analyze the game. *Richard Bartle* analyzes the personality of a player in a role playing game [2]. He describes eight personalities: *opportunists, planners, politician, scientists, hackers, networkers, friends, grievers* as roles used in the game, and he claims that a player changes his/her roles according to the current situation. However, the classification does not take into account the human relationship that is important when analyzing trading card games. On the other hand, *Karen Horney’s personality theory* is based on the essential desires in the human relationship. In TCG, the human relationship is the most important factor to define the game. Thus, we consider *Karen Horney’s* classification as more appropriate to analyze TCG.

The *big five theory* claims that human personality can be analyzed by five factors: *openness, conscientiousness, extraversion, agreeableness, and neuroticism* [15]. The factors are demonstrated by rigorous scientific experiment. On the other hand, the *Karen Horney’s personality theory* is classified based on the human relationships like isolation, cooperation and conflict. At the moment, there is no psychological discussion to show the relationship between these two theories.

In [4], the scenarios analysis focuses on only one personality: moving toward people because the personality is the majority in our real world. We focus on more comprehensive analysis based on three personalities. One of the essential contributions of our paper is that players of trading card games are classified into three personalities, and the players of all personalities can enjoy the game.

The *product attachment theory* [16] explains that a user feels more empathy when the personality of a product matches the user’s personality. Applying the theory to TCG, TCG has three personalities and they correspond to the player’s personalities. Daily products also have multiple personalities [20], and our approach to analyze scenarios based on multiple personalities will be useful to design daily products.

There are several ways to augment the *Yu-Gi-Oh!* TCG. *Duel Accelerator* [24] is an online-based *Yu-Gi-Oh!* TCG where each player chooses an avatar that identifies him/her from the other players, and special effects on cards make players more excited to play the game. Also, the *Skype duel* uses Skype to show remotely each player’s card on the opposite player’s display and the voice communication between the two players is possible as well.

CyberOne [23] is a new TCG that enhances previous TCG. Each paper card has a sequence number. When the number is input, the corresponding virtual card appears in the online

TCG. The player can exploit the tangibility of cards, but he/she can also enjoy additional special effects, which is an example of the advantages of the virtual cards. Also, since the rules are simplified, the duel is automatically progressed without the player doing anything. However, the enjoyment of constructing an original deck carefully, remains for the player. Moreover, the two players do not need to play the game at the same time because they just need to construct their decks. One significant advantage of this type of TCG is that for a player with the moving away from people personality there is no obstacle to play a duel. However, since the TCG does not encourage the communication in the game, it may not be suitable for a player with moving toward people personality.

Augmented reality techniques may be used to enhance the existing games. For example, in [21], there are several augmented reality games that enhance traditional games. Specifically, *Augmented Go* [9] is a promising approach to maintain the advantages of the physicality, but to add virtuality to the Go board game. In [19], a pervasive game is designed with virtual and tangible objects, and two approaches are compared to investigate the effect on social interaction and physical activities. Also, in [5], Pacman and Ghosts are human players in the real world experiencing computer graphics fantasy-reality by using wearable computers on them.

The most significant difference between our approach and previous approaches is that we propose the usage of virtual characters from animation and game stories [18]. Specifically, this approach is very different from using avatars that identify users. The virtual characters in our approach add the fictional atmosphere of the stories to the trading card games and enhance players' experiences if players know the stories well.

The interaction between the virtual environment and the physical environment is one of the hottest topics in the game research. In [13], authors present an introduction and overview of the field of pervasive games that can blend real and virtual game elements. Our analysis can be extended to discuss how the games in virtual environments lose the reality, and to consider how the techniques of pervasive games can be used to improve the lost reality. Also, in [18], we discussed how a virtual character is effective when the virtual and real world are blended. Specifically, a virtual character used in animation and game stories can give us an enhanced feeling to seamlessly blend our real life and the fictional world of the animation and game stories.

III. SCENARIO ANALYSIS BASED ON PERSONALITY THEORY

The personality classification used in this paper is based on the *Karen Horney's personality theory* [7]. TCG offers several ways to enjoy the game, and giving a good classification of the players' personalities would allow us to analyze the ways to play the game in a more systematic way. We believe that the way and attitude of playing TCG for a

certain player is identical to creating his/her own original and personal story. Even though each player emphasizes on a different way to play the game, it is possible to classify the players into few patterns. Therefore, creating scenarios based on the personality theory concepts is an appropriate approach to analyze the behavior and intention in the game play.

A. Player's Personality Analysis for Trading Card Game

Personality refers to how people evaluate the personalities of other people, including: 1: the characteristics or qualities that form an individual's character, 2: qualities that make someone interesting or popular (Oxford Dictionary, 2006). *Karen Horney* classifies human personalities into three types: *moving away from people*, *moving toward people*, *moving against people*. In this paper, we consider three scenarios based on this personality classification for *Yu-Gi-Oh!* trading card game players.

1) *Moving Away from People*: A person belonging to this category likes to seek completeness and perfectionism in a closed world, and attempts to establish his/her identity by self-satisfaction. Therefore, the person usually collects cards alone, and is really determined and concentrated to collect all the cards he/she wants. A player with this personality has a strong attachment to his/her cards, and the story to encounter the cards is very important for him/her. This means that he/she establishes his/her identity and deepens the attachment to the cards by knowing and exploring carefully the background of each card.

2) *Moving Toward People*: A person belonging to this category attempts to establish his/her identity by acquiring the approval and affection from others and seeking a partner. He/she likes the interaction with others by using cards, and constructs his/her original story by deepening the friendship with his/her friends and achieving self-realization together with others.

3) *Moving Against People*: A person belonging to this category attempts to establish his/her identity by obtaining social evaluation and praise from others, and creates his/her story by seeking his/her perfection. Also, he/she likes to be superior to the other party and satisfies his/her pride by showing his/her advantages to others.

B. A Scenario for Moving Away from People

"Mizuki is a university student who likes Yu-Gi-Oh! cards. Her favorite deck type is Light Sworn. The illustrations on the cards of the Light Sworn series are very lovely and pretty to her, and she really enjoys just arranging her cards and looking at them. However, she still does not have all the cards from the Light Sworn series. Specifically, she does not have the Lightsworn Sorceress Lyla card, but she really wants to have it. Lyla is a beautiful lady, and the card

depicting it is twinkling as well, which makes it even more attractive. Moreover, the card of Lyla would make Mizuki's deck stronger. But, the card is extremely rare, and it is very hard to get it. She has the chance to get the card as a used one, but she does not like the idea since she would not feel the card as hers. However she is determined to find the card and for that purpose she goes to the card's shop and buys two boxes of cards that may contain the Lyla card. Each box costs 4500 yen and contains 30 packs, where each pack contains 5 cards.

After coming back home, Mizuki impatiently starts opening the packs. She is so excited, her heart beats fast, and she carefully opens the packs, one by one. She hopes to get the card whenever she finds a card whose edge has the same color as the Lyla card. Unfortunately, just the edge of the card is the same color and the illustration on the card is a different monster. She is very disappointed not to get the desired card again and again. Unfortunately, she could not find the Lyla card in the two boxes she bought this time. Although she is disappointed, she carefully sorts and keeps all the cards bought today in her collection. She could get some other rare cards this time as well, but she could not be very happy about that. She really wants to get the Lyla card, so she decides to buy seven more boxes and look for it. No matter how expensive it is, she will continue buying boxes until she gets the Lyla card.

Again, in the first box, she could not find the Lyla card. She also could not find the card in the second box. Now she thinks she will not be able to find the card this time as well and feels desperate. But, finally, she could find the Lyla card in the third box. Mizuki becomes really happy, inserts the Lyla card very carefully in a sleeve and adds it happily to her deck. However, she has no plan to use the deck to play Yu-Gi-Oh! TCG, but just to keep it for herself. She continues to open the fourth and the fifth box still excitedly, and finds another Lyla card in the fifth box. Thus, she becomes super happy again. After opening all the boxes, she is able to complete fully her collection of cards in the Light Sworn series and is very satisfied about that. Although she gets more than ten same cards, she is really happy to have completed her goal. “.

C. A Scenario for Moving Toward People

“Toty has started to play the Yu-Gi-Oh! TCG with the recommendation from her friend Eiji. Since Eiji has more experience with the Yu-Gi-Oh! TCG than her, he teaches her how to play and enjoy the game. Eiji takes her to a card shop near their homes. Eiji plays the game with the deck of the Elemental Hero series, and he wants to get cards from the Elemental Hero series. Each of them buys 10 packs. Then, they go back to Toty's home together and start opening their packs. There is a super rare card in Toty's Elemental hero series pack that he really wants to have. Eiji negotiates with Toty to exchange the card with him for another super rare cards that he currently has and she

agrees since she does not consider to use the card in her deck. Toty passes the card, and asks Eiji to exchange cards with her again when he gets a card that she wants to have in the future. Then, finally, they start to play a duel.

Although Toty really loves playing the duel, she does not really understand the game's rules yet. Thankfully to Eiji's kind help and explanations after playing several duels, Toty increases her playing skills and understands how to use the super rare card she got from Eiji. They play ten duels, in which Toty has three wins and seven losses, but in all the three wins, the super rare cards that she has got from Eiji plays a key role. Now, it becomes dinnertime, Eiji returns to his house and both of them are looking forward to their next duel.

At home, Eiji starts to rearrange his deck by selecting some more suitable cards for dealing with the super rare card that Toty has in the next duel. He raises his fighting spirit and says to himself “Well, that deck will not lose in the next duels with Toty.

After dinner, Toty also looks carefully at the cards she has got from Eiji. She has enjoyed today's duels and chats with Eiji a lot and is satisfied with the score, but she promises to herself to win the duels with Eiji next time.

They both had a great day and are really excited and looking forward to their next duels and talks about Yu-Gi-Oh! Cards”.

D. A Scenario for Moving Against People

“Tatsuo is more than 10 years advanced Yu-Gi-Oh! TCG player. For him, winning the duel is the most important issue, and he is very interested in increasing the power of his deck. Tatsuo has also participated in tournaments a couple of times. Today, he visits again one of his favorite cards shop and plays duels there. Since he visits the cards shop every week, he has some friends there to play with. They all are advanced players, and use a variety of decks and tactics. In their play, all decisions are completely effective. All of them know the effects of the cards by just looking at the illustrations of the cards, without reading any of the explanations. They all play the duels very seriously and concentrated without even chatting during the play. Specialized words like: “Draw”, “Summons”, “Attack”, “Trigger Monster Effects”, “Trigger Magic Effects”, “Trigger Trap Effects”, “Chain”, “Turn End” are the only communication among them during the play. Although Tatsuo is a strong player, it is not easy for him to win the duel today. Just one mistake would make him lose, so he feels great thrill for the play. He needs to predict the opponent player's tactics from the opponent player's field and graveyard and from the opponent's gaze and face expression, and choose the most effective card towards it. Finally, he wins the duel and feels extremely happy and satisfied. Then, his friend starts a new duel with another player after changing his deck with a deck, which would be more effective for the new opponent player's deck.

Some of his friends start to return to their homes and Tatsuo also decides to quit playing for today. He has lost two duels today. He analyzes the reasons to lose, and considers how to improve his play next time by choosing more appropriate and stronger card. Immediately, he tries to buy that card as a used card before coming back home. Only in case he cannot find the card as a used card, he will try to buy some new packs and look for that exact card in them. In such case, if he cannot find the target card in the packs, he will sell all the cards at the shop. Tatsuo will definitely come to the shop next week, and try to win all duels."

IV. THE INFLUENCE OF VIRTUALITY THROUGH SCENARIO ANALYSIS: LOST REALITY

In the previous section, we have presented three scenarios for the case when players use real paper cards in the game. In this section we consider how scenarios change in the case of the *DS version* of the TCG that uses digitally implemented virtual cards. In this paper, we call *lost reality* the situation in which a player loses some of the realities, he feels during the play with the real paper cards, while playing the *DS version*. In this section, we consider the lost reality issues in the scenario of each personality.

A. Moving Away From People

In the scenario described in Section III.B, the physical and visual value of the real paper card is essential for a player with this personality. As described in the scenario, the player can achieve a feeling of fulfillment just by the arrangement of the cards and by looking at them. Also, she feels that the twinkling super rare cards are very precious for her. The digitally implemented virtual cards are difficult to offer detailed visual information and a sense of twinkling. Also, in the scenario, the player obtains more than 10 same cards. Virtual cards lose the sense of quantity because the quantity is represented just as a digital number, while real paper cards offer the sense of the quantity as the thickness of the set of cards. Buying boxes of cards, opening packs and keeping and arranging cards in sleeves carefully is related to the sense of touch. However, even though virtual cards lose all these physical senses they have some advantages as well. Virtuality makes it easy to manage the cards, i.e., it is easy to sort the cards and keep them together. But, virtual cards may make the collection of cards a boring task.

Virtual economy is also one of the ways to recover the reality [11]. In the *DS version*, *duel points (DP)* are added to the game. A player can get cards by using his/her *DP*. *DP* can be increased in various ways in the game such as winning a duel with the game AI. Thus, without spending money on collecting cards, a player can obtain the cards he/she likes using his/her *DP*. Therefore, the will to increase his/her *DP* winning percentage encourages a player to play the game with the game AI or other player through a WiFi connection. A player with the moving away from people personality is discouraged to play the game when the card

is virtual because virtual cards decrease the player's motivation to collect the cards. Introducing virtual economy increases the values of the cards, which offers the possibility to recover the motivation to play the game.

B. Moving Toward People

In the scenario described in Section III.C, the player with the moving toward people personality considers that the relationship and the communication with other people are the most important conditions to enjoy the game. Going to a nearby cards shop together with a friend, visiting a friend's house to play together and opening packs of cards together are some typical important actions in the scenario. It is not easy to buy cards and open packs together when using virtual cards. Especially, in the *DS version*, each player does these actions alone. Also, changing the rules, such as exchanging a card for two, is a limited action since it is hard to change the rules in a flexible way in the *DS version*. Moreover, it is impossible to chat with friends when playing the *DS version* remotely against them. Also, while playing a duel, it is difficult for friends to support each other and give advices to each other.

As described above, a play with real cards involves a duel that is performed by players located at the same place, who can communicate with each other directly. On the other hand, a player performing the game with virtual cards may lose the chance to enjoy the communication with the opponent player. However, if the two players are located at the same place, then even using the *DS version* of the game will not bring any communication difficulties to them, since they can see and talk to each other. In [12], there is a similar discussion for the case when online RPG game is played among people who are located at the same place. Of course, the sense of physical presence increases the pleasure of the game, but it is more important whether the two players can use a rich communication channel or not.

A player with the personality of moving toward people would be mostly motivated and excited to play a duel with his/her opponent face-to-face.

C. Moving Against People

In the scenario described in Section III.D, for the player with the moving against people personality, winning the duels is the most important pleasure and goal in the game. Since winning against real human is different from winning against game AI, a player of this type is much more satisfied to win duels against strong human players. However, one worth mentioning feature of computer games is the fact that it is possible for a player to reset the game by simply turning off the computer if the current situation and score are not convenient and favorable for him/her. In the scenario, the player feels a strong sense of thrill because just one mistake in his play would make him lose the duel, while in the virtual world, it is easy to reset the game when the game does not advance according to his preferences. Thus, in the

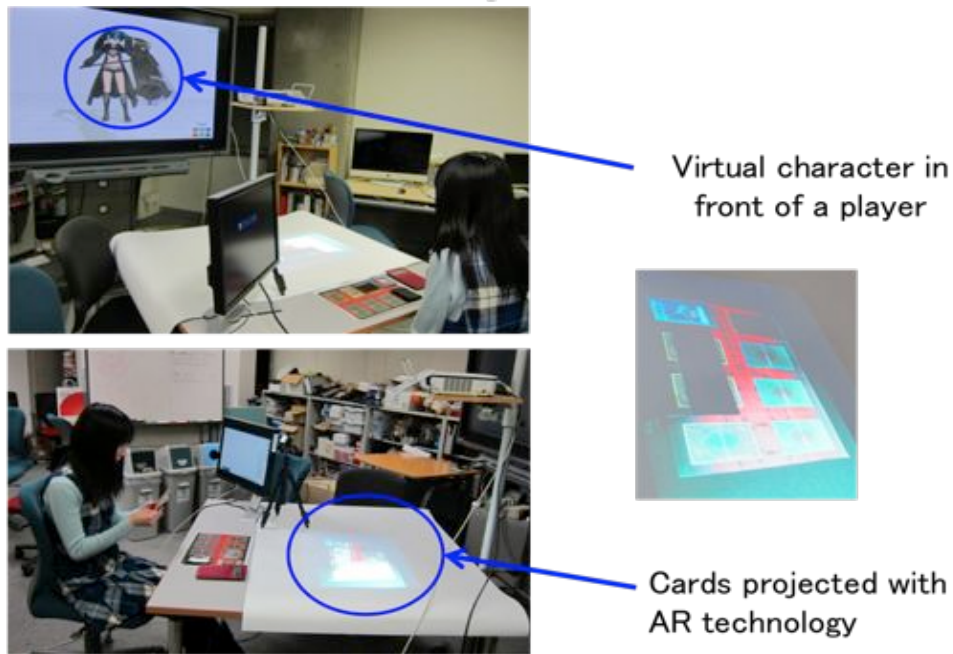
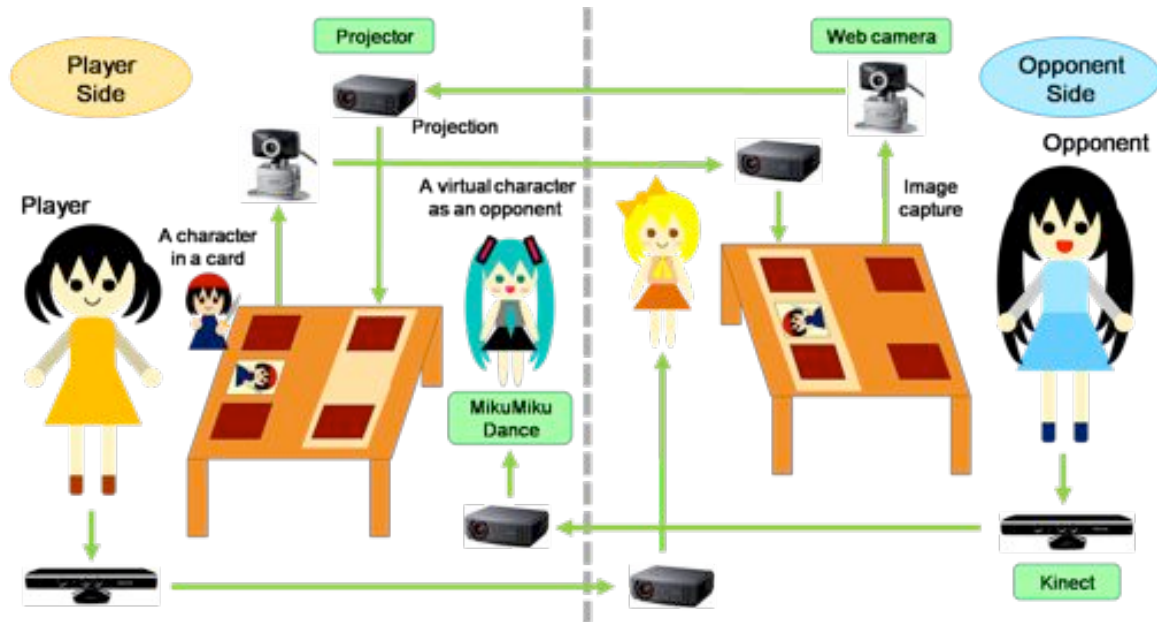


Figure 2. Augmented Trading Card Game.

virtual world, the sense of thrill, challenge and risk is decreased with the possibility to terminate or reset the game at any time.

Also, in the scenario, the player predicts the opponent player's tactics and move by observing his/her gaze and face expressions. This reality is completely lost when players cannot see each other, which decreases the excitement and enjoyment of the game, as well as the satisfaction of winning the game. Moreover, since the player does not see the opponent player, he/she tends to easily cheat in the game.

For example, in the *DS version*, the winning percentage is recorded, and this becomes a big incentive for the players with this personality to win the duels. Being determined to win the game, many players using the Nintendo DS, tend to disconnect the connection with the remote opponent player once they realize they might be losing the game. Currently, this becomes a serious problem for players who play the *DS version*, which shows that it might be difficult to maintain a good moral ethics in case the sense of presence of the opponent player is lost.

V. AUGMENTED TRADING CARD GAME

A. Motivation and Overview of Augmented TCG

As described in the previous section, if the reality of a game is lost, the incentive to play the game and the enjoyment of the play decrease. For a player with the moving away from people personality, the lost reality of the physical sense of the cards decreases his/her motivation to collect cards. Also, for a player with the moving toward people personality the incentive to play a game when the communication between players becomes difficult or inactive, diminishes. And for a player with the personality for moving against people, the motivation to play a game weakens if it is impossible for him/her to look at the face of the opponent player in order to observe his feelings and thus predict his tactics and moves. Moreover, such player does not feel the self-esteem when other people do not see his/her victory. This means that it is hard for a player to create a story based on his/her own memories by the lost reality.

When analyzing a player's intention and behavior, behavior economy plays an important role. Behavior economy demonstrates that human intention and behavior are greatly influenced by a frame defined for each condition [1]. This means that a frame defines how to offer pleasure to a player and also changes according to the realization of the game. In this section, we consider a new frame to support remote TCG play that covers all the personalities. The frame also offers the physical tangibility of paper cards. The case study will show our personality analysis is effective to analyze the pitfalls of the current game design.

Jean Baudrillard proposed a concept called hyper reality [3]. Augmented reality technologies are used to introduce virtuality in a game, but also they are used to increase the hyper reality that is lost by the virtuality. In this section, we present *Augmented TCG*, which offers one possible frame to play the *Yu-Gi-Oh!* TCG that recovers the realities lost in the *DS version*.

We have designed *Augmented TCG* taking into account our pre-observations and analysis of the scenarios described in the previous section. The basic design approach is similar to the one in the augmented reality games introduced in [21]. As shown in Fig. 2, the two players are located in different places. Each player's cards (real paper cards), in his/her duel field on the table in front of him/her, are captured by a camera and projected on the opponent player's table. Also, each player is represented as the 3D model of a virtual character used in popular animations and games, and this character is shown to the opponent player. In the current implementation, *MikuMikuDance* [25] is used to show the 3D models of the virtual characters. *MikuMikuDance* is free software for creating 3D movies by using virtual characters. The virtual character is controlled using *MS Kinect* and its movement is synchronized with the movement and the behavior of the player it represents. Moreover, the two players can communicate with each other via Skype if

desired, and thus it is possible for them to introduce each other directly instead of using virtual characters. This option will allow us to compare the case of the players communicating with each other through virtual characters and the case of the players directly communicating with each other.

Fig. 2 also shows a basic configuration of *Augmented TCG*. The most important design issue of *Augmented TCG* is the approach to use real paper cards not virtual cards, implemented digitally in a computer as shown in the figure, and the player performs the duel with a virtual character as an opponent. The system is useful to discuss the issues how virtual and real components in the TCG game affect the player's game play.

B. Experiments and Design Implications

We have conducted a user study to show some experiences and observations with *Augmented TCG*. We have recruited five participants who are familiar with *Yu-Gi-Oh!* TCG, have more than three years experience with *Yu-Gi-Oh!* TCG, and know both the *paper version* and the *DS version* well. Three kinds of experiments have been performed for each participant and each participant performed the duels in the experiments against one of the authors of the paper, who has deep knowledge about the TCG and could lead and control the experiment so that all participants play the game under the same conditions. After the experiments we made an interview with the participants through semi structured focused group. In this subsection, we explain an overview of each experiment, and show some experiences extracted during the user studies.

In the first experiment, each participant played a duel against an opponent, represented by a virtual character, whose movement was synchronized with the movement of the opponent player by using *MS Kinect*. After the experiment a participant told us that if the virtual character was his favorite character, he could enjoy the duel better. Another participant said that he focused mostly on the opponent player's card, and presenting the virtual character was not important for him. However, most of the participants claimed that the virtual character was not enough to feel the presence of the opponent player because *Kinect* was unable to extract face expressions and eye movement. Also, the movement of the virtual character was not natural because *Kinect* interpreted the movement of the player based on only few body points.

We also compared the case of the player directly seeing his/her real opponent player with the case of using a virtual character to represent the opponent player as shown in Fig. 3. From the interview we have found that if a participant knows the opponent player well, then the real person view is more preferable and increases the reality of the game, while in the case of the opponent player being a stranger, some of the participants claim that using virtual character is preferable because they do not feel comfortable either

showing themselves or seeing their opponents. A participant, whose personality is the moving away from people type, does not like to see the opponent player directly if he/she does not know the player well. For him/her, representing the opponent player as a virtual character is helpful to increase his/her motivation to play the duels. A participant with the moving toward people personality would prefer to see the real view of the opponent player. Therefore, the right representation of the opponent player depends on each player's personality. Finally, for a participant whose personality is moving against people the real gaze and face expression of the opponent player is essential in order to predict his/her tactics and consequent moves. That is why in such case it does not matter whether the opponent player is real or is represented with a virtual character, but the most important is that if he/she is represented by a virtual character then that character should offer a gaze and a face expression exactly the same as the real opponent player's one at that moment. The discussion teaches us that the reality of the virtual character is essential to satisfy and motivate all personalities.



Figure 3. Playing against a Real Opponent Player.

In the second experiment, the card that the opponent player draws is shown on a small display near the participant as shown in Fig. 4. As described in the scenarios presented in the previous section, virtual cards significantly decrease the motivation and the game enjoyment for players with the moving away from people personality. However, if the opponent player's cards are projected on the table, it might be hard to clearly see and understand the characters on them if they are too small or with low resolution and thus more difficult for a player to make a right decision. That is why in our settlement we show the card drawn by the opponent on a small display near a player. However, the necessity of such details strongly depends on the personality of a player. If a player's personality is moving away from people type, then he/she usually likes to win a duel because it is important for her/him to show the superiority of his/her

favorite deck, but he/she may not have enough knowledge about other players' cards. Hence, he/she needs to see enough information of the opponent player's cards in order to play well. For a player with the moving toward people personality, winning a duel is not the most important point but the fact that he/she would be able to communicate and enjoy a game with a friend. In such case, the offered information by the displayed card is not so important since he/she can always ask his/her friend opponent for more information if necessary and such communication would even strengthen their friendship. A player with the moving against people personality has a lot of knowledge for most of the cards and just seeing the shape of the illustration on the card is enough for him/her to know its functionality. Thus, for him/her, it is not so important to show the small details of the cards. However, we believe that the possibility to show detailed card information would have a positive impact on the enjoyment of the game for each personality.



Figure 4. Showing a Card in a Small Display.

In the third experiment as shown in Fig. 5, while playing the game, another virtual character depicted on one of the player's cards appears on a small display near the player once that card is drawn out of the deck, and supports and encourages him/her to win the game until the end of the game. After the experiment one of the participants said that it was desirable that the card depicting the character shown on the small display did not lose from the attack of the opponent player. Another participant, who was not interested in the character shown, told us that it would have been more enjoyable if his/her favorite character encouraged him/her. Most participants said that the presence of the character was enjoyable, but it was hard to consider winning the game just from the character's encouragement. The participants' comments showed that they were aware that exactly the character depicted on one of their cards appeared on the small display without them being informed in advance about this feature of the system. A player with the moving away from people personality feels the importance to show the character depicted on his/her favorite card.

Especially, a female player likes a card depicting a lovely character and the approach is very effective for encouraging her to win the duel. For a player with the moving toward people personality, showing such a character is also a kind of special effect for encouraging him/her in the duel. So, if the character shows the current state of the duel, i.e. winning or losing, it may increase the pleasure of the duel. Therefore, the effect should be customized for each player's personality, but we believe that offering the encouraging effect to the duel would be useful for all personalities.

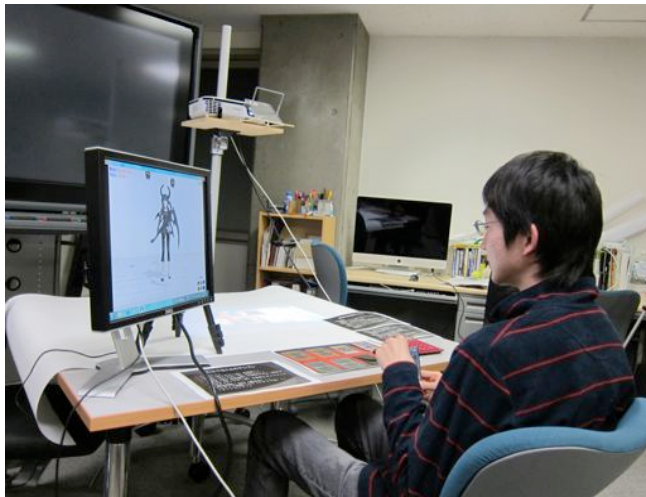


Figure 5. Encouraging a Player by a Virtual Character.

C. Discussions and Future Directions

In this subsection, we give some discussions on the observations and results obtained from the experiments with the *Augmented TCG*. In *Augmented TCG*, the physicality of the cards is the most important design decision, since virtual cards do not offer the sense of tangibility and thus lead to the loss of the reality in *Yu-Gi-Oh!* TCG. However, physical tangibility is a very important concept to offer enjoyment of the game to a player [8, 10]. Especially, for a player with moving away from people personality, collecting *Yu-Gi-Oh!* TCG cards is the most significant fount of pleasure, but virtual cards lose the sense of ownership and thus decrease the enjoyment and satisfaction of the game. However as a positive observation, adding virtuality may help to increase the empathy on the cards. For example, showing the special character depicted on one of the cards on a display near the player increases the empathy with that character. If the character were the player's favorite character then playing together and communicating with the character during the game would make the game even more enjoyable and exciting. Furthermore, even in case the card depicting that character is a very rare one, the player would make a great effort to get the card and enjoy the interactive play with the character.

For a player with moving toward people personality, feeling empathy with the virtual character representing the

opponent player is important to maintain the incentive to play the game. In this case, the sense of the remote player is an important issue. If the player knows which virtual character his/her friend likes, using that character to represent the player increases the empathy during their play because he/she considers playing with his/her friend. The effect is similar to using an avatar. If a player knows the avatar of his/her friends well, he/she does not distinguish the avatar from his/her friends. However, using virtual characters from games and animations may enhance the conversation between a player and his/her friend if both are interested in the stories of these characters.

A player with moving against people personality feels more excited to play against *Yugi* or *Kaiba*, which are very skillful players in the *Yu-Gi-Oh!* animation story, because that player has a strong motivation to win the game against an expert player. Then, he/she feels the illusion of playing the game inside the animation story. However, in this case, as described in the previous section, the reality of the virtual character is essential. *Augmented TCG* synchronizes the movement of the remote player with the movement of the virtual character, but to maintain the reality of *Yugi* and *Kaiba*, the movement needs to be modified to reflect their natural characteristics in the animation story.

In our recent projects, analyzing the personality becomes a common tool when designing a new service. We especially believe that the analysis based on a user's personality can be used when designing social media. Recently, social media like *Twitter* and *Facebook* become very common as a tool to connect people and increase human creativity. However, from the aspect of the personality theory, the current social media does not support well people with the moving away from people personality. The scenarios analysis described in the paper is useful to improve the current social media for a larger number of people. Specifically, the personality analysis framework described in the paper would be useful to analyze the social aspect of any services, and we hope that the proposed approach can contribute to the progress of the future social media and services.

VI. CONCLUSION AND FUTURE DIRECTION

In this paper, we discussed the *Yu-Gi-Oh!* Trading Card Game, which offers two versions of playing. One is the version of the TCG played with paper-based cards, and the other is the TCG played on a computer. We discussed the lost reality and the lost enjoyment by playing the computer based TCG compared to the paper based TCG. For analyzing the effect of the virtuality, we proposed a scenarios-based analysis of a computer game based on the player's personality. Our study also presented that computer technologies can solve the problems caused due to the virtuality introduced in a game by using augmented reality techniques. We introduce *Augmented Trading Card Game*, and describe the results of some experiments with *Augmented TCG* that show how the pitfalls in playing

trading card game among remote players on the Internet could be improved.

Computer games attract people by creating the illusion of being immersed in an imaginative virtual world with spectacle computer graphics and sound. The goals of computer games are more interactive than that of traditional games, and it brings players a stronger desire to play the game. Computer games designed with an optimal level of information complexity can provoke players' curiosity. Therefore, computer game intrinsically motivate players by bringing them more fantasy, challenge, and curiosity, which are the three main elements contributing the fun in games. Augmenting and virtualizing our daily life by using computer games is a promising way to extend traditional gamification. Our approach is also useful to analyze the lost reality of augmenting and virtualizing our daily life. We need to discuss these issues in our future research.

As a next step, it is necessary to identify metrics to analyze the scenarios more systematically. In [17], we identify five values to analyze the values of products and services and would like to investigate whether these metrics can be used to analyze the described scenarios. We need to consider how each value is related to the player's personality. We may change the values dynamically according to the current player's personality. Also, we are interested in designing gamification scenarios [22] based on the personalities. Each player's personality requires different incentives to motivate a user of the gamification service. That is why, future gamification frameworks need to take into account how to successfully incentivize players depending on their specific personality and we believe that the personality analysis given in this paper would be helpful in that direction.

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