

Analyzing the influence of virtuality on playful social interaction

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Abstract Ambient intelligence technologies are making our daily life increasingly virtual, and the boundary between the real world and the virtual world is gradually disappearing. Computer games are often played on the Internet, which allows people to enjoy games with others, even when they are not at the same location. This paper analyzes the Trading Card Game (TCG), which has two versions. One version is played with paper-based cards, whereas the other is played on a computer. The computer-based TCG supports remote play and has a number of enhancements, such as providing special fictional effects on virtual cards. The two different versions are useful to analyze the influence of virtuality in making future social interaction more playful. First, we investigate potential pitfalls to introduce virtuality in TCG through the scenario-based analysis, which adopts a player's personality to exploit potential difficulties. For investigating further insights on the influence of virtuality in TCG, we analyze some experiments with Augmented Trading Card Game, where a real opponent player is replaced with a fictional player. Our findings from the analyses show that the feeling of realness is essential to make incorporated virtuality successful. Recently some games' concepts can be adopted in order to augment our real world. It is essential to investigate the influence of virtuality introduced with the games. The future social interaction will incorporate virtuality based on a variety of game-like features to make the interaction more playful. Therefore, the insights described in this paper will be useful to help the design of future playful social interaction.

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1 Introduction

Ambient intelligence technologies [12, 19, 22] are making our daily life increasingly virtual, and the boundary between the real world and the virtual world is gradually disappearing. Jean Baudrillard explains our consumption behavior as follows: we consume symbols that are associated with things, not the things themselves [5]. The virtualization that is supported by ambient intelligence technologies accelerates the symbolization of things, which rapidly increases virtual consumption. Moreover, ambient intelligence technologies augment our daily objects like clothes and chairs by adding an information layer to the surface of real things [28, 34]. The technologies have also replaced various game related physical things to virtual things implemented in computer-based virtual worlds. Thus, the analysis of the effect is important to understand the influence of virtuality in human social interaction.

There is a lack of knowledge regarding the influence of the introduction of virtualization on our daily lives, although *digital rhetoric* has become common [39] and virtual worlds, such as *The Elder Scrolls V: Skyrim*¹ are creating almost indistinguishable real worlds within computers because it offers a high degree of a player's freedom to explore the virtual world. It is essential to discuss the influence of replacing real things with virtual things via dynamically generated visual expressions that encourage users to value objects and perceive them as attractive.

This paper analyzes the Trading Card Game (TCG), which has two versions. One version is played with paper-based cards, whereas the other is played on a computer. The computer-based TCG supports remote play and has a number of enhancements, such as replacing a real player with a virtual player. In particular, our analysis is based on *Yu-Gi-Oh! Trading Card Game (Yu-Gi-Oh! TCG)*.² The two versions are useful to analyze the influence of introducing virtuality in human social interaction through intangible virtual objects for making future social interaction more playful. Recent crowdsourcing includes various game-like features to encourage participants' activities [29, 33]. Similarly, future social media will incorporate game-like features to make its social interaction more playful. The insights extracted from the analysis presented in this paper offer useful insights to develop such future playful social interaction. In our study, we want to identify potential pitfalls when incorporating virtuality in human social interaction through the analysis of *Yu-Gi-Oh! TCG* as an example. To our best knowledge, these aspects have not been well investigated in past research.

We first develop three scenarios of *Yu-Gi-Oh! TCG* play, where each scenario represents the typical play of a player with certain personality. The scenarios are analyzed with the *value-based analysis framework* [34] that is useful to analyze diverse TCG players' preferences. The purpose of the analysis is to extract and exploit potential pitfalls of incorporating virtuality in *Yu-Gi-Oh! TCG*. The use of the personality classification is helpful to predict a variety of potential pitfalls from the scenarios and the use of values help us to identify the reasons for such pitfalls and approaches to overcome them. We present how values can be used to avoid the pitfalls. In particular, we give an approach to use empathetic virtual human to overcome pitfalls.

¹ <http://www.elderscrolls.com>

² <http://www.yugioh-card.com/en/>

The insights extracted from the analysis show that a sense of realness is essential when incorporating virtuality in human social interaction. The main contribution of the paper is to identify that the aspect of realness is an important design issue when incorporating virtuality in human social interaction. Incorporating virtuality is essential to embed game-like features in social interaction. For example, gamification has become popular recently to encourage people in a variety of information services [10, 40]. We have also developed several prototype systems to gamify human behavior [22, 27, 38]. The experiences with building the prototype systems also show that the sense of realness is an essential factor to make the systems successful. The insights described in this paper identify more concrete pitfalls when embedding such playful features in order to exploit virtuality in social interaction.

In the second analysis, we focus on investigating the influence of presenting a fictional remote opponent in the game. The analysis exploits an approach to use empathetic virtual human introduced in the first analysis. We examine the influence to replace a real opponent player with a fictional *Yu-Gi-Oh! TCG* player that appears in the *Yu-Gi-Oh! TCG* animation. We conducted some experiments with *Augmented Trading Card Game (Augmented TCG)* to find potential pitfalls when introducing fictionality in the real TCG play. The experiences from these experiments enhance the insights extracted in the first analysis.

The remaining sections are structured as follows. Section 2 presents previous research that is related to our study. Section 3 presents an overview of *Yu-Gi-Oh! TCG* and three scenarios for different TCG players and play styles of the paper cards version, based on a personality classification, for analyzing virtuality introduced in human social interaction. The scenarios present how *Yu-Gi-Oh! TCG* offers different ways to play the game. Section 4 analyzes the scenarios to extract potential pitfalls with regard to how virtuality was introduced when implementing remote TCG play during the computer-based version of the game. The analysis is based on the *value-based analysis framework* that is effective to analyze diverse characteristics of *Yu-Gi-Oh! TCG* players. We also show how the values can be used to overcome the pitfalls. Section 5 presents the *Augmented TCG* that enhances TCG via ambient intelligence technologies, and discusses how the incorporated fictionality influences players' gaming. The analysis provides further insights to introduce virtuality in human social interaction. Finally, Section 6 concludes the paper.

2 Related work

Richard Bartle analyzes the personality of players during a role-playing game [3]. He describes the following eight personalities as roles that are adopted during the game: *opportunists, planners, politicians, scientists, hackers, networkers, friends and grievers*. He claims that players change their roles according to the current situation. This classification is used to analyze gameplay in role playing games, and it is not suitable to analyze gameplay in TCGs.

The *big five theory* claims that human personality can be analyzed according to the following five factors: *openness, conscientiousness, extraversion, agreeableness, and neuroticism* [23]. These factors are demonstrated through rigorous scientific experiments. In contrast, the personality classifications within our approach are based on human relationships, which include isolation, cooperation and conflict. The *big five theory* is more fundamental than our personality classification, but our personality classification offers a better abstraction level to analyze and design human social interaction.

In [9], Deci and Ryan proposed the following three basic needs: a *need for relatedness*, a *need for competence*, and a *need for self-determination*. For each individual, one of the needs is typically stronger than the other needs, which influences each person's personality.

In [2], the proposed analysis of the scenarios only focuses on one personality and the social aspects of TCG. The current paper focuses on a more comprehensive analysis that is based on multiple personalities, which are proposed in our personality classification system. One novel contribution of our study is that the TCG players are classified into distinct personality types, as players with different personality classifications may enjoy different aspects of TCG duels.

The *product attachment theory* [24] proposes that people feel more empathy when the personality of a product matches their own personalities. Applying this theory to TCG play suggests that TCG has three personalities that correspond to the players' three personalities proposed in Section 3. Daily products also have multiple personalities, as described in [36], and our approach to analyzing scenarios based on multiple personalities can be applied to analyzing daily products if social interactions are essential for the products' use.

Augmented reality techniques are used to enhance existing games: For example, in [38], several augmented reality games are used to enhance traditional board games. Specifically, *Augmented Go* [14] is a promising approach to maintaining the advantages of the physicality of the Go board game while adding virtuality. In [15], Jordan proposes *physio-pleasure*, which argues that physical tangibility is an important source of pleasure. Enhancing physical artifacts with augmented reality technologies is promising for exploiting the merits to embed computers into the artifacts without losing the benefit gained in the games' physical tangibility.

In [18], a *pervasive game* is designed with virtual tangible objects, and two approaches are compared to investigate their effects on social interaction and physical activities. The most significant difference between the *Augmented TCG* and previous approaches is the use of fictional players that appear in the animation and game stories. This approach differs from using avatars that identify respective users, as our fictional players support the fictional atmosphere of the stories within the gameplay and enhance players' experiences when they are familiar with the stories.

3 Personality-based scenarios

In the following subsections, after presenting an overview of *Yu-Gi-Oh! TCG*, we show a classification of the players' personalities. Then, for each personality in this classification we present a scenario that illustrates the typical game play behavior of a player with that personality. The scenarios show three typical ways to play *Yu-Gi-Oh! TCG* with paper-based cards. In the scenarios, players play the game in the real world and in a face-to-face manner. The reason to choose *Yu-Gi-Oh! TCG* in our analysis is that each different way to play the game corresponds to a typical different aspect in social interaction. Thus, the analysis of the scenarios allows us to extract diverse pitfalls of introducing virtuality in human social interaction.

3.1 Yu-Gi-Oh trading card game

The *Yu-Gi-Oh! TCG* is a turn-based game that uses paper cards and is played in a one-on-one or two-on-two manner. The *Yu-Gi-Oh! TCG* cards are categorized into the following three types: monster cards, spell cards and trap cards. A player chooses his/her favorite cards to

construct his/her own original deck, which consists of at least 40 cards. The TCG play with *Yu-Gi-Oh! TCG* cards is called a duel. Each player starts a game with a specific number of points, called *life points*, and engages in a duel by summoning his/her monsters and battling against an opponent or using spells and traps. Depending on the action taken and the outcome of this action, a player's life points either decrease or increase. When a player's life points are equal to zero or the player cannot draw cards from his/her own deck anymore, then this player loses the duel and the game ends.

Players collect paper cards by buying packs of cards that contain sets of randomly chosen cards or by exchanging cards with other players. The version of this game that uses paper cards is called the *paper-version*. In contrast, there are several versions of the *Yu-Gi-Oh! TCG* that can be played on personal computers, which allow players to play the game remotely. The cards are represented virtually on the computer and players manipulate their cards using a mouse. A single player can play this game, such that the duel is performed "against the computer", i.e., the game's AI. In this paper, we focus on a version of the game that is played on the *Nintendo DS* as a computer-based TCG.³ This version of the game is called the *DS-version*. In this version, the game can either be played by one person who competes against the game's AI as an opponent or by two people who play against each other by connecting two *Nintendo DSs* through a Wi-Fi connection.

The TV animation of *Yu-Gi-Oh TCG* is continuing for more than 10 years.⁴ The animation has become a major source to teach youth new ways of playing the game. This is an important factor to maintain Japanese youth's curiosity, and *Yu-Gi-Oh TCG* is still one of the most popular games among Japanese young people. In the animation story, a hero player meets attractive players with diverse characteristics in the story. Many young people admire these players and imitate and learn their plays. This fact shows that most players can learn diverse ways of play easily that matches their own personality; this is one of the major reasons why *Yu-Gi-Oh TCG* has become very popular in the world.

There are many *Yu-Gi-Oh TCG* tournaments every year in countries around the world such as in North America and Europe⁵; there is also a world *Yu-Gi-Oh TCG* championship that chooses a world champion from the most skillful players in the world. This is another typical way to enjoy *Yu-Gi-Oh TCG*. In this case, the player wants to play against a skillful player, and win a duel. In order to win a duel, the player needs to collect strong cards, and learn useful tactics and powerful techniques. That is why selling and buying cards in specialized markets has become popular practice. If players acquire multiple numbers of the same card, they want to sell them, but also they would like to buy rare cards that they cannot obtain by themselves.

3.2 Player's personality analysis and social interaction

Personality refers to how people evaluate others' personalities, including the characteristics or qualities that form an individual's character and the qualities that make someone interesting or popular (Oxford Dictionary, 2006). In this paper, we classify human social relationships into the following three categories based on the classifications proposed in [25]: *independent people*, *cooperative people*, and *competitive people*, and we use the classification as frames to analyze virtuality introduced in social interaction. Karen Horney also classifies human

³ Yu-Gi-Oh! 5D's World Championship 2011 – Over the Nexus

⁴ <http://www.yugioh-card.com/en/about/newto-series.html/>

⁵ <http://www.yugioh-card.com/en/events/>

personalities into three types: *moving away from people*, *moving toward people*, *moving against people* [13], where the classification is the same as the above personality classification. Since these personality classifications focus on the analysis of social interaction, they are appropriate for developing scenarios that cover diverse TCG players' behavior patterns. We show the definitions for the personality classifications during players' TCG play below.

Independent People: A person in this category seeks completeness and perfectionism in a closed world defined by him/her, and attempts to establish his/her identity through self-satisfaction. Therefore, this person usually collects cards alone and is determined to collect all of the cards that he/she wants. A player with this personality has a strong attachment to his/her cards, and the story that the player encounters the cards is very important for him/her. Thus, this player establishes his/her identity and deepens his/her level of attachment to the cards through careful knowledge and exploration of each card's background.

Cooperative People: A person in this category establishes his/her identity by acquiring others' approval and affection and by seeking a partner. This player enjoys interacting with others through the cards, constructs his/her original story by deepening his/her friendships and achieves self-realization with others.

Competitive People: A person in this category establishes his/her identity by obtaining social evaluation and praise from others and creates his/her story by seeking perfection. This player likes to be better than the other players and satisfies his/her pride by showing his/her skills to others.

3.3 Scenario design

3.3.1 Issues in scenario design

In this section, we explain how our scenarios are designed. Our approach to develop and analyze the scenarios relies on an expert. As described in [8], the scenario-based analysis is a useful design tool to identify requirements and potential pitfalls. In the past, the scenario-based analysis has been widely used to discuss potential pitfalls when introducing new technologies. A famous example to use the scenarios-based analysis was published in [11] and analyzes the influence of introducing ambient intelligence technologies. In these cases, the design and the analysis of the scenarios by experts are essential to extract potential pitfalls in the scenarios-based analysis. The expert with regard to the *Yu-Gi-Oh! TCG* in our approach has more than 10 years of experience with the *Yu-Gi-Oh! TCG* and has thousands of *Yu-Gi-Oh!* trading cards. The expert is also familiar with the TCG animation story, including how each character structures the deck and how to use the cards in the animation.

As shown in [2], it is considered that for the majority of people the most typical way to enjoy *Yu-Gi-Oh! TCG* is to play with friends. However, the expert's insights show that there are more ways to play and enjoy the game. Based on the personality classification described in the previous section, we developed three scenarios. Since the personality classification is very natural for the analysis of *Yu-Gi-Oh! TCG*, the expert can find a typical player who fits to each personality. From the conversation with the expert, we collected necessary information about the typical player's attitude and behavior during the a game play for developing the player's scenario. The developed three scenarios were validated by examining information acquired from both official and community online websites and through commercial game magazines

that are available to professional players.⁶ For example, in online community websites, many players share their experience with the game every day; that information usually contains a diverse aspect of players' daily activities related to a TCG play, where players discuss detailed situations to play TCG. In the websites, they also discuss why and how they buy and sell cards, and they play in tournaments. After developing the scenarios, the expert examined whether players activities described in the scenarios are consistent with the activities described in the collected information.

It is an important insight that the above-described three concepts of *Yu-Gi-Oh* TCG play, that are playing with friends, participating in tournaments and collecting special cards, are closely related to and correspond to three personalities presented in the previous section. As described above, the most typical players of *Yu-Gi-Oh* TCG are cooperative people. This is one of the reasons why *Yu-Gi-Oh* TCG is popular and many young people enjoy it at schools. However, the number of players that concentrate on the other two concepts of the game play is not small as well. That is why it is essential to discuss the influence to introduce virtuality in human computer interaction on players with different personalities so that we can better predict and avoid potential pitfalls for diverse players. Moreover, this is an important issue to keep players interested in the game.

3.3.2 Independent people

“*Asuka* is a university student who likes *Yu-Gi-Oh*! TCG 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 arranging her cards and looking at them. However, she still does not have all of the cards from the *Light Sworn* series. Specifically, she does not have the *Lightsword Sorceress Lyla* card, but she really wants it. *Lyla* is a beautiful lady, and the card depicting her is sparkly which makes it even more attractive. Moreover, the *Lyla* card would strengthen *Asuka*'s deck. However, this card is extremely rare. She has the chance to obtain the card as a used one, but she does not like this because she would not feel like the card was hers. However, she is determined to find the card; therefore, she goes to the card shop and buys two boxes of cards that may contain the *Lyla* card. Each box costs 4,500 yen and contains 30 packs, such that each pack contains 5 cards.

After returning home, *Asuka* impatiently starts opening the packs. She is so excited that her heart beats quickly as she carefully opens the packs, one by one. She hopes to obtain the card whenever she finds one that has an edge with the same color as the *Lyla* card. Unfortunately, only the edge is the same, as the illustration on the card is a different monster. She is repeatedly disappointed when she does not find the desired card. Ultimately, she does not find the *Lyla* card in the two boxes that she bought. Although she is disappointed, she carefully sorts and keeps all of the cards that she bought today into her collection. She may have obtained some other rare cards this time, but she is not very happy about that. She really wants to obtain 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 obtains the *Lyla* card.

Again, in the first box, she did not find the *Lyla* card. She also did not find the card in the second box. Now, she thinks that she will not be able to find the card this time and feels desperate. However, she finally finds the *Lyla* card in the third box. *Asuka* becomes really

⁶ <http://yugioh-wiki.net/> is an official wiki for *Yu-Gi-Oh*! TCG and <http://blog.with2.net/rank2329-0.html> lists various blogs offering information about typical play types.

happy, inserts the *Lyla* card very carefully into a sleeve and adds it to her deck, as shown in Fig. 1. However, she has no plan to use the deck to play *Yu-Gi-Oh! TCG*, as she just keeps it for herself. She continues to excitedly open the fourth and fifth boxes, and finds another *Lyla* card in the fifth box, which makes her very happy again. After opening all of the boxes, she is able to complete her collection of cards in the *Light Sworn* series and is very satisfied about that. Although she gets more than ten of the same cards, she is really happy to have completed her goal”.

3.3.3 Cooperative people

“*Rei* has started to play the *Yu-Gi-Oh! TCG* after her friend *Ryo* recommended it. Given that *Ryo* has more experience with the *Yu-Gi-Oh! TCG* than she does, he teaches her how to play the game. *Ryo* takes her to a card shop near their homes. *Ryo* plays the game with a deck consisting of the *Elemental Hero* series, so he wants to get cards from that series. Each person buys 10 packs. Then, they return to *Rei*’s home together and start opening their packs. There is a very rare card in *Rei*’s *Elemental Hero* series pack that he really wants to obtain. *Ryo* negotiates with *Rei* to exchange the card with him for a different super rare card that he currently has, and she agrees because she does not use the other card in her deck. *Rei* passes the card, as shown in Fig. 2, and asks *Ryo* 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 *Rei* really loves playing the duel, she does not fully understand the game’s rules yet. Due to *Ryo*’s help while playing several duels, *Rei* improves her playing skills and comes to understand how to use the very rare card that she received from *Ryo*. They play ten duels, in which *Rei* has three wins and seven losses, but in all three wins, the very rare card that she has received from *Ryo* play a key role. At dinner time, *Ryo* returns to his house, and both people look forward to their next duel.

At home, *Ryo* starts to rearrange his deck by selecting more suitable cards to face the very rare card that *Rei* has for their next duel. He raises his fighting spirit and says to himself, “Well, this deck will not lose in the next duels with *Rei*.”



Fig. 1 Independent people

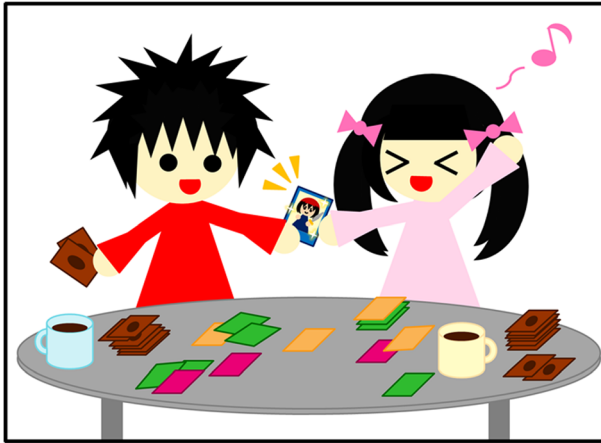


Fig. 2 Cooperative people

After dinner, *Rei* also looks carefully at the cards that she has received from *Ryo*. She greatly enjoyed today's duels and chats with *Ryo* and is satisfied with the score, but she promises herself that she will win the duels with *Ryo* next time.

They both had a great day and are really excited and looking forward to their next duels and conversations regarding their *Yu-Gi-Oh! TCG* cards."

3.3.4 Competitive people

"*Masahiro* has more than 10 years of experience playing *Yu-Gi-Oh! TCG*. For him, winning duels is the most important issue, and he is very interested in increasing the power of his deck. *Masahiro* has participated in a number of tournaments, as shown in Fig. 3. Today, he visits one of his favorite card shops and plays duels there. As he visits this card shop every week, he has some friends there to play with. All of them are advanced players and use a variety of decks



Fig. 3 Competitive people

and strategies. When they play, all of the decisions are completely effective. They know the effects of the cards by looking at the cards' illustrations and do not have to read the explanations. They all play the duels very seriously and concentrate without talking during the game. Specialized words, like “*Draw*”, “*Summons*”, “*Attack*”, “*Trigger Monster Effects*”, “*Trigger Magic Effects*”, “*Trigger Trap Effects*”, “*Chain*”, and “*Turn End*”, are the only communications among them during the game. Although *Masahiro* is a strong player, it is not easy for him to win during the duels today. Only one mistake may cause him to lose, so he is excited when playing. He needs to predict his opponent's strategies based on his/her field and graveyard and from his/her gaze and facial expressions, and he must choose the most effective card to win. Finally, he wins the duel and feels extremely happy and satisfied. Then, his friend starts a new duel with another player after changing his/her deck for a new deck that should be more effective against the new opponent's deck.

Some of his friends return to their homes, and *Masahiro* also decides to quit playing for the day. He has lost two duels today. He analyzes the reasons for the losses and considers how to improve his play for the next time by choosing a more appropriate and stronger card. Immediately, he tries to buy a used card matching that description before returning home. However, he cannot find a used card, so he will buy some new packs and look for that exact card in them. If he cannot find the target card in those packs, he will sell all of the new cards at the shop. *Masahiro* will definitely visit the shop next week and try to win all of the duels.”

4 The influence of virtuality through scenario analysis

In this section, we analyze how the scenarios described in the previous section change for the *DS-version* of the TCG, which uses digitally implemented virtual cards. The player feels a sense of realness of a game with real paper cards being played against a real opponent while playing the *DS-version*. When a player does not feel a sense of realness in TCG plays, we call the situation *lost reality*. In the following subsections, we discuss the lost reality issues with regard to the scenarios for each frame based on personality classification in accordance with the *value-based analysis framework* [34]. The *value-based analysis framework* offers appropriate frames for investigating the influence of the virtuality introduced by computer technologies because the framework was extracted from design experiences with building several computer-enhanced digital-physical hybrid artifacts. After introducing a brief overview of the *value-based analysis framework*, we analyze the scenarios described in the previous section based on the framework.

4.1 An overview of the value-based analysis framework and issues in the scenario analysis

The *value-based analysis framework* includes six values that are extracted from experiences with building smart and value-added artifacts. The first value is the *informative value*. This value offers sufficient information to people and helps them make better decisions. A typical example of this value is an augmented reality service that superimposes useful information onto a video. This service provides people with detailed information about their daily environment, such as shopping and travel information.

The second value is the *empathetic value*. This value is achieved and enhanced by adding some similarity with a user. It is usual that people have strong empathy on another people

when they have some similarity between them. As described in [24], people can feel a close relationship with even a product which has some similarities with them.

The third value is the *economic value*. This value provides people with a sense of ownership. In particular, physical tangibility is important because it increases people's sense of ownership of an object. For example, people enjoy owning expensive jewelry or artwork. Scarcity is key to increasing this sense of ownership, as collecting rare objects increases social status. The sense of ownership of an object is very important because it allows people to create their own original "empathetic stories" with the object. These stories include people's feelings and their levels of attachment to an object and how their daily life has changed following their possession of the object.

The fourth value is the *aesthetic value*. Aesthetics is an important concept with regard to making daily objects more attractive. Aesthetics is a branch of philosophy that addresses the nature of art, beauty, and taste, particularly the creation and appreciation of beauty. For example, traditional Japanese folk crafts represent *aesthetic values*, which are important for increasing people's quality of life.

The fifth value is the *persuasive value*. This value provides people with feedback regarding their current situations and shows the future influences of their current activities. For example, a package of cigarettes often presents photos of unhealthy lungs that are the result of long-term smoking. Because presenting negative information may encourage people to stop engaging in undesirable activities, showing positive information should increase people's motivation to engage in desirable activities.

The sixth value is the *ideological value*. This value reminds users of important ideological concepts, such as friendship and justice. This value is not explicitly presented to people; rather, special stories containing important ideological messages are used to implicitly explain the importance of these concepts. If people are familiar with the stories, then the characters that appear in the stories can be used as metaphors to demonstrate various *ideological values*.

In the following subsections, we use these values as a guideline to analyze lost reality introduced in the *DS-version*. In the analysis described from Section 4.2 to 4.4, we first identify typical activities of players with the *paper-version* according to each scenario. Then, we investigate the activities while *DS-version* is used and discuss how values are changed when some pitfalls are found. The expert who developed the scenarios also helped the analysis to find out the reasons that cause the pitfalls. In these sections, we present an overview of the results of the analysis. The analysis identifies potential pitfalls caused by introducing virtuality in *DS-version*, and suggests some possible approaches to avoid the pitfalls. We also examine two cases where values are increased even when *DS-version* is used in Section 4.5. The analysis identifies possible approaches to overcome the pitfalls used in computer-based TCGs. Finally, in Section 4.6, we summarize how the pitfalls can be overcome by increasing values complementing the lost values.

4.2 Influence on independent people

The *economic* and *aesthetic values* are strong motivation for independent people to collect cards and feel them precious. Independent people achieve a sense of fulfillment just by arranging and admiring their cards, as described in the scenario. They enjoy when the cards are beautiful, are proud to own the cards, and feel that the twinkling super rare cards are precious. The virtual cards offered in the *DS-version* do not offer adequate tangibility; therefore, people who use the virtual cards do not experience a sense of the cards' realness. For example, the digitally implemented virtual cards do not offer detailed visual information

and the pleasure of twinkling. In the discussed scenario, the player obtains more than ten of the same cards: virtual cards lose the sense of quantity as it is represented as a textual digital number, whereas real paper cards provide this sense through the thickness of the set of cards. Buying boxes of cards, opening packs and carefully keeping and arranging cards in sleeves is related to the sense of touch. Thus, virtual cards may cause collecting cards to become a boring task. However, although virtual cards decrease the engagement with the physical senses, they have their advantages, such as the fact that virtuality makes it easier to manage the cards, i.e., it is easy to sort and keep the cards together. The low display resolution of *Nintendo-DS* is on of the pitfalls in introducing virtual cards, which would be removed by the technology advancement. However, it is not easy to offer a sense of tangibility to virtual cards even with the progress of tangible interaction technologies [4].

The *empathetic value* may complement the lost values by introducing virtual cards, if the cards strengthen the attractiveness through the power of the digital representations, but the *DS-version* currently does not support that feature well. People may feel empathy toward a commodity object [24] when they have used that object for a long time. It is hard for people to feel empathy with virtual objects when they do not have a sense of objects' realness, as described in [15]. When independent people experience strong empathic feelings for a fictional figure from their cards, collecting virtual cards on the *DS-version* becomes interesting for them. In particular, if there are additional games to allow them to use their favorite virtual figures on collected cards, the play of the games increases their motivation to collect virtual cards. Computer-based TCG offers the possibility to enhance players' experiences by adding special effects to their favorite fictional figures on their cards to increase their empathy through the *persuasive value*. This approach can supplement the lost reality that occurs due to the introduction of virtual cards and may increase the playing pleasure experienced by independent people.

Table 1 summarizes how independent people feel values on the *DS-version* and the *paper-version*, where "o" means that the value can be offered and "x" means the value cannot be offered in the respective versions. Also, "/" means that the value is not strongly essential for independent people. The summary shows that the *DS-version* loses the sense of realness compared to the *paper-version* for independent people because of the decreased *economic* and *aesthetic values*.

4.3 Influence on cooperative people

A player with a cooperative personality is primarily motivated and excited to play a face-to-face duel with his/her opponent. This player loses interest in playing a duel when the human relationship weakens due to the virtuality of the game. Two issues are important and relevant from this aspect. The first issue is that people may lose interest in the game when they do not feel empathy for their opponents. Thus, the *empathetic value* of having an opponent is the most important factor for enjoying the duel for cooperative people. Recently, many young Japanese people have expressed that they feel strong empathy with the fictional players that appear in animations and games. Therefore, we argue that these fictional players could be good substitutes for the real opponents if players feel strong empathy for them. Players perceive these fictional players as real friends. These insights motivate us to further investigate the influence of fictional players in Section 5.

The second issue is that physical tangible cards are key items that encourage high-quality human relationships among friends for cooperative people, as previously described. Thus, the *economic value* of the cards is essential for these players. In the players' daily lives, going to a

Table 1 A summary of value analysis for independent people

	Economic	Empathetic	Informative	Aesthetic	Persuasive	Ideological
Paper-version	o	o	/	o	x	x ^a
DS-version	x ^b	x	/	x	o ^c	x

^a Currently, both versions do not support the *ideological value*. The issue will be discussed in Section 4.6

^b The *DS-version* can offer the *economic value* in a different meaning as shown in Section 4.5. This does not mean that the pitfall to lose a sense of realness in the *DS-version* can be overcome. The issue will be explained in Section 4.6

^c As shown in Section 4.5, the special effect on a virtual card increases the *persuasive value*. This fact may be used to overcome the lost reality in the *DS-version*. We will discuss the issue in Section 4.6

nearby card shop with a friend, visiting a friend's house to play together, exchanging cards with a friend, and opening packs of cards with friends are typical common actions. It is not easy to buy cards and open packs together when using virtual cards, as each player performs these actions individually in the *DS-version*. Additionally, changing the rules, such as exchanging one card for two, is a limited action in the *DS-version* because it is hard to change the rules in a flexible way. The *DS-version* does not support exchanging cards among friends, but the loss of the functionality is not essential to use virtual cards. If virtual cards could be exchanged among friends, cooperative people might enjoy a duel with their friends in the *DS-version*.

As previously discussed, a duel with real cards is performed by players who are located at the same location and can communicate with each other directly. In contrast, a player performing the game with virtual cards may lose the opportunity to communicate with an opponent. However, if the two players are located at the same location, then using the *DS-version* of the game does not cause any communication difficulties because the players can see and talk to each other. Moreover, it is impossible to chat with friends when playing the *DS-version* remotely against them. Thus, while playing a duel, it is difficult for friends to support and provide advice to each other. The loss of the *informative value* in their communication decreases their motivation to play the game. In [17], there is a similar discussion regarding online RPG games in which the people who are playing are located at the same location. Of course, a sense of physical presence increases the pleasure of the game, but the more important factor is whether the two players have access to a rich communication channel. A communication technology offering better presence may overcome this pitfall.

Table 2 summarizes how cooperative people feel values on the *DS-version* and the *paper-version*. The summary shows that the *DS-version* also loses a sense of realness compared to the *paper-version* for cooperative people.

4.4 Influence on competitive people

For a player with a competitive personality, wining duels is the most important goal of the game for competitive people. Thus, the *informative value* of winning a duel and the *ideological value* of providing players with a reason to play duels are important factors for them. Given that winning against a human is different from winning against a game's AI, competitive people are more satisfied when they win duels against strong human players. As seen from the described scenario, they feel a strong sense of excitement because simply one mistake in their strategy causes them to lose a duel. Additionally, competitive people predict their opponents' tactics and observe their opponents' gazes and facial expressions. The *DS-version* does not offer this

Table 2 A summary of value analysis for cooperative people

	Economic	Empathetic	Informative	Aesthetic	Persuasive	Ideological
Paper-version	o	/	o	/	x	x
DS-version	x	/	x	/	o	x

information about an opponent to players, which may cause competitive people to not enjoy playing a duel in the *DS-version*. If an adequate amount of information were available for players to make better decisions, competitive players could still enjoy duels in the *DS-version*.

A sense of realness of having an opponent is completely lost when players cannot see each other, which is how the game is in the *DS-version*. The loss of the *informative value* is the reason for the lost reality. This decreases the excitement and enjoyment of the game, as well as the satisfaction of winning the game. Moreover, players tend to cheat during the game given that they cannot see their opponents. For example, in the *DS-version*, players' winning percentage is recorded, which is a great incentive for competitive people to win duels. Being determined to win games, many players using the *DS-version* tend to purposefully disconnect the connection with their remote opponent by turning off the network connection once they realize they might be losing the game.⁷ Currently, this is a serious problem for players who play duels in the *DS-version*. This issue reveals that it may be difficult to maintain good moral behavior when the presence of an opponent is not apparent.

The *ideological value* helps players increase their pride and self-respect while playing the game for complementing the loss of the *informative value*. For example, when players feel that winning games supports positive outcomes in the real world, their pride and self-respect significantly increase, which is important for competitive people who usually have strong pride and self-respect. Competitive people need a reason to play a game, such as winning against a strong player. The *ideological value* provides a reason to play the duel. One approach to providing players with *ideological value* is to present a story that explains why the players need to win the duel. However, the *DS-version* currently does not support the *ideological value*. This gives us suggestions how to enhance the *ideological value* by using digital technologies. We will investigate the issue in the next section and the investigation complements the insights presented in this section.

Table 3 summarizes how competitive people feel values on the *DS-version* and the *paper-version*. For competitive people, the *information value* is the most essential one as explained above, and the *DS-version* currently does not support the value well, but in a tournament, a lot of information is published on Web sites to organize the tournament and this information complements the lost informative value in the *DS version*. This is a reason why the *DS-version* is mainly used for on-line TCG play with unknown players because a player with competitive personality needs the right information to make a better decision in order to win a duel.

4.5 Influence of virtuality through generic mechanisms

In this section, we discuss the generic mechanisms offered in *DS-version*, which exploit the advantage to introduce virtuality, that are useful for recovering lost reality. A virtual economy

⁷ In many Wikis and blogs, a large number of players claimed this was a problem. ex. <http://okwave.jp/qa/q4891893.html>

Table 3 A summary of value analysis for competitive people

	Economic	Empathetic	Informative	Aesthetic	Persuasive	Ideological
Paper-version	/	/	o	/	x	x
DS-version	/	/	x	/	o	x

[16] is one way to recover a sense of realness of a game when introducing virtual cards. In the *DS-version*, *duel points (DP)* have been added to the game; this increases the *economic value* in a game play. A player can obtain cards by using his/her *DP*. *DP* can be earned in various ways in the game, such as by winning a duel with the game's AI. Thus, a player can obtain the cards that he/she likes using his/her *DP* instead of money. Players are encouraged to play against the game's AI or other players via a *WiFi* connection to increase their *DP* winning percentages. Introducing a virtual economy may increase the cards' values and players' motivations to play the game. When the *economic value* offered by the *DP* is greater than the lost values due to the introduction of virtual cards, independent people want to play the *DS-version* of the game. Specifically, when the *DP* are represented as a way to collect rare items, independent people's motivation to play increases. This aspect is important to discuss how to recover the lost reality. We argue that decreasing any values causes lost reality. That is why if a player could feel a sense of realness by introducing other values, the lost reality can be recovered.

Visual rhetoric [20] is typically used in advertisements to add persuasiveness, whereas *procedural rhetoric* [7] is offered in video games to persuade people to play the games. *Procedural rhetoric* is a rhetorical argument effectively embedded in the rules and codes of a game which is revealed to the player through gameplay. Virtualizing the real world offers the opportunity to embody the rhetoric, as represented as a computation. For example, when a figure on a card moves and encourages a player based on the player's interactions, this has a strong impact on the player's motivation. Additionally, special effects during a game that are consistent with the current play situation offer an immersive feeling to a game and increase players' motivation to continue playing.

We identify two possibilities for increasing the *persuasive value* of games when exploiting the advantage of *procedural rhetoric* in this subsection. The first possibility is to add special effects during the game. One special effect could be feedback regarding the current play, which offers players encouragement to continue with the game. In this case, the aesthetic value can be added to increase a player's motivation and excitement in the game. The second possibility is to navigate players' future actions according to their current situation. As described in [38], when appropriate information regarding the current situation is provided to players, they make better decisions regarding their next actions. One important issue is that these possibilities, which are based on the *persuasive value*, do not rely on players' personalities. Thus, these possibilities may offer a better generic solution for recovering the lost reality when incorporating virtuality.

4.6 Design implication

From the analyses described in the previous subsections, the lost reality caused by introducing virtuality can be recovered by increasing other values instead of the lost values. In this section, first, we present two experiments, which shows the effect of distinct values on virtual objects and human. The reason to choose the experiments in this subsection is that the experiments

show typical and interesting effects that can be widely used for overcoming potential difficulties by introducing virtuality in human social interaction; the results of the experiments also present a guidance how to use values to overcome the pitfalls.

Second, this subsection also summarizes the insights extracted from the scenarios analysis and possible approaches to overcome the pitfalls presented from Section 4.2 to 4.5. We also describe insights to discuss the sense of realness when incorporating virtuality in the TCG play from the summary.

4.6.1 Recovering lost values with other values

The first experiment is to investigate the influence of using favourite virtual human in the game. Each participant experienced the game in two configurations, that are playing against a familiar virtual human that they really like or a stranger who is a real human, and we investigated the impressions of the players in the two situations. The experiment shows the effect of the *empathetic value* to recover the lost reality of an opponent player. In the experiment, we also investigated how a participant feels about the rarity of a virtual card received as a gift from one of those favourite virtual opponents. The experiment shows how lost reality of a virtual card can be recovered by increasing the *economic value* on a virtual card. In the experiment, six people (five males and one female) participated; their ages ranged from 21 to 28. A player plays with an opponent player that is replaced by an empathetic virtual human or a stranger human. The players could exchange cards as gifts between them.

After the experiment using a favourite virtual human or a stranger for an opponent, we asked the following questions to each participant:

- Q1: How much happiness do you feel?
- Q2: How much rarity do you feel about the gift?
- Q3: How much reciprocity do you feel when you are asked for a favour?

For all the questions, all of the participants responded that the experiment with a favourite virtual human gave them more delight than the interaction with a stranger. A participant said “*I want to cherish and reciprocate a card if I was given the card as a gift from my favourite virtual human.*” Another participant said “*I think I cherish the card more than had I bought it by myself.*” Conversely, when a stranger gave a card as a gift to a participant, he said, “*It [the degree of happiness] depends on whether the card is pleasant or useful for me.*” There were some negative opinions, such as “*I have doubts when a stranger gives me a card,*” or “*The gift from a stranger is terrible.*” Although ‘given a card’ is the same in both configurations, the attitude of participants was largely different. It seems that the important factor to motivate people is not a mechanic such as a ‘given a card’, but instead, the meaning attached to the mechanics. Focusing exclusively on the mechanics may create the danger of making a service meaningless. The results of the experiment show that values attached to virtual object or human significantly affect human behavior and selecting a right value offers a possibility to overcome pitfalls caused from introduced virtuality in human social interaction.

The second experiment investigated a style of a narrative. The aim of the experiment is to investigate whether a narrative in a game has more of an effect than a narrative in traditional media, such as a book or a movie. The experiment shows the effect of the use of different frames to offer the *informative value*. The participants of the experiment are the same as the first experiment.

In this experiment, each participant was presented with two types of narratives that were used in the two configurations. Both narratives represent the necessity of participating in collective action to achieve a sustainable society, but the manner of presenting the narratives is different. The first narrative provides the sentence from a third-person perspective that contains many general sentences (e.g., “*Recently, the environmental problem becomes serious*” or “*To solve the environmental problem, it is important for many people to co-operate.*”). Conversely, the second narrative represents the sentences from the first-person perspective, as if the reader is a person who is concerned about the problem and performs concrete activities to protect nature, with a style is typically used in a video game. In addition, the second narrative expresses the influences of collective activities with concrete roles or numbers (e.g., “*You are the selected person who can have the special power to save the world*” or “*If you set the temperature of your air-conditioner even one degree higher, you can reduce 33 kg of CO₂ and save 1,800 yen in a year.*”).

After the experiment, we asked opinions about the two configurations. All of the participants responded that the experiment with the second narrative motivated them more than the first narrative. In the first narrative, a participant answered “*I can understand that environmental problems are important issues, but I cannot understand how the problem is related to me.*” or “*I cannot imagine what I can do to help solve the problems or what the effect of my current behavior is on our society.*” Conversely, with the second narrative, a participant said “*It is easy to understand the importance because there were some examples of concrete activities and concrete numbers,*” and “*I can feel a sense of closeness with the narrative*”. In the experiment, the style of narratives significantly affected human behavior, and some ideas from video games are very useful in providing ways to offer the *informative value*.

4.6.2 Summarized insights extracted from the scenario analysis

Next, we summarize the values offered by the *paper-version* and the *DS-version* in Table 4 based on the discussions presented from Section 4.2 to 4.5. The discussions clearly show that digital technologies can enhance values and significantly increase the attractiveness of the TCG play although the *DS-version* currently has some disadvantages to lose the sense of realism in the TCG play by decreasing some values. As shown in the former part of this subsection, we present examples to enhance values through digital technology, where using favorite virtual human offers a possibility to enhance the *empathetic value* and the *economic value*. In the remaining of the section, we summarize how the lost values can be recovered with the potential power of virtuality based on the values.

In the scenario analysis described in the previous subsections, we mainly discuss the influence to introduce virtual cards and virtual opponent players. If a player feels lost reality on a virtual card, there are two ways to recover that lost reality. One way is to use an attractive aesthetic card to increase the player’s feeling of ownership. The other is to use a rare card that a player wants to obtain. The experiment shown in the previous subsection is one of the ways to increase the rarity of a virtual card. For a player to play in a tournament, for winning a duel, he/she needs to play the duel with the right precise decision making in each of his/her turn. Using paper cards may lose the *informative value* for such players. For example, in a remote play, it may be difficult to see the opponent’s cards well. In this case, it is essential to recover the lost *informative value* by using some technologies such as augmented reality technologies. Replacing the value to another value, such as the *empathetic value*, increases a player’s pleasure, but the strategy is not suitable if the goal of a player is to win a duel in a tournament. There are

Table 4 A summary of offered values in the paper-version and the DS-version

	Economic	Empathetic	Informative	Aesthetic	Persuasive	Ideological
Paper-version	o	o	o	o	x	x
DS-version	x ^a	x	x	x	o	x

^a As shown in Section 4.5, the *DS-version* offers the *economic value* by introducing virtual economy, but the discussion in the paper focuses on the sense of realness in the TCG play. Thus we mark “x” here in terms of our current focus

many ways to recover the lost *aesthetic value*. An easy way is to use a high resolution display to show virtual cards. Also, some techniques used in media arts to express stimulated impacts may be used to offer the aesthetic interaction and to increase the value.⁸ This means that using digital technologies can offer a possibility to help the enhancement of the values.

When an opponent player is replaced with virtual human, making the virtual human more empathetic is a way to overcome some pitfalls of virtuality. One way is to use preferred fictional players that appear in *Yu-Gi-Oh! TCG* animation, if a player not only enjoys the animation story but has also learned a variety of play skills from it. There is another way to recover lost reality when using virtual human to overcome pitfalls of introducing virtuality in *Yu-Gi-Oh! TCG*. The *ideological value* is important to fairly play a duel in a tournament. The animation story is an important factor to motivate players because some of them want to imitate the players in the animation story. In particular, many of the *Yu-Gi-Oh! TCG* players want to play a duel like the heroes in the animation story. If the story is reminded well to competitive people, they are motivated to play duels more fairly and keep a good relationship with the opponent players even if they play at remote locations [26]. As shown in [30], using virtual human also offers a possibility to enhance the *ideological value* through transmedia storytelling. This means that the digital technology also offers a possibility to help to increase the *ideological value* that is not properly enhanced in both the *paper-version* and the *DS-version*. In a similar way, the *persuasive value* can be enhanced though digital technology as shown in Section 4.5.

As shown in Section 4.5, incorporating virtual economy motivates people through the economic incentive. In [29], virtual currency can be used to increase a community’s activity. For individual people, they have a community to acquire cards that they like to own. The economic incentive may violate people’s intrinsic motivation [1] that is why we should be careful to use the economic value as the economic incentive for encouraging a player’s activities. Incorporating virtuality offers various ways to introduce special fictional effects in the gameplay. This increases the *persuasive value* and motivates players to continue to play the game. Introducing the *persuasive value* usually increases pleasure in the gameplay, but while playing a duel in a tournament, the effect may cause some biases to interfere their right decision making.

The analysis presented above also shows the current weakness of the *value-based analysis framework*. The *economic value* offered by virtual currency may be difficult to be treated with the same value used for indicating the rarity or the authenticity of virtual objects. In Table 4, it is shown that both versions can offer the *economic value*. However, the *economic value* described in Section 4.5 and the *economic value* discussed in Section 4.2 have different meanings. The *economic value* defined in the current *value-based analysis framework* does

⁸ The realness to use stimulated impacts is discussed in [28].

not distinguish these *economic values* in this case well. Also, the *persuasive value* may belong to more generic mechanisms not values. As shown in [31, 32], *gameful digital rhetoric* contains two abstractions named *values* and *rhetoric*. It is desirable that the above values can be categorized as *rhetoric* not *value* defined in *gameful digital rhetoric*. In the next step, we need further discussions how *rhetoric* is related to recover lost reality.

In this section, we mainly discuss how the *DS-version* decreases the sense of realness in the TCG play. In addition, we also show that the digital technology can enhance values of the TCG play. In the next section, we will present how the digital technology; especially the augmented reality technology enhances the values of the TCG play. In particular, we will focus on incorporating fictionality in the TCG play and discuss how this approach affects the sense of realness in the TCG play.

5 Augmenting a remote opponent player with augmented reality

In the previous section, we discuss that the incorporated virtuality in *Yu-Gi-Oh! TCG* decreases a player's motivation through lost reality. We have developed *Augmented TCG* to enhance TCG plays with augmented reality technologies in order to satisfy diverse requirements of players with different personalities by incorporating extra virtuality [27]. In *Augmented TCG*, an opponent player is replaced with a fictional player appearing in the animation story as a virtual opponent. Also, the opponent's cards are projected on a player's table although the player can use physical paper-based cards. Some additional fictional or enhanced effects can be shown for the opponent's cards. In Section 4.6, we suggested to use empathetic virtual human to overcome some potential pitfalls. As shown in [26, 28, 30], fictionality can be incorporated through transmedia storytelling and it is possible to embed ideological concept in the real world. Also, *Augmented TCG* does not lose most of values even when virtuality is incorporated into the real world through computational elements. We still need to investigate how the incorporated fictionality introduced in *Augmented TCG* affects a player's behavior through three experiments in this section. In particular, we focus on how the realness of virtual opponent players degrades the player's motivation. The discussion presented in the section complements the insights described in the previous section; the discussion is effective when incorporating virtuality in the real world. As suggested in [28, 30], fictionality is effective to navigate human behavior towards a better lifestyle. The insights can be used to develop future gaming to explicitly support fictionality for aiming behavior changes.

5.1 Overview of the Augmented TCG

Augmented TCG augments the traditional paper-based TCG with the following two features, based on the aforementioned observations:

- Replaces a real opponent with a fictional player as a virtual opponent.
- Exaggerates useful information regarding an opponent's cards.

The first feature is the most significant characteristic of the *Augmented TCG*. Using fictional players that appear in the *Yu-Gi-Oh!* animated story as virtual opponent players supports the feeling of playing a game with the animated character as an opponent. The feature enables ideological concepts introduced in a fictional story to be embedded into the real

TCG play [26, 30]. The second feature provides useful information to players to support better decision-making. If important information that is necessary to play the game well is difficult to understand, additional simplified information may be useful for TCG beginners. It also supports the perception that the fictional figures depicted on opponent players' cards move during the game. For example, if an opponent player has a card that depicts a pretty angel, this may encourage the player. Similarly, if he/she has a card that depicts a powerful monster, the special effect may demonstrate the strength of the monster.

Figure 4 presents the basic configuration of the *Augmented TCG*. Each player's cards, which are in the duel field on the table in front of the player, are captured by a camera and projected onto the opponent's table. Each player is represented as a 3D model of a fictional player. In the current implementation, *MikuMikuDance*⁹ is used to show the 3D models of the fictional players. *MikuMikuDance* is free software that creates 3D movies using fictional players. The fictional player is controlled using *MS Kinect*, and its movements are synchronized with the movements and behaviors of the real player whom it represents. In the current *Augmented TCG*, a player can choose either *Yugi* or *Kaiba* who are fictional heroic players in the *Yu-Gi-Oh!* animation story. The system allows us to examine how fictional and real components of the TCG game affect players' game play.

5.2 Experiments

We conducted a user study to demonstrate players' experiences and observations with *Augmented TCG*. We recruited five participants who were familiar with the *Yu-Gi-Oh! TCG*. They all performed the duels in the experiments against an expert player, who has a deep knowledge of the TCG and could lead and control the experiment so that all the participants played the game under the same conditions. All participants had more than 3 years of experience with the *Yu-Gi-Oh! TCG* and were familiar with both the *paper-version* and the *DS-version*. All participants were male and between the ages of 21–22 years.¹⁰ The generation of the participants is especially familiar with *Yu-Gi-Oh! TCG*. Additionally, the most active *Yu-Gi-Oh! TCG* players are male. Therefore we argue that, the selection of participants is reasonable for producing useful insights, and their opinions show how our approach is promising from an expert's point of view. Two experiments were performed with each participant. Before the experiments, players could not talk to each other. None of them knew about *Augmented TCG*. During the experiments, to analyze each participant's values, each participant played a different duel against the expert player described in Section 3. The expert could lead and control the experiment such that all participants played the game under identical conditions. All of the experiments were recorded, and all dialogs in the experiment were transcribed to facilitate analysis of the dialogs. Following the experiments, we held a semi-structured focused group interview with the participants. We analyzed the video recordings later to observe each participant's play using the contextual inquiry method [6]. The discussions in these experiments were extracted from the observation of the play and the interview with a player.

During the experiments, the rules of the game were simplified to make the duels shorter, and special predefined decks of cards were used. The decks were prepared by the skillful

⁹ <http://www.geocities.jp/higuchuu4>

¹⁰ These ages are the most suitable for the experiments because *Yu-Gi-Oh! TCG* is the most popular for the ages when they were high school students.

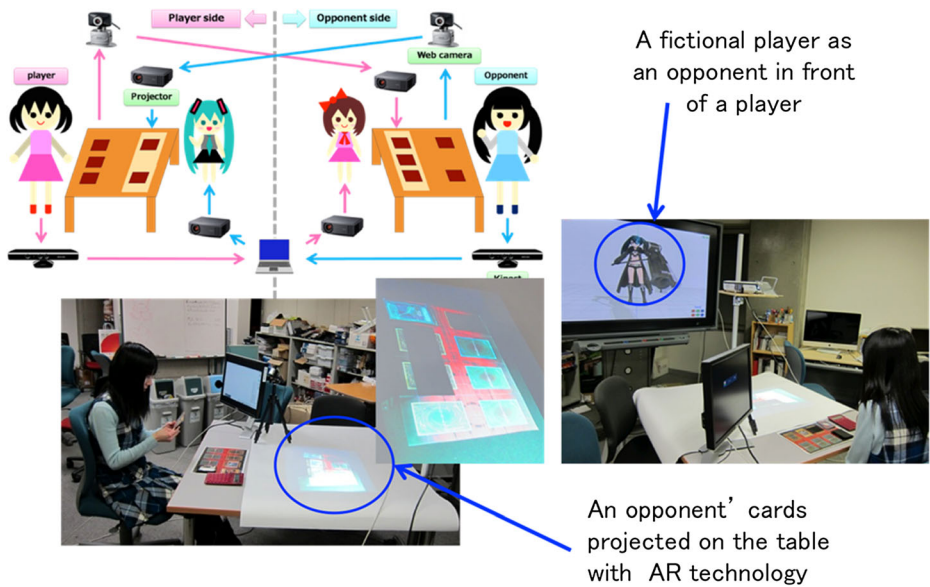


Fig. 4 Playing the augmented trading card game

expert player who has enough skills to control the experimental duels. The expert is also familiar with the TCG animation story as described above, and knows well how each fictional player in the animation story structures the deck and uses the cards in the animation. Therefore, for each possible fictional player to be chosen by a participant to represent him/her in the game, a suitable deck consistent with the animation story situation was prepared. In the current version of the *Augmented TCG*, the virtual opponent player's behavior did not precisely reflect the real behavior of the player; instead, the behavior was exaggerated in accordance with the current play situation. In the following subsection, we provide an overview of each experiment and present some experiences extracted from the user study.

5.2.1 Playing against virtual and real players

In this experiment, each participant played a duel against a virtual opponent, who was represented by a fictional player and whose movement was synchronized with the movement of the real human opponent via the *Kinect*. After the experiment, one participant told us that he would have enjoyed the duel more if the virtual opponent player had been his favorite fictional player. Another participant said that he focused primarily on the opponent's cards and that the virtual opponent was not important for him. Most of the participants claimed that the virtual opponent was not sufficient for feeling the presence of the real human opponent, as the *Kinect* was unable to extract facial expressions and eye movements. Additionally, the movement of the virtual opponent was not natural because the *Kinect* interpreted the movement of the player based on only a few body points.

We compared the situations when the players directly saw their real human opponents with when virtual opponent players were used to represent the opponents, as shown in Fig. 5. In the interview, a participant said “If I know the opponent player well, then the real person view is more preferable and increases the reality of the game.” Another participant claimed “When the



Fig. 5 Playing against a real opponent

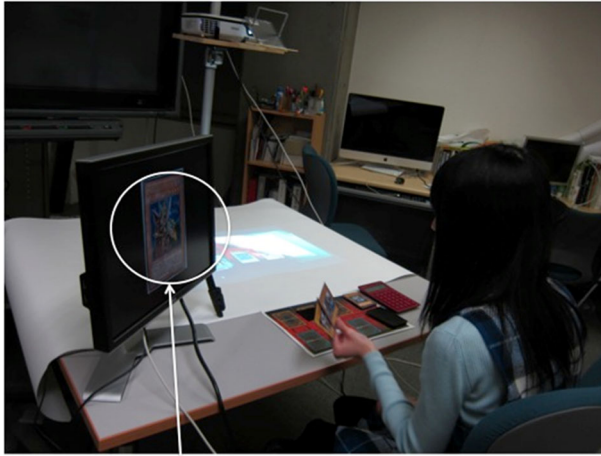
opponent player is a stranger, using a virtual opponent is preferable because I don't feel comfortable either showing myself or seeing the opponents.". Thus, we found that viewing the real person was preferable and increased a sense of realness of the opponent when the participants knew the real human opponent. When the opponent was a stranger, some of the participants claimed that using a virtual opponent player was preferable, as they did not feel comfortable either showing themselves or seeing their opponents.

One participant did not like viewing the opponent directly when he did not know the player. For him, representing the opponent as a fictional player increased his motivation to play the duels. Another participant preferred seeing the real human opponent. Thus, the preferred representation of the opponent depended on the players' preferences. Finally, one participant stated that a real gaze and facial expressions were essential for predicting an opponent's tactics and subsequent moves. Therefore, he said that it did not matter whether the opponent was real or represented by a fictional player, as long as the gaze and facial expressions were available and accurate. Thus, a sense of realness of the virtual opponent player is essential for satisfying and motivating players.

5.2.2 Showing an opponent's cards

In this experiment, the cards that the opponent draws are presented on a small display near the participant, as shown in Fig. 6. When the opponent's cards were projected onto the table, it may have been hard for players to clearly see and understand the characters on the cards, as the images may have been too small or were of low resolution. This would have made it difficult for players to make the best decisions. Therefore, in this experiment, we presented the cards that were drawn by the opponent on a small display near the participants.

Information about the strength level shown in the card is hard to see during the game, and so showing detailed information about the cards near a player is useful to support better decision making and strategy choices by the player. Such information also encourages a player not to give up the game. In a typical setting of a duel, it might be hard to clearly see and understand the fictional figures on cards that are placed in a duel field and thus more difficult for a player to make a correct decision. In particular, if the opponent player's cards are



a player can see detailed information in an opponent's card.

Fig. 6 Showing a card on a small display

projected on the table, the low resolution of the projected cards becomes a serious issue. That is why, in our setup, we show the card drawn by the opponent on a small display near a player. One participant said, *"If more hints to choose a card in my deck are shown, it is helpful to make a better decision."* Another participant told us, *"If the textual information in a card is represented as visual information with fictional images, a player's cognitive overload is decreased and [this] makes it possible to make a better decision."* Additionally, one of the participants said *"If the card shown on the small display has more fictional effects, the effects make me more excited."* These hints or effects are usually adopted in computer-based *Yu-Gi-Oh! TCG* that uses virtual cards. The approach can be implemented in the current version of *Augmented TCG* even if physical paper cards are used. From the experiment, we found that the usefulness of the approach depends on the players. Players who usually want to win a duel and know the trading cards very well can recall the detailed information of the cards merely by looking at the image of the trading cards. For these players, special effects or hints to teach them how to duel better are more appropriate. On the other hand, players who know only their own cards well but do not know other players' cards feel that showing the projected cards on the small display is very useful for them to play their duel better. Therefore, the offered information needs to be customized according to the players' preferences and circumstances for increasing their enjoyment of the game and satisfying better their expectations.

5.2.3 Playing against a fictional player in TCG animation

In this experiment, participants could choose either *Yugi* or *Kaiba*, who are the heroic fictional players in the *Yu-Gi-Oh!* animation story, for their own virtual opponent player according to their preferences. Most young boys want to follow one of these two fictional players because of their typical, attractive and ideal personalities. As shown in [26], adding fictional players appearing in the animation story can be used to remind essential ideological messages in the story. The approach offers a possibility to increase the *ideological value*, where both the *paper-*

version and the DS-version cannot treat the value well. The discussion shows that the approach can complement the discussion in the previous section.

After the game, we interviewed the participants about their impressions about the fictional player representing their opponent. One participant said, *“I could feel I am playing against Yugi, but Yugi used in the experiment does not offer enough.”* The movement of the character was sometimes not like that of the real Yugi in the animation story. This participant also said, *“I would definitely more enjoy a game against Yugi, and would like to win the game if the movement is more realistic.”* Another participant said, *“The facial expression of the character is poor and it is a very important issue playing a game against a real person.”* Additionally, one participant stated, *“The voice should be the same as the voice of the character in the animation story.”* Moreover, if the player’s opponent was really female,¹¹ some participants found it strange because both Yugi and Kaiba are male fictional players. In the animation story, players usually play Yu-Gi-Oh! TCG standing up, and we therefore chose to have the fictional players standing during the game, but in the real world, players are usually sitting. Some participants found the fictional players’ standing positions to be unreal, but if the fictional players were sitting, the participants also felt that this was inconsistent with the personalities of Yugi and Kaiba.

5.3 Design implication

The most important characteristic of *Augmented TCG* is the use of a fictional player as a virtual opponent player to augment traditional TCG. In this section, we discuss our observations, from our experiences with designing and playing *Augmented TCG*, about the influences of using a fictional player as virtual opponent in the game.

Collecting Yu-Gi-Oh! TCG cards is a significant source of pleasure for many players. Virtual cards lose the sense of ownership, which decreases the enjoyment and satisfaction with the game for such players. For some players, playing against a fictional player does not matter, yet if the player is their favorite, it increases their pleasure in their duels. One positive observation is that adding fictionality may increase these players’ good feeling with their cards. For example, presenting their favorite and empathetic figures appeared on Yu-Gi-Oh! TCG cards on a display near them increases their empathy with that players. Playing together and communicating with the player during the duel should make the duel even more enjoyable and exciting. When the card depicting that figure is a rare one, these players should strive to obtain that card and enjoy the interactive play with that figure. We claim that our approach of using physical cards and adding the effects of the fictional figures is a good decision.

As already mentioned, most of the participants in the experiments, all of whom had watched the Yu-Gi-Oh! animation story, felt that including popular fictional players from the animation in the game can make it more enjoyable and exciting. The desire to imitate these fictional players may also become an incentive for the users to change their behavior. Negative feedback may be used to achieve moral play, but changing a player’s general attitude is not easy [22]. The most important insight is that it is possible to use a fictional player as a symbol that reminds the player of the fictional player’s story during the game, and in this way, the story may convey values such as the importance of friendship, honesty, and thoughtfulness [26]. This approach could have the power to change the player’s attitude towards “fair play”. As mentioned above, the results of our experiments and interviews with participants have

¹¹ The expert player is a female player in the experiment.

indicated that the relative realness of the fictional players, such as their facial expressions, movements and behavior, is important for players' enjoyment of the game. Realness is an important criterion for evaluating a design. In *Augmented TCG*, the virtual opponent's behavior should be consistent with the fictional player's behavior in the animation story, and this consistency is important to players' sense of their realness in the game. For example, cards that are not used by the fictional player in the animation should not be used in the game, and the movements of the virtual opponent should be consistent with its movements in the animation. The number of cards owned by the fictional player in the game should be consistent with the corresponding number in the animation as well. Excessively realistic expressions, however, may lead to the uncanny valley problem [21] if the achieved realness is perceived as not being completely realistic. The balance between the realness and the virtuality of the fictional player is important for design strategies when introducing virtuality into human social interaction.

One serious limitation of the current *Augmented TCG* is that it does not alter an opponent's voice to match the fictional player's voice. This limitation makes it difficult to use voice communication between players while maintaining a sense of realness of the fictional opponent. Players who participate in tournaments need to strongly feel the existence of their rivals; one important factor is how skillful their opponent is. The opponent's skills should be consistent with the fictional player's skills to maintain a sense of realness of their duels with *Yugi* or *Kaiba*. Therefore, opponent players should not use *Yugi* and *Kaiba* as their fictional players if they are less skillful players. As also shown in [28], a sense of realness on fictionality can be realized in many ways to solve the issues described in this section.

Currently, our user study includes only young male participants. For better generalization of the results in this paper, it would be more effective to conduct the experiments with female participants and kids, which will give us broader information and design implications from different angles. Also, the number of participants is not sufficiently large to validate how a player with different personality is influenced by incorporated fictionality. We can just show some potential pitfalls caused by introduced fictionality. We still need a larger scale experiment to understand the personality effect of fictionality introduced in human social interaction. Recently, a pervasive game named *Ingress*¹² adds a fictional layer on our daily life to make our life more playful. Also, *Live Action Role Playing (RARP)* [35] becomes popular to make our real life fictional. Since the phenomenon will accelerate the virtualization of our real world, the insights presented in this section will help us to design a better society through playful social interaction without losing the realness.

5.4 Summary

Augmented TCG overcomes a variety of pitfalls occurring in the *DS-version*. The discussion shows that using virtuality introduced by digital technologies does not mean to lose values offered by the *paper-version*. A careful integration of real and virtual components maintains values and also even enhances them. From the experiences with *Augmented TCG*, we can conclude that the tangibility of game items is essential, but the enhancement of the real world by using augmented reality technologies increases the pleasure of a player. The section shows that it is important for a player to feel a sense of realness on the fictionality added in the real world and describes some insights for how not to lose the realness. Also, *Augmented TCG* offers a possibility to increase the *ideological value* as shown in Section 5.2.3. Because this

¹² <https://www.ingress.com/>

means that the discussion focuses on a different aspect from the insights presented in the previous section, the insights shown in this section complement the insights presented in the previous section.

6 Conclusion and future direction

In the paper, we discussed the influence to incorporate virtuality and fictionality in human social interaction through an example of *Yu-Gi-OH! TCG*. Our analysis is based on scenarios of players with typical personalities; the discussions extracted several potential pitfalls of incorporating virtuality and fictionality in *Yu-Gi-OH! TCG*. The *value-based analysis framework* was used to discuss several design decisions to incorporate virtuality. We also showed some insights to use fictionality in *Yu-Gi-OH! TCG* through some experiments with *Augmented TCG*. Our discussions focused on only *Yu-Gi-OH! TCG*, but we believe that the insights are useful for designing a variety type of social interaction that incorporates virtuality. Recently, gamification becomes a very popular topic in research communities [10, 40]. As shown in [29, 33], virtuality is a useful tool to gamify participants' activities in social media. The insights described in the paper offer an effective guideline to design these services; a sense of realness is an important design criterion to make services incorporating virtuality successful.

As shown by Richard Bartle, each player may change his/her personality according to the current situation [3]. Currently, our analysis assumes that each personality is fixed and does not change during a play. The dynamic changes of personalities may offer some interesting ways to recover lost reality. The experiment described in this subsection is just a trial to show how to exploit values to recover lost reality. We need more scientific evidences to show how values can help to overcome pitfalls caused by introduced virtuality; we also need to investigate more how to develop a general guideline to use values to recover lost reality and develop a formal framework to identify pitfalls and overcome them based on values.

Computer games attract people by creating the illusion of being immersed in an imaginative virtual world with spectacular computer graphics and sounds. The goals of computer games are more interactive than are those of traditional games, leading players to have strong desires to play the games. Computer games designed with an optimal level of information complexity can provoke players' curiosity. Thus, computer games intrinsically motivate players by supporting their fantasies, challenges, and curiosity, which are the three main elements that contribute to fun in games. Augmenting our daily life through the use of virtuality introduced in computer games is a promising way to extend traditional gamification-based approaches.

We also consider that our approach is useful to analyze tangibility of virtuality incorporated in the real world. Although tangible virtuality is promising to make human interaction more fruitful, the basic design approach is like art; we still do not have a good framework to design tangibility of virtuality. We believe that our insights will be effective to discuss how people feel tangibility as the realness of incorporated virtuality. In particular, the *value-based analysis framework* is useful to design the affordance of tangible virtuality through the co-creation approach among the stakeholders that design the virtuality. The tangibility of incorporated virtuality is also related to the concept named affordance [37]; the meaning of the virtuality is defined through a process to construct its affordance. *Gameful digital rhetoric* [31] that offers the design abstraction to define the rhetorical meaning of virtuality can be considered as *persuasive affordance*. We also need to exploit the relationship between *persuasive affordance* and *gameful digital rhetoric* in the next step.

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