Fairness, Judges and Thrill in Games

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Abstract. In this paper the model of three masters (Iida, 2002) is revisited. Using the model we study the inner meaning of games with focus on solving a game to know its true colour, thrilling sense to feel when playing a game and noble uncertainty to imply the mind state of vanity. The model reveals that the attractiveness of games highly relates to a harmony between fairness, judges and thrill in games. In conclusion, we claim that inclusion of draws and several playing style enhancements were important contributions to maintaining such a harmony.

Keywords: thrilling sense, noble uncertainty, attractiveness of games.

1 Introduction

Just as men long for freedom, intelligence seeks for uncertainty. Games, which epitomize uncertainty, evolved in their long history to refine uncertainty. This process employed a harmony between skill and chance in games, leading to evolutionary changes in noble uncertainty. Masters who stand at the top of their games seek the ultimate harmony that may exist at the end of the changes. Despite their desire to win, masters occasionally exercise their creativity unconditionally without prejudice. We call this state of mind, which is commonly found among masters, the "model of three masters" (Iida, 2002). An illustration of the conceptual model is shown in Figure 1.

This model reveals three distinct master aspects: the Master of Winning (M/W), the Master of Playing (M/P) and the Master of Understanding (M/U). They correspond to each of the three important characteristics that games possess: competitiveness, entertainment, and communication. Existing theories that may be related to each are the game theory (von Neumann and Morgenstern, 1944), game-refinement theory (Iida and Yoshimura, 2003; Iida *et al.*, 2004), and combinatorial game theory (Conway, 1976). The model indicates the existence of various interactions between intelligences of players. We have studied it in terms of the dynamics of intelligence in the field of games (Iida, 2005b).

In this article, the model of three masters is revisited in Section 2 to explore the inner meaning of a game in its history of human play and computer play. Section 3 discusses the interactive relation between three distinct aspects of games mentioned above. Then, concluding remarks are given in Section 4.

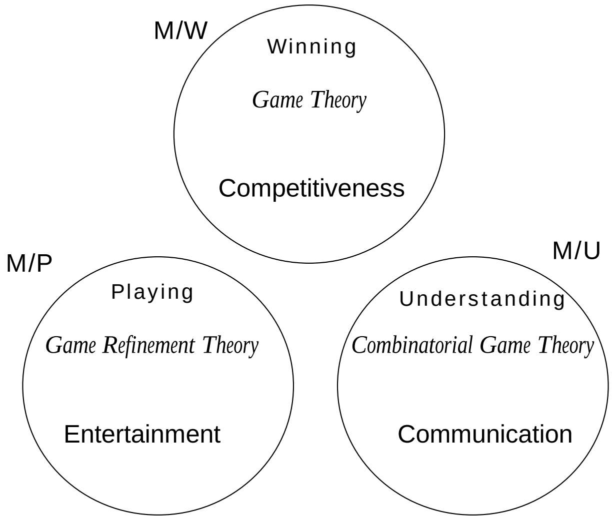

Figure 1. A model of three masters (Iida, 2002).

2 Three Masters Model Revisited

In this section the model of three masters is reconsidered. It was first proposed at the 7th Game Programming Workshop in 2002. Since that time we revised it again and again to take a deep insight into the model. This reconsideration would enable us to have a better overview of computer-game research and other various game-related studies. The principal aim of our study with the model of three masters is to explore the human intelligence that created sophisticated games such as chess and shogi.

2.1 The Master of Understanding: Solving a game to know its true colour

Towards a better understanding of games, the first step is to determine its game-theoretic value, i.e., solving the game. Note that there are some levels of solving a game: ultra-weakly solved, weakly solved, strongly solved, and ultra-strongly solved (Allis, 1994; Iida, 2007a). For half a century building strong game-playing programs has been an important goal (v.d.Herik *et al*., 2002). Although the principal aim was to witness the “intelligence” of computers, its practical goal has been to establish the game-theoretic value of a game, i.e., the outcome when all participants play optimally.

Singmaster (1981; 1982) showed a reasoning of why first-player wins should abound over second-player wins. However, v.d.Herik *et al*. (2002) observed through the exhaustive computer analysis that in relatively many games on small boards the second player is able to draw or even to win. Hence, it is assumed that the Singmaster’s reasoning has limited value when the board size is small. From an investigation of solved games the concept of initiative seems to be a predominant notion under the requirement that the first player has sufficient space to fulfill the goals (Uiterwijk and v.d.Herik, 2000). Moreover, Kita and Iida (2006b) showed that the game-theoretic value is positively correlated with the mobility in the initial position. This result indicates that the mobility in the initial position affects the game outcome more strongly than search space or the board size. Thus, we observe that if the first player has a sufficient number of possibilities in the initial position of a given game would take an advantage of the initiative.

Iida (2007c) made a conjecture that the game-theoretic value of a sophisticated two-player game is a draw. The conjecture indicates that for sufficiently strong players or even the omniscient players the game-theoretic value of a game must be a draw to maintain fairness. Fairness comes from the equal or nearly equal winning ratio for White and Black. It implies that for the omniscient players the outcome of a game is a draw, if the game is fair. Some games including sophisticated games such as checkers (Schaeffer *et al*., 2007) have been solved by the development of computer technologies and game programming techniques. All these results are indeed in agreement with that conjecture.

We thus observe that sophisticated games have been survived till today while these theoretical values being a draw to maintain fairness. On the other hands, many non-draw (e.g., first-player-win) games are still being attractive for people to play. A question then arises: (1) how did they maintain fairness in these games? It is likely that people would lose charm in such a non-draw game due to unfairness. Otherwise, competitiveness will decrease when people playing games which often end in a draw. Then, we meet the next question: (2) how did people maintain charm of games while keeping competitiveness. For both questions we observe that a draw and other enhancements play an important role, which will be discussed in detail in Section 3.

The rebirth of solved games is another issue. To create new variants of classical games is quite easy but to refine solved games, in order to make them much more fascinating, is challenging. For such purpose, Cincotti and Iida (2006) introduced two simple techniques: synchronism and stochastic elements. With such ideas a solved game would be reborn while being “unsolvable” or even “unpredictable”.

Moreover, concerning the “ultra-strongly solved”, the beauty of the initial state or finding the most reasonable initial state is also an important issue (Iida, 2007a). Better understanding of a game implies the finding of the best initial state among some plausible candidates. The quality of the initial state would depend highly on the intelligence of the game creators or their sense of art.

2.2 The Master of Playing: Thrilling sense is derived from the second derivative

Iida and Yoshimura (2003) proposed a logistic model of outcome uncertainty based on the principle of seesaw games or late chance. Let us show, in Figure 2, an illustration of the model of game-outcome uncertainty. Here we assume that the solved information $x(t)$ is twice derivable at $t \in [0,T]$. T stands for the average length of a game, which means the average number of moves. The second derivative here indicates the accelerated velocity of the solved uncertainty along the game progress. It is the difference of the rate of acquired information on the outcome during game progress. This model has been elaborated to establish the game-refinement theory based on the outcome uncertainty (Majek and Iida, 2004).

A good dynamic seesaw game in which the outcome is unpredictable at the very last moves in the endgame stage corresponds with a high value of the second derivative at $t = T$. This implies that a game is more exciting, fascinating and entertaining if this value is larger. We expect that this property is the most important characteristics of a thrilling game. Suppose that B stands for the average branching factor in a game, which means in general the average number of the available options of players throughout a game. Then, $\frac{B}{T^2}$ or its root square $\frac{\sqrt{B}}{T}$ is the value related to the thrilling sense in a game play (Iida, Takeshita and Yoshimura, 2003).

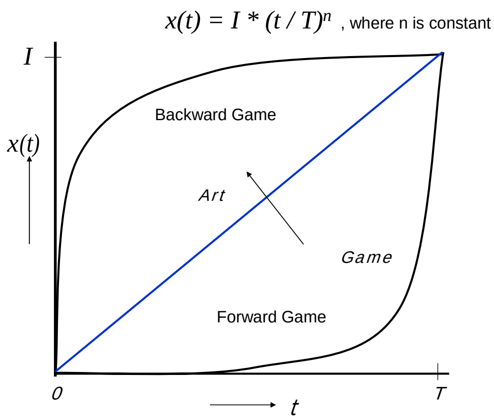

Figure 2. A logistic model of game-outcome uncertainty: from game to art.

In seesaw games, the second derivative value obtained from the mathematical formula in regards to time becomes just right at the finish of the game. If the value is too large, the outcome of the game depends too much on chance and if the value is too small, then it relies too much on skill. Just as the adequate slope of slides gives proper thrill, the sufficient value of the second derivative brings the satisfying amount of thrill.

The seesaw game principle is related to the good balance between skill and chance in games. Players rely on both skill and chance. Just as games are unentertaining when skill is not involved, games without chance are equally unentertaining. Games which have a good balance of skill and chance offer the harmonic uncertainty that captures the hearts of players of all levels. However, as the players' skills improve, the balance will change. As a result, rules change in order to satisfy the sensibility of the players in the evolutionary sense.

When the value of the second derivative in that logistic model is positive, players may enjoy a thrilling game, i.e., thrilling sense. What would it happen if the value is negative? This was explained by introducing a notion called a forward game and backward game (Kita and Iida, 2006a). They correspond to a game and art, respectively (Iida, 2007d), as shown in Figure 2.

2.3 The Master of Winning: noble uncertainty and mind state of vanity

We proposed a notion called noble uncertainty (Iida, 2003). This notion focuses on an important aspect of the attractiveness of games: chance. Even masters meet the aspect of chance in their game play. This is because they sometimes are not able to choose the best one among plausible candidates. Hence, they may experience some stochastic factor even in deterministic games such as chess and shogi. We thus observed a model of the kernel of a game (Yamamoto and Iida, 2006). The choice among a few best candidates is a thrilling task. Namely, the skill of game playing enables to transform a game with many possibilities (superficial freedom) into a stochastic game with fewer possibilities (essential freedom), as shown in Figure 3.

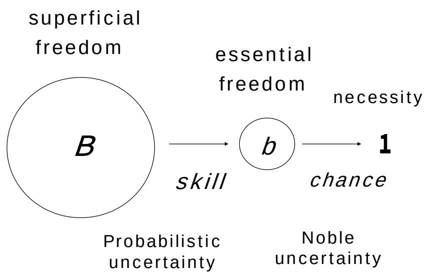

Figure 3. A model of noble uncertainty.

In stochastic games such as poker "unpredictability" is important, which makes it difficult for opponents to form an accurate model of one's strategy (Billings *et al.*, 2002). A strong player must develop a dynamically changing (adaptive) model of each opponent, to identify potential weaknesses. Hence, mixing strategies, i.e., occasionally handling a given situation in different ways, hides information about the nature of one's current hand. By varying one's playing style over time, opponents may be induced to make mistakes based on incorrect beliefs. Thus, for any type of games including deterministic games and stochastic games, unpredictability is an important issue in order for a player to be the Master of Winning. This is the mind state of "vanity" (Iida, 2005a). It is interesting to note that masters standing at the top of their fields such as sports and material arts deeply understand the importance of being a mind state of vanity.

In the simple stochastic game "RoShamBo" or "Rock, Paper, Scissors", for example, the best strategy is to randomly select each of the options an equal proportion of the time. If any player diverted from that strategy by following a pattern or favoring one option over, the others would soon notice and adapt their own play to take advantage of it. In more complicated stochastic games such as poker, Nash equilibrium (1950) can be applied. The Master of Winning knows to vary his play so the opponent has a hard time figuring out whether he is bluffing or employing some other strategy.

However, even in games of no chance such as chess and shogi, because of noble uncertainty masters eventually have to meet such a stochastic game. That is why they know the importance of "unpredictability". To avoid the opponent modeling the mind state "vanity" is the only strategy, where it is not pure random but more than random.

3 Discussion

For attractive games it is important to be "unpredictable". The game-theoretic value must be unpredictable as well as the game outcome and player's model (Iida, 2003). Unpredictability might be simply obtained from the increasing of search space of games considered. However, it would lose more or less people's concentration to choose a move that is an important factor of game's attractiveness. Hence, we need a good balance between judges, fairness and thrill. In this section we discuss some key factors to maintain such a harmony.

3.1 A Draw bridges between Judges and Compassion to maintain Fairness

A game play usually produces winners and losers. In this sense a game is a battlefield to judge players. For the judgment or strict ranking of players, a game with a sufficiently large option space in which they can exercise their real strength would be desirable (Iida, 2007b).

However, people do not always appreciate such a strict ranking for three reasons. First, they have compassion for their fellow players. When one player becomes a winner, the other player must be a loser. Second, we sometimes only need partial ranking instead of full ranking for participants. For example, we may need only the top three players to be qualified in n-person games like tournaments. This implies that strict ranking is not necessary for the others. Third, in a game with the concept of turn to move, there may exist the advantage of the initiative (Uiterwijk and v.d.Herik, 2002). In this sense the second player in a two-person game deserves compassion from the first player in order to maintain fairness (Iida, 2007c).

It is wise to allow draws to maintain fairness in games. It is like a gift to the second player who usually cannot take the advantage of initiative in many classical games. An important issue is the frequency of the draw in actual games. Concerning judgment, fewer draws may be desirable, whereas concerning compassion some degree of draw might be acceptable. Thus, the draw plays a role as a bridge between judgment and compassion in games.

A game with very few draws becomes potentially exciting as we observe the game of shogi. In games with too much draws, people might not be excited, but peaceful or sometimes even unentertained. The fairness of two-person games, however, may be measured statistically by collecting the winning percentages of the first and second player. They must be more or less equal to call a game fair (Iida, 2007b; v.d.Herik *et al*., 2002).

3.2 Playing Style Enhancements: maintaining fairness and thrill

We here consider the relation between fairness and thrill in games. To maintain fairness, the rules of a game have been changed in its long history in order that the game-theoretic value may be a draw. Eventually it may often end in a darw and would lose its charm in the sense of judges. Especially in modern generation, competitiveness is a key factor for people to play a game.

Looking back to the history of game playing styles, various enhancements have been made. A simple enhancement is the round-match playing style, in which two players play a game in a round and continue to play some rounds. Many title matches follow this system in various domains. One can feel thrilling sense in a game as well as in a round match.

The two player round-match style is easily extended to the multi-player case: tournament. For the tournament Swiss System is a well known pairing and ranking system. It is very effective especially when all participants cannot play each other. This system has two aspects: knockout tournament and round-robin tournament. In the context of our discussion, they correspond to unfairness and fairness in the sense of the Master of Winning and Master of Understanding, as well as entertaining and unentertaining in the sense of the Master of Playing. Hence, we need a good balance between them for a tournament.

Random-Swiss System was proposed to improve the drawback (judges or ranking) of Swiss System (Hashimoto *et al*., 2002). A ranking problem comes from its pairing strategy. With Random-Swiss System, the tournament results are able to become closer to the round-robin tournament. To tackle another ranking problem of Swiss System, Kawai *et al*. (2005) designed a new measurement based on the tournament scores. This is because a player sometimes obtains larger winning points than other stronger players since that player played with relatively weaker players.

4 Concluding Remarks

An attractive game deserves a harmony between judges, fairness and thrill. A draw has been a bridge between judges and compassion for some games. Playing style enhancements such as round match style and Swiss System were important contributions to maintaining such a harmony. It is likely that such a meta-structure of playing style would strengthen a play of games to be more attractive.

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