Title	遊び心地と乗り心地を題材とした遊戯性メカニズムに関する研究
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Abstract

Game refinement (GR) theory, taking the game process as the elimination of game outcome uncertainty, proposes a logistical model of game information progress to quantify and evaluate the sophistication of different kinds of games [1]. It firstly and profoundly raises the idea that if we consider the information process in the human brain, which can be measured as in physics, taking Newton's second law into comparison, we could get the game acceleration in mind, which we denote as GR value. From the evaluation by GR, we could better design and optimize a game [2]. Similarly, the changes in speed acceleration in driving have been taken as a key and universal factor in assessing riding comfort-ability in practice.

We analyzed Action Games from several perspectives to deeply analyze game refinement theory. Technology advancements allowed the development of action games that packed multifaceted play in a single match while requiring fast-paced movements. Since modern action game is composed of boss battles, evaluating them was scarcely investigated. In this study, the analysis of the boss battle was conducted based on the God of War (GoW) series, where the underlying entertainment aspects of the game were identified. The information progress of the boss battle of each of the considered GoW series was modeled using the game refinement (GR) theory and its extension, called motion in mind. The evolution of challenge, anticipation, and unpredictability between different GoW series was identified while the entertainment aspects of the game were investigated. The evolutionary trend of the sophistication and unpredictability of the GoW series games provided insights into the intended narrative design, harmonic balance between skill and chance, and provided learning comfort for player mastery of the game-playing.

As for ride comfort from the passenger's perspective, we knew that the passenger's experience could be reflected through velocity and acceleration in the vehicles. Velocity and acceleration are fluent except for sudden breaks or sudden starts, and that may not offer the game player stimulation. In taking the roller coasters, the attendant body can be affected by gravity, roughly showing the riders' different ex-

periences in its moving motions (Eager 2016). Roller Coaster, as an overlapping transmission of combining game and driving, is both for entertainment and for a driving experience in physics. So this study chooses a roller coaster as an important medium for the research object.

The extension of game refinement theory, the Motion in mind model will efficiently indicate how velocity, acceleration, jerk, momentum, and potential energy changes affect the comfort concerned, this gives the convenience to study the correlation between the players and the riding comfort.

Further in-depth research into the use of the motion-in-mind theory to study comfort in games is needed. Previous studies have established a model based on data from the world's most popular roller coaster. However, in order to gain a more realistic understanding of user motion and build a roller coaster model that is more suitable for players, it is important to consider their preferences. To this end, this study used focus group interviews and questionnaire surveys to gather specific data on roller coaster preferences. By using this first hand information, it is possible to simulate a roller coaster model that is more suitable for contemporary players, and the motion in mind theory can be used to analyze the player's psychological movement and improve the comfort level of both reality and play in the future.

Keyword: *Play comfort*; *Ride comfort*; *Game refinement theory*; *Motion in mind*; *Entertainment mechanism*; *Action game*