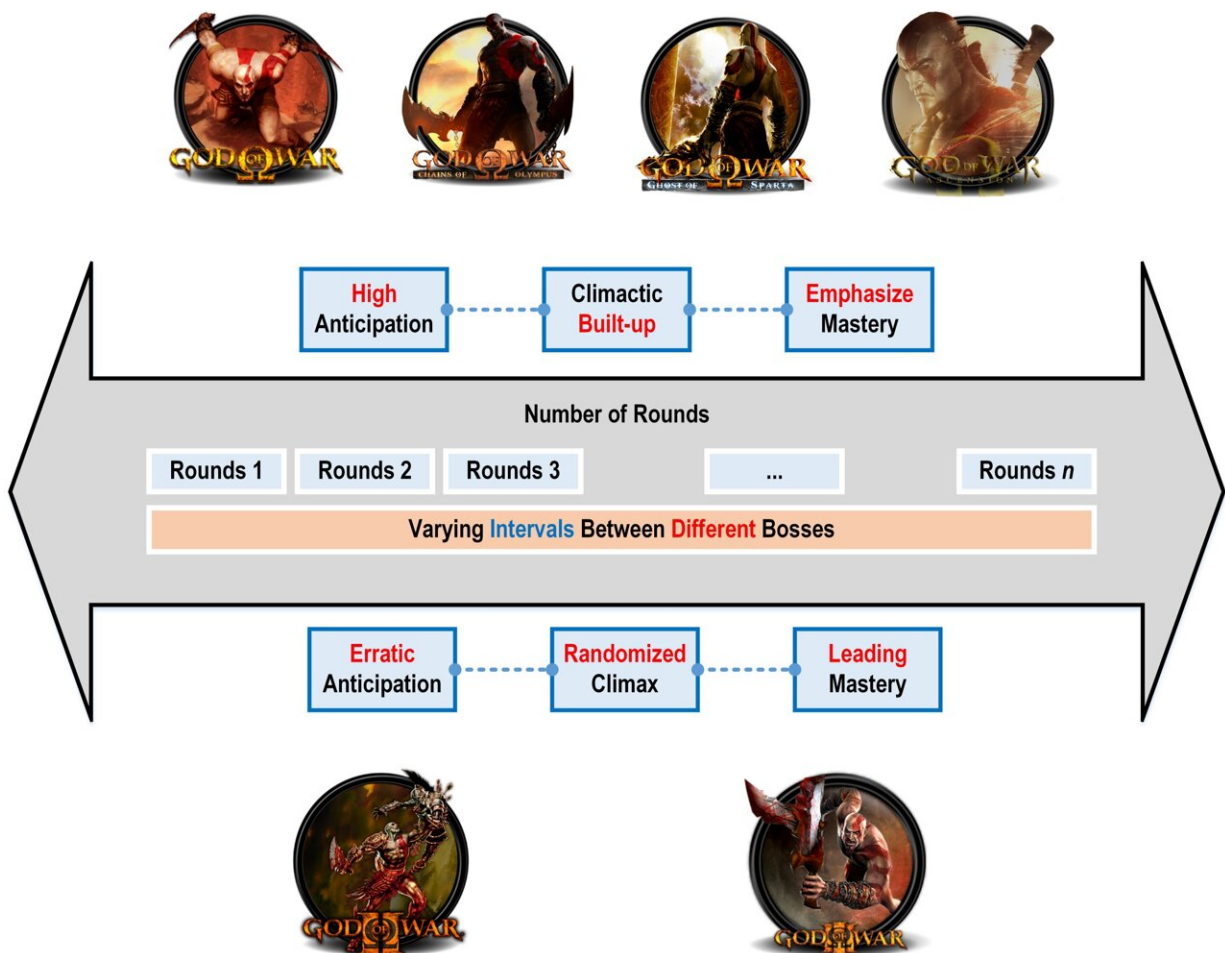


Researchers decode the evolution of action games through the lens of boss battles

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The boss battles in the God of War series were analyzed via the game-refinement theory and motion-in-mind, where their entertainment aspects were determined. These aspects provide exciting game experience for players and insightful design principles for developers. Credit: Mohd Nor Akmal Khalid from JAIST

Action games have developed drastically with advancements in graphic technology over the last decade. Unlike the single character-based Super Mario series, modern action games involve simultaneous fast-paced elements such as shooting and fighting. Furthermore, they have exciting visuals, complex narratives, and boss battles. In action games, the players always have to overcome "enemy boss" characters to reach the next level.

Despite their significance in modern games, boss battles have scarcely been investigated. In this vein, a group of researchers led by Assistant Professor Mohd Nor Akmal Khalid of the Japan Advanced Institute of Science and Technology (JAIST), have studied the evolution of boss battles in the God of War (GoW) series for identifying its underlying entertainment aspects. The paper was published in volume 10 of the journal *IEEE Access* on November 30, 2022 and was co-authored by Prof. Hiroyuki Iida of the JAIST.

Dr. Khalid briefly explains the [research methodology](#). "First, data on boss battles were collected for six GoW games: I, II, Chains of Olympus, III, Ghost of Sparta, and Ascension. The process involved five participants with different levels of play experience, ranging from beginner to expert. Next, the boss fights were analyzed using the game refinement theory and its extension, motion in mind.

"These methods utilize specific parameters to model the game information progress, attractiveness, and sophistication. In this study, two metrics were recorded for each round of boss battle: game length and successful attacks. Here, the game length is the total number of attacks by Kratos—the game protagonist controlled by a player."

Using these parameters, the researchers found that the main GoW series (I, II, and III) progressed differently from the remaining games. In GoW I and III, the challenge peaked around the final three [boss](#) battles. In

contrast, it was maximum in the middle in the non-main versions. Further, their anticipation building was similar to that in GoW I. It increased with the progression of the game. On the contrary, the anticipation level fluctuated throughout the games in GoW II and III.

Overall, the different GoW versions are sophisticated enough, making them popular and attractive. In addition, the series increases in difficulty. The new releases are also highly unpredictable and provide a roller-coaster-like experience. It retains the interest of the players for a repeat experience.

The success of the GoW series can also be attributed to the exciting narrative design, parallel development of human-computer interfaces, harmony between skill and chance, and learning comfort for game mastery. Therefore, it provides a balanced game experience for beginner and advanced players.

Discussing the future potential of the research, Dr. Khalid says. "The successful application of the motion-in-mind concept to the GoW series demonstrates its ability to capture the player experience intended by the creators. It is now possible to elicit such information without extensive computational resources such as deep learning.

"The resulting unified view of the game design would provide insights beneficial to [game](#) developers and publishers. Further, it would help design an enjoyable digital experience on various interface devices for the users."

More information: Zeliang Zhang et al, Action Games Evolution Analysis: A Case Study Using the God of War Series, *IEEE Access* (2022). [DOI: 10.1109/ACCESS.2022.3224469](https://doi.org/10.1109/ACCESS.2022.3224469)

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