Influence of Relationship between Game Player and Remote Player on Emotion

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Abstract— **The main trend in video game playing is the move to collaborative from competitive styles. Additionally, the game system is no longer confined to a stand-alone video game machine, but opened to other players through the Internet, so the competitors and the cooperators in the video game's world are not only programs, but also human beings. Over the internet, the players compete for a goal with their competitors in the competitive style game and obtain their goal together with their partners in the collaborative style game. Therefore, the game player cannot estimate the partner or enemy's behavior, and the interest in the game doesn't only depend upon the game itself but also on the partners' and competitors' behaviors. In this paper, we will investigate the influence of a partner or competitor on the performance and the state of mind of the game player. Another aspect of game playing is discussed by Mihaly Csikszentmihalyi, who identifies 'Flow', in which a person is fully immersed in a feeling of energized focus, as a central experience for enjoyable something. It is said that a person can feel Flow when they recognize their skill is just enough to accomplish the task. We will investigate the game player's state of mind based on Flow theory. As a result of some experiments, it will be shown that the player tends to feel good when the performance of their partner or enemy is almost as high as the skill of the subject. These experiments were performed by participants playing various video games, however, we think that the results of the experiment may be applied on the many and varied systems which support human motivation.**

Keywords; social game; video game; flow theory; collaboration; competition

I. INTRODUCTION

Recently, because of the diffusion of the Internet into the home and onto hand-held devices, Network Games such as Social Games have become popular. Further, it is not only competitive type games in which the player brings down an opponent, but also cooperative type games in which the player obtains the goal in cooperation with online partners that have grown in popularity. In this study, we will investigate the influence of the difference between competitive and cooperative type games as well as the opponent's effect on the primary player's state of mind and his performance.

The concept which is named Flow is widely acknowledged in Sociology. As mentioned previously, Flow is advocated by the social psychologist Csikszentmihalyi [1], and is the state in which a game player is fully immersed in a feeling of energized focus. A person can feel Flow in the condition, when he recognizes his skill level is just enough to accomplish the task, which may also be adjusted by changes in the challenge level as a player gains experience. We think that the video game player can feel Flow easily because the game player can raise his skill level by simply playing the game and the game system can raise the game level based on the player's ability automatically. In this paper, we also wish to discuss the possibility of the game system which induces Flow on the player's state of mind.

Until now, many varied game systems have been developed and have succeeded in the video game market. Some researchers in this field have focused on motivating workers by using video games, and enhancing the elements of entertainment and game design that have this effect [2]. Other research has investigated the influence of a player's skill and competitor's behavior on the player from the viewpoint of brain activity by using fNIRS [3]. Still, other researches on game systems based on Flow theory have been performed using commercial games [4]-[6]. There is a possibility that another results were obtained with another games. And this study will also examine game systems and human computer interaction based on Flow theory.

In this paper, the goal is to propose a game system which induces Flow and to experimentally measure this experience based on the influencing factors of *game type* (cooperative vs. competitive) and *opponent's ability* (lower/equal/higher). It is difficult to control these situations by using the commercial game. Therefore, It is necessary to design the experimental game system in which the game situation can be controlled by the experimenter. In Section II, Flow theory is introduced, and the relation between the competitive type or cooperative type games and that theory is discussed. Section III describes the experimental system which allows the experimenter to control the game situation and the remote player's skill, and experimental method to investigate the influence the remote player's skill on the game player's performance and state of mind. The experimental results are demonstrated in Section IV. Conclusions and future works are demonstrated in Section V.

Eventually, we think the knowledge gained from this research can be utilized in various kinds of computers and machine interfaces.

II.   FLOW THEORY

A.   Overview

Fig. 1 shows the model of flow state, which is advocated by Csikszentmihalyi. When the task challenge level, which means the difficulty of the task, is higher than the operator's skill, he probably feels 'Anxiety' and/or 'Stress'. Conversely, in the case that the challenge level is lower than the operator's skill, he will feel 'Relief' and/or 'Boredom'. In the case that the operator recognizes the challenge level is just right for his skill, he will feel 'Flow'. Additionally, when both levels are high and well balanced, then he feels it more strongly. It is said that the components of 'Flow', are as follows [1],[7]:
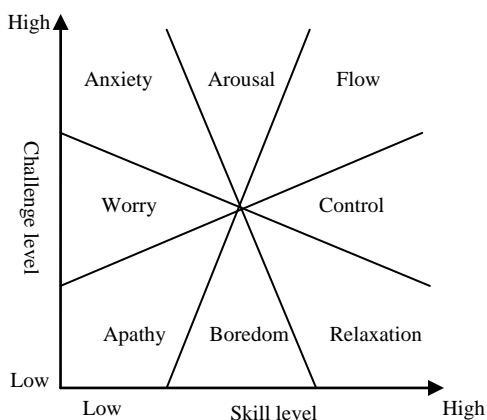
Figure 1.   Model of the Flow state [5].

- Clear goals (expectations and rules are discernible and goals are attainable and align appropriately with one's skill set and abilities). Moreover, the challenge level and skill level should both be high.
- Concentrating, a high degree of concentration on a limited field of attention (a person engaged in the activity will have the opportunity to focus and to delve deeply into it).
- A loss of the feeling of self-consciousness, the merging of action and awareness.
- Distorted sense of time, one's subjective experience of time is altered.
- Direct and immediate feedback (successes and failures in the course of the activity are apparent, so that behavior can be adjusted as needed).
- Balance between ability level and challenge (the activity is neither too easy nor too difficult).
- A sense of personal control over the situation or activity.
- The activity is intrinsically rewarding, so there is an effortlessness of action.

- A lack of awareness of bodily needs (to the extent that one can reach a point of great hunger or fatigue without realizing it).
- Absorption into the activity, narrowing of the focus of awareness down to the activity itself, action and awareness merging.

B.   Flow model for competitive type video game

In the case of video games or sports, the challenge level is replaced by the competitor's skill. In other words, a well balanced level between the competitor's skill and player's skill may induce Flow on the player. Fig. 2 shows estimated model of the mind state of the competitive type game with the competitor's skill as the vertical axis instead of the challenge level.
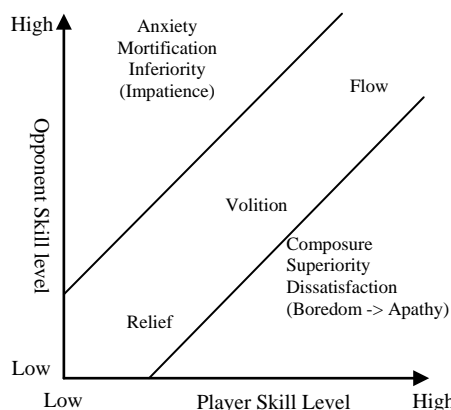

Figure 2.   Proposed model of Flow state (Competitive type).

When the competitor's skill level is higher than the player's skill level, the player may feel 'Anxiety', 'Mortification' and 'Inferiority'. In the opposite case, he will feel 'Composure', 'Superiority' and 'Dissatisfaction'. When their skill levels are almost equal, the player will feel Flow and 'Volition'. Furthermore, player's emotions will change with time. The emotions which are indicated in '( )' show the player's feelings after the interval has passed.

C.   Flow model for cooperative type video game

In the case of the cooperative type game, the challenge level can be replaced by the cooperator's skill. Fig. 3 shows the estimated model of the mind state in the cooperative type game with cooperator's skill level as the vertical axis. When the cooperator's skill level is higher than player's skill level, the player may feel 'Luck' and 'Impatience'. In the opposite case, he will feel 'Boredom'. When their skill levels are almost equal, the player will feel 'Volition', 'Relief' and Flow. The emotions which are indicated in '( )' also show the player's feelings after the interval has passed.
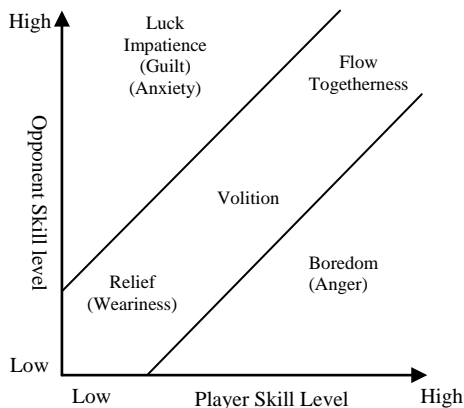
Figure 3. Proposed model of Flow state (Cooperative-type).

After each competition, the subject answers a questionnaire. The subjects are 15 male and female students in their twenties.
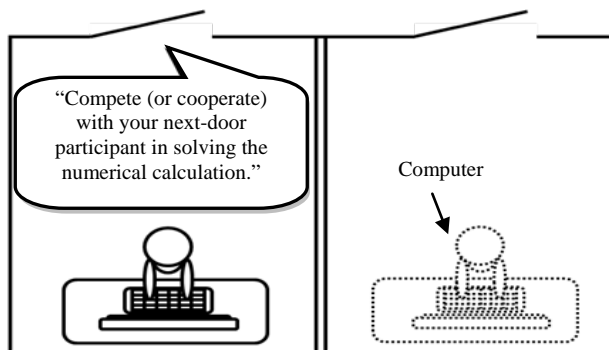

Figure 4. Experimental setup.

III. INFLUENCE OF RELATIONSHIP BETWEEN PLAYER AND OPPONENT ON THE PLAYER'S PERFORMANCE AND EMOTION

A. Experimental method

To investigate the influence of the relationship between player and opponent on the player's performance and emotion, we performed some sensory evaluations under various conditions. For that purpose, a simple calculation game was produced. Using this system, the subjects solve a numerical calculation under controlled conditions; the opponent is a competitor or a cooperator and the opponent's skill level is high/even/low ability. The game is over when the 50 calculations are done by the subject and the opponent. After the game, we make subjects respond to a questionnaire. The subjects performed each of these conditions randomly.

B. Experiment I (Competitive type game)

First of all, the subject is asked to go into the room and to sit down on the chair in front of the PC shown in Fig. 4. Secondly, he is asked to solve some two-digit numerical calculations on the computer display for practice. After that, the experimenter lets the subject know that there is another subject in the next room, and he will compete with the competitor in solving the numerical calculations on the display. The victory will be determined by the number of solved calculations. In fact, the competitor is the computer and the competitor's skill is controlled based on the subject's skill, which is measured in the practice round. The competitor's skill (computer) is set to high ability, equal ability or low ability. It means the competitor's calculating speed is twice, even or half of the subject's calculating speed. In the experiment, the subject doesn't know the competitor's ability. Fig. 5 shows the G.U.I.: Graphical User Interface of experiment I.

The numerical calculation is displayed on the left side, and the numbers of solved calculation of the subject and competitor are shown in the lower region in number form and in a bar graph on the right side. The subject competes with 3 opponents, and the order of competition is random.
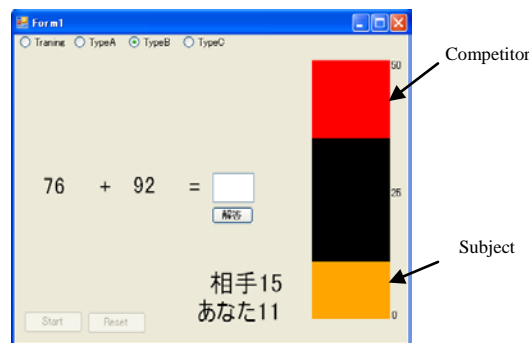

Figure 5. G.U.I. of experimental system (Competitive type).

C. Experiment II (Cooperative type game)

For Experiment II, a new set of 15 subjects were recruited. Experiment II is almost the same as I. However, the experimenter lets the subject know that there is another subject in the next room, and he will cooperate with them in solving the numerical calculations on the display. Fig. 6 shows the G.U.I. of experiment II. The numbers of solved calculation of subject and cooperator are again shown in the lower region in number form and in a bar graph on the right side.
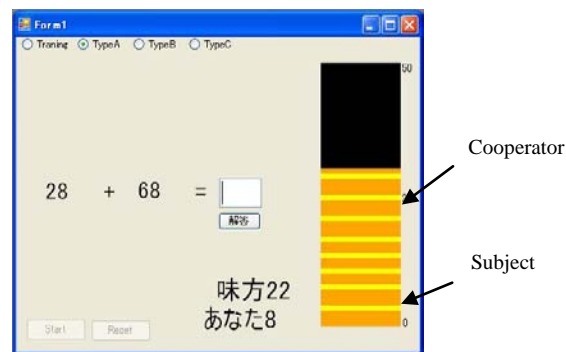

Figure 6. G..U.I. of experimental system(Cooperative type).

IV.   EXPERIMENTAL RESULTS

After each experiment, the subject intuitively plotted the point which indicated the relationship between the subject's skill level and the opponent's skill level on an empty graph in which the horizontal axis shows the subject's skill level and the vertical axis shows the opponent's skill level. Fig. 7 and 8 show the accumulation of all subjects' perceived comparative skill level entries. In Fig. 7 and 8, the black circles indicate the high ability opponents; the squares indicate the equal ability opponents and triangles indicate the low ability opponents. From these figures, it is clear that most subjects recognized the opponent's ability exactly. Additionally, the white circles show the games that the subject thinks were the most interesting of the 3 levels. The star mark shows the center point of those preferred games. The subjects showed a tendency to prefer the game in which the opponent's skill level is almost the same as the subject's skill level in both conditions.
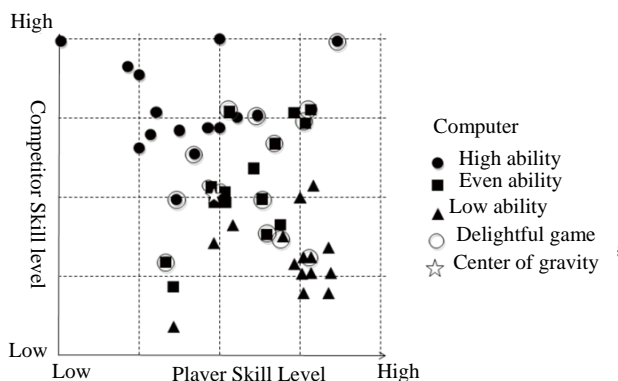

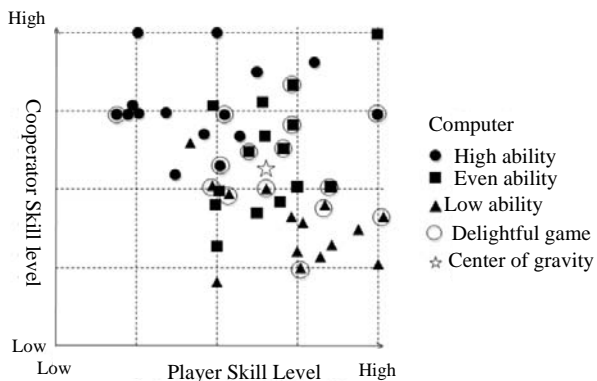Figure 7.   Questionnaire result (Competitive type).

Figure 8.   Questionnaire result (Cooperative type)

Fig. 9 and 10 show the average solution times per one numerical calculation of all subjects. In these figures, the gray bar shows the most interesting game and the black one shows the others. These data are normalized by the solving time recorded in practice. All average times are lower than those recorded in practice with the most interesting games

receiving even lower times than the others. Especially, in the competitive format, there is a significant difference at 5%, which indicates that the player performs best when he feels enjoyment or feels best when he performs well in a competitive environment.

Fig. 11 and 12 show the emotions that the subjects felt in each game.
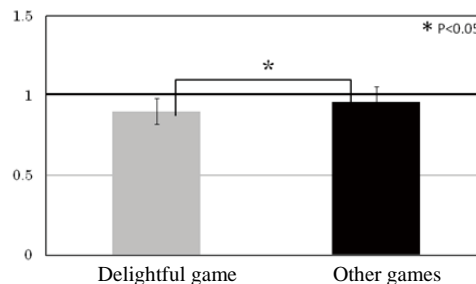

Figure 9.   Average of response time (Competitive type).
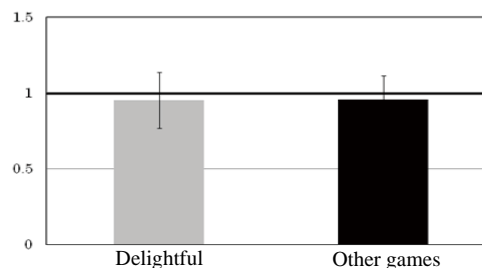

Figure 10.   Average of response time (Cooperative type).
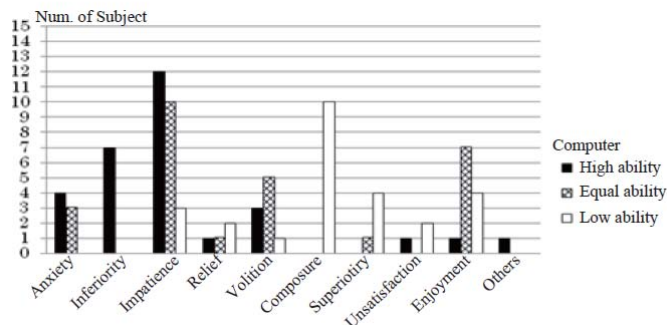

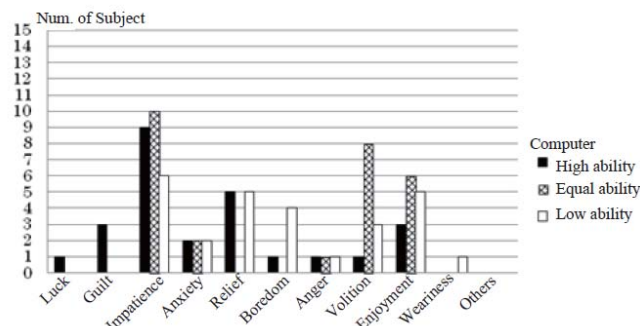Figure 11. Questionnaire results for subject's feeling (Competitive type)

Figure 12. Questionnaire results for subject's feeling (Collaborative type)

In the case of the competitive game, the subjects tended to feel 'Composure', 'Superiority' and 'Enjoyment' when the opponents' skill levels were lower than theirs. In the case of the cooperative format, they felt 'Impatience', 'relief', 'Enjoyment' and 'Boredom'. When the opponents' skill level was higher than the subjects' skill level, they tended to feel 'Impatience', 'Inferiority' and 'Anxiety' in the case of the competitive type. In the case of the cooperative type, they felt 'Relief' and 'Enjoyment' in addition to 'Impatience' and 'Guilt'. When the opponents' skill levels were equal to the subjects' skill levels, they tended to feel 'Impatience', 'Volition' and 'Enjoyment' in both game types. From these results, it is possible to suggest that even the same game style can induce the various emotion states by controlling the situation.

Fig. 13 and 14 show the emotions which are the top 3 in Fig. 11 and 12, on a graph which indicates the player's skill level as the horizontal axis and the opponent's skill level as the vertical axis. Comparing this to Fig. 2, we obtained almost the same result shown in Fig. 13. However, when the ability of the opponent is lower than that of the player, we expected the emotion 'Dissatisfaction', yet there aren't so many subjects who selected this emotional state. In the case of the cooperative type game, when the opponent's ability is lower or higher than the player's ability, many subjects responded 'Relief' and when the opponent's ability was lower, they tended to feel 'Enjoyment' contrary to expectations.
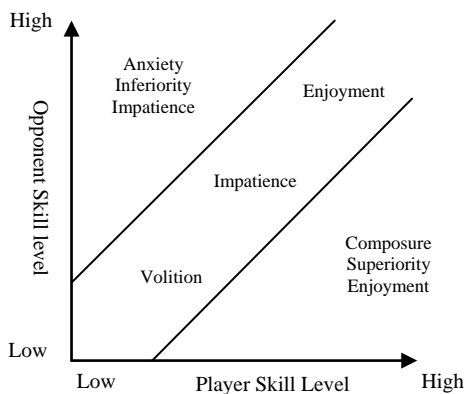
The emotion 'Enjoyment' is chosen in almost all situations, except for the situation that the opponent's skill is higher than that of the subject's within the competitive type format. In the case of the cooperative type game, the subject tends to feel 'Enjoyment' and 'Impatience' in all situations. On the other hand, in the case of the competitive type, the difference emotions were induced by the opponent's ability. When the ability of the opponent is equal to the subject's ability in both cases, 'Enjoyment', 'Impatience' and 'Volition' are selected.

The results of the questionnaires based on the component of Flow are shown in Fig. 15 and 16, when the opponent's ability is equal to the subject's ability the highest score is obtained in both game types. They also indicated that the game player is able to enjoy playing most when the opponent's skill is equal to the subject's skill in any game. The situation in which the opponent's ability is higher than the player's ability ranks second in the case of the competitive type game, however it ranks lowest in the cooperative type game. From these figures, the condition when the opponent's ability is equal to the subject's ability can provide the sense of flow best to the subjects. Comparing these results with Fig.13 and 14, there is high possibility that 'Enjoyment', 'Impatience' and 'Volition' are selected as the emotional elements of flow.

Figure 13. Flow model based on questionnaire result (Competitive type)
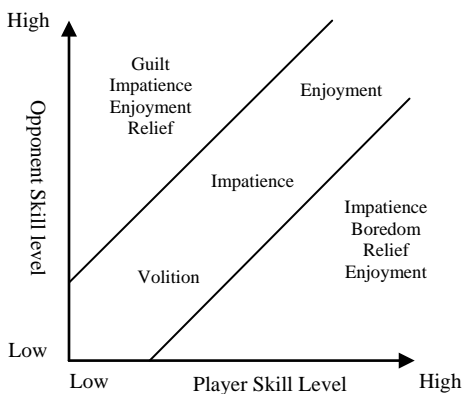
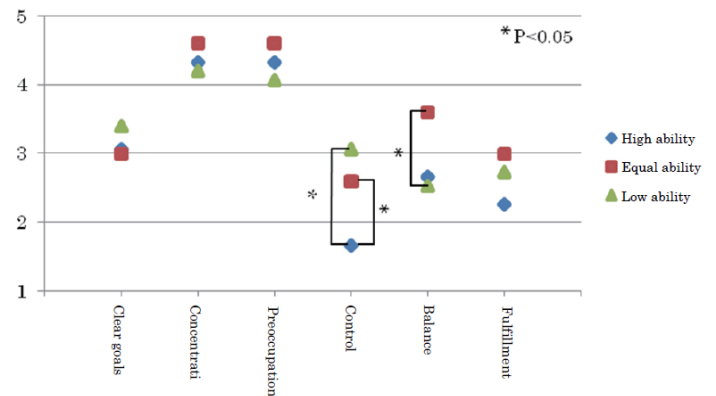Figure 14. Flow model based on questionnaire result (Cooperative type).

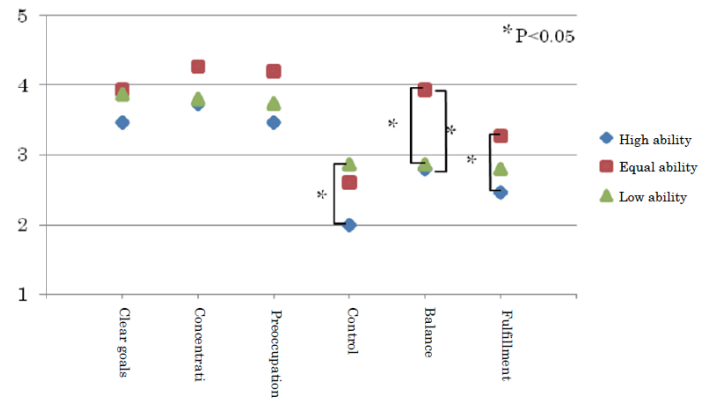Figure 15. Questionnaire result to the flow component (Competitive type).

Figure 16. Questionnaire result to the flow component (Cooperative type).

If it is necessary for a game which provides the state of being crazy that the components of flow are high, that game has to provide the situation that creates the feelings not only 'Enjoyment' but also 'Volition' and 'Impatience' on the user's mind.

V.   CONCLUSION AND FUTURE WORK

In this study, to investigate the influence of game types and opponent's ability on the player's state of mind and performance, we developed a simple numerical calculation game system. Through use of this system, we performed some experiments under controlled situations. All subjects solved the calculations at a similar rate, except when factoring for the players' recognition of the cooperator or opponents' skill level. However, the subjects' performance and emotions are different depending on the situation, which suggests that the video game system has an effect on the player's emotional state.

We have a plan to evaluate the influence on the player's skill in the game with team on the player's performance and state of mind.

On the other hand, the experiments in this study were performed under a controlled video game situation. However, we think that the results of the experiment may be applied on the many and varied systems which support human performance, emotion and motivation. We have another plan to construct the G.U.I. for operation system on the tablet pc and mobile phone, which will adapt the user's skill and usage based on these experimental results.

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