

Project B*B: A physiological approach to assess and promote fan service in a professional baseball game of 'The Hokkaido Nippon-Ham Fighters'

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The enthusiasts who come to see audience-attracting sports events like professional baseball games held at stadiums are comprised of various types of people with different styles and different experiences of watching games. Therefore, we must provide appropriate services matched to each type of audience. To meet this requirement, it is necessary to understand the audience's psychological states when they watch the games by carefully observing them. In other words, it is necessary to measure and record how the audience psychologically responds to each event and service (at scoring scenes, during the dance exhibition, etc.) and understand how they differ by type. It is also important to understand how they differ when the same type of audience watches the game and when different types watch it.

Human psychological conditions strongly affect the autonomic nervous system. It has been pointed out that the autonomic nervous system activities are reflected in the fluctuating patterns of physiological signals such as heart rate variability [1]. The proposed method of using this phenomenon is to numerically analyze the fluctuating patterns of heart rate variability (physiological signals) and evaluate psychological states by using the index values. Other methods to measure human psychological states include the subjective evaluation method by which subjects fill out questionnaires and the interview method in which we interview subjects. Since it is difficult to apply these methods during games, subjects usually remember and answer their situations after the games are over. However, it has been pointed out that the results may reflect errors due to subjects forgetting, making mistakes in recalling, and exhibiting psychological biases. The three advantages in using heart rate variability (physiological signals) are: (1) it is possible to relatively unconsciously and automatically measure it without preventing the subject from watching the game once the equipment is attached, (2) it is possible to consecutively measure variability at short time intervals between samplings, and (3) objective numeric values can be attained. With these advantages, heart rate variability supersedes the conventional subjective evaluation method and interview method. In this research, therefore, we measure the fluctuations of the heart rate variability of the audience watching a professional baseball game at a stadium and automatically and objectively evaluate the psychological responses to fan services and events based on the data.

The primary purposes of this research are to clarify how the responses differ between the case when the same type of audience watches the game and when mixed audiences watch it and to clarify how it can differ depending on the styles and experience of the audience watching the game. Our secondary purpose is to build a multi-agent simulation model for predicting such psychological responses by computer to make it a tool for preparing an optimal audience seat arrangement by which we could expect to promote the maximum amount of excitement. So far, we have measured and recorded the fluctuations of heart rate variability, video images by viewpoint camera, face expressions, and behavior of ten of the audience (five females and five males, between the ages of 21 and 53 years) watching games of a Japanese professional baseball team, the Hokkaido Nippon-Ham Fighters, at Sapporo Dome. The audience participated in the experiments in one to three games during the months from July to September 2008. We measured the data of 27 people in total. (See the companion papers for the background of the study [2] and developmental processes of fan loyalty [3].) Numeric value analysis of the measured heart rate variability enabled us to clarify the following three points. (1) We fit the trend change of heart rate for about three hours from the beginning of the game till the end with a linear regression line and found its slope was negative for 22 out of the 27 participants (=81.4%). This suggests increasing weariness and sleepiness as the game progressed. (2)

A study of the average heart rate when the supported team scored indicated that the heart rates increased due to excitement on 54 out of 61 occasions (=88.5%). The average heart rate responses to scoring decreased among all the participants in August and September (August, 4.91 [bpm]; September, 5.87 [bpm]) compared to that in July (13.10 [bpm]). The Fighters were in contention for the league championship in July but fell behind the competition in August and September. Moreover, the game schedule overlapped baseball games at the Olympic Games in Beijing in August. It can be considered that these factors affected the decrease in the excitement responses of the audience. (3) The average increase heart rates when the supported team scored was likely to become lower as the total number of games watched increased, which indicated that responses to scoring became duller as the fan career matured. We are now continuing to analyze the data in more detail (spectral analysis, chaos and fractal analysis, etc.). We will also clarify the differences between audiences of the same type sitting side-by-side to watch the game and when different types sit side-by-side. Based on the results, we are developing a multi-agent simulation model to describe the

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interaction between the heart rate variability response model of each type of audience and that of the other subjects. With such a model, it would be possible to simulate (or predict) how much the level of excitement will increase under specific conditions when a specific event is watched by type-1 and type-2 audiences sitting side-by-side. We could then create a system by which we could prepare a seat arrangement that combines types of audience so as to maximize excitement. All in all, we could expect to ascertain fan service activities in a scientific and technological manner by measuring and analyzing physiological signals in the field of audience-attracting sports entertainment.

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