A Study on Influence of Technical Elements of Moving Image on Visual Cognitive Response(1)
- Focused on Frame Rate and Motion Blur -

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Abstract

Unlike a still picture, moving image is perceived by relying on the complex and diverse visual system of a human brain. As a medium, film has been developed in a way that is most suitable for human visual system within its physical limits. Entering into a digital era following the age of film, many physical limits of film are being overcome. Frame rate of moving images is one of those examples, and, until now, 24 frames, which is close to the lowest limit, have been used based on persistence of vision and flicker fusion threshold theory. The digital moving image technology that has been rapidly developed recently enabled recording up to 60 frames with normal recording equipment. However, contents producers still insist on 24 frames to make sophisticated or movie-like moving image based on the rule of the 24-frame, even though they can use 60 frame moving image. Based on the research background, this study attempted to demonstrate the influence of frame rate and motion blur, which must be considered with it, on the visual cognitive response of humans through empirical experiment.

Before the experiment, theoretical review of moving image and human visual system was performed to identify characteristics of technological elements of moving image. And, through theoretical review and identification of research factors, three hypotheses that form the core of this study were proposed. Hypothesis 1: high speed frame rate will have a positive effect on functional vision. Hypothesis 2: high speed frame rate will have a negative effect on emotional vision. Hypothesis 3: absence of motion blur will have a negative effect on comfort and a positive effect on clarity. To verify the proposed hypotheses, independent and dependent variables were established as well as the operational range and method.

In experiment 1, where the ‘Hobbit’ was used as experiment material and frame rate as an independent variable, the frame rate had a positive effect on functional vision, validating hypothesis 1, and also on emotional vision, which means hypothesis 2 was not validated. In contrast to hypothesis 2, high speed frame rate showed higher evaluation than 24 frames even for emotional vision. In experiment 2 where a horse race scene in a racetrack was used as experiment material and frame rate as an independent variable, frame rate had a positive effect on functional vision and, especially, on clarity, which validated hypothesis 1. Also, frame rate had a positive effect on emotional vision as well, and high speed frame rate receive a relatively higher evaluation than 24 frames in terms of sophistication. Therefore, hypothesis 2 was not validated. In experiment 3 where the moving image of a racetrack waiting ground was used as experiment material and motion blur as an independent variable, weaker motion blur led to higher evaluation, which means that they hypothesis that lower motion blur will create more visual discomfort was not validated, while the hypothesis that lower motion blur will create more clarity was validated. To discuss the overall results, high speed frame rate of 60 frames has a very positive effect on functional vision, and, contrary to expectation, does not have a significantly negative effect on emotional vision. Therefore, it may be an anachronistic prejudice that the traditional 24 frame is more sophisticated than high speed frame rate.