



**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS**

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Programme of Study : Ph.D.

Thesis Title: A CORRELATION STUDY BETWEEN THE SUBJECTIVE AND OBJECTIVE (EYE TRACKING) MEASURES DURING THE EVALUATION OF VISUAL CLASSICAL AESTHETICS

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Thesis Submitted to the Department/ Center : Department of Design

Date of completion of Thesis Viva-Voce Exam : 28.10.2022

Key words for description of Thesis Work : visual perception; eye-tracking; consumer behavior; cognitive ergonomics; 2D shapes; complexity; composition; market research,

SHORT ABSTRACT

The term aesthetics is used broadly to encompass the perception, production, and response to art and interactions with objects and senses that evoke an intense feeling, often of pleasure. Evaluation of aesthetics for any visual (two-dimensional and three-dimensional) is critical in today's scenario. Any product's success in the market depends on its aesthetic appeal, as functionality/ usability and utility aspects are almost saturated. Visual aesthetics plays a crucial role in attracting consumers and leading to positive emotional changes, resulting in purchase intention. It is well known that 'seeing is believing, and believing is buying.' Thus, the visual perception of any product/image plays a decisive role in consumer behavior. It is important to incorporate aesthetic features in the consumer product during its design and development. Improper assessment of the aesthetic values of a product may lead to market failure.

Traditionally, aesthetics evaluation methods are primarily subjective and generally use questionnaire survey-based user responses. The application of eye-tracking technology for comparing visual behavior and people's visual attention provides a scientific measure to evaluate visual aesthetics. The correlation matrix between people's perceived aesthetics and eye-tracking variables is not well established till now. Hence, the aim of the research is to establish a correlation between the subjective and objective (eye-tracking) measures during the evaluation of visual-classical aesthetics. A hypothesis has been postulated as 'subjective measures of the perceived level of aesthetics for a visual is significantly correlated with the objective measures (eye tracking variable – fixation duration, fixation count, etc.).' To achieve the aim of the current research, following objectives were set: (a) To determine the list of variables that could be used by researchers as measures of aesthetic evaluation across diverse fields (e.g., painting, sculpture, product design, film, animation, etc.). (b) To assess aesthetics through subjective measures. (c) To assess aesthetics through objective measures (eye-tracking). (d) To study the level of correlation between the subjective and objective measures of aesthetics.

The research outcomes include (a) Generation of random 2D stimuli by varying the descriptive characteristics of the shapes. (b) An experimental protocol for the eye tracking study for abstract 2D shapes. (c) Establishment of design philosophy for the quantitative evaluation through the eye tracker with a unique methodology.

The current research findings indicate that aesthetic perception is highly variable and challenging to narrow down to a simple function of complexity and composition alone. One exciting outcome was that perceived complexity was found to be significantly correlated with the number of points, curve angle ratio, and perceived aesthetics. Similarly, the perceived composition was significantly correlated with the number of points, curve angle ratio, figure background ratio, symmetry, and perceived aesthetics. It indicated if descriptive characteristics (number of points, curve angle ratio, figure background ratio, type of symmetry) of 2D shapes are altered, it would directly impact the perception of complexity and composition, thereby influencing aesthetic perception. Outcomes of interviews with participants suggested that most factors influencing aesthetic perception are directly or indirectly part of perceived complexity or composition.

Following the experiment using stimuli of three different perceived aesthetic levels, it was noticed that perceived complexity was significantly correlated (positive) with a few eye-tracking variables, namely fixation duration, fixation count, and percentage of fixation. It means an increase in complexity level contributes to a high value of aforesaid eye-tracking variables. In the case of composition, eye-tracking variables (e.g. fixation duration, fixation count, and percentage of fixation) were found to be significantly correlated (negative). It can be stated that better composition of the stimuli leads to a reduction of values of earlier mentioned eye tracking variables. Independent sample Kruskal-Wallis test expressed that fixation count, fixation duration, and fixation percent varied significantly across three different levels of complexity of the stimuli. Similar observations were also noticed for three different stimuli composition levels. Out of various eye-tracking variables in current research, only fixation duration, fixation count, and percentage of fixation have been directly impacted by the change in the perceived level of complexity and composition.

To examine the influence of perceived complexity and composition (independent variables) on eye-tracking variables (dependent variables), an Ordinal Logistic regression (OLR) analysis was conducted. The OLR result revealed that perceived complexity and composition could be predicted using fixation count but not other eye-tracking variables. Thus, it can be concluded that it is very difficult to judge the perceived complexity and composition based on eye-tracking variables, as the prediction capability of the eye-tracking variable (except fixation count) is very low in determining perceived complexity and composition.

The study with natural stimuli where both levels of complexity and composition vary simultaneously showed that fixation duration and percentage of fixation varied significantly across stimuli of different levels of perceived aesthetics. It was noticed that the stimuli with lower and high perceived aesthetics have a higher fixation duration and percentage of fixation. Thus it can be concluded that the level of perceived aesthetics could be identified from the eye tracking by measuring the variables like fixation duration and percentage of fixation.

The present study with 2D monochromatic shapes is a stepping stone for the objective evaluation of aesthetics based on eye-tracking variables. To a great extent, it successfully established an experimental protocol for evaluating aesthetics involving subjective and objective measures and their correlation. Moreover, the current study disclosed the correlation between descriptive characteristics of a visual (Number of points, curve angle ratio, figure background ratio, and symmetry) with perceived

complexity or composition and association with perceived aesthetics. Further research as the extension of current research by involving different influencing factors (color, form, texture, etc.) will provide detailed information regarding objective measures of aesthetics.

The resulting plots didn't follow the inverted bell curve theory, but they did offer a convenient method to evaluate the relationship between the aesthetic and eye-tracking variables. These findings constituted empirical evidence for the relationship between aesthetic perception and eye-tracking variables. Therefore, the current research contributed to knowledge in the field of classical visual aesthetics. The results of experiments conveyed that to achieve higher aesthetic perception; there should be a balance between complexity and composition.

