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Mini-Review

Mini Review on Eye Tracking Method in Tourism Research

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ABSTRACT

The application of the eye-tracking method in tourism research has been going through an obvious increase recently. Eye movements as a physiological behavior can reflects how tourists viewing the scenery, and further relates to their tourism affects behavior, tourism demand and decision-making. Eye tracking provides a new method to think and explain human's mind and behavior in tourism-related activities. Due to the improvement of algorithms and technology in capturing the direction the invisible near-infrared light reflected off the cornea, the price of the eye tracker becomes lower.

Keywords: Eye-tracking; Tourism; Tourism demand; Physiological behavior

INTRODUCTION

Many universities and related laboratories were set up and equipped with eye-trackers. Another reason is that tourism research still calls for a more objective or quantitative research methodology. Eye tracking method can provide unbiased, objective and quantifiable data hence has been getting more attention. Cross-disciplinary research among tourism behavior, cognitive behavior and neuro/physiological behavior has been emerging. The eye tracking method has long been used in the research of reading behavior, visual attention during driving and advertisement effects. But is this method applied appropriately in facilitating the research procedure and approaching the research goals? Several questions require to be answered.

What the eye tracking method measures? Eye tracking is a technology of measuring eye movements to determine where a person is looking, what they are looking at, and for how long their gaze is in a particular spot. Two types of fundamental eye movement data, fixation and saccade and a whole package of the eye tracking metrics can be obtained. Visual behavior can be measured quantitatively and objectively through eye-tracking experiments, which entails, for example, tracking the location and duration of a subjects' gaze and the order in which elements were viewed; all of this can be obtained easily, clearly revealing visual perceptual processes [1,2]. Heat maps can be created by positioning fixation points and overlaying viewing time on images to highlight the observed areas. And a scan path map can be created by orderly connecting lines between the fixation points to shows the attention process. An Area of Interest (AOI) is part of the visual stimuli defined by researchers to measure the attention on some special elements. According to cognitive psychology, outside object as a stimulus can be perceived or cognized through two spontaneous and simultaneous processes, a top-down mode and a bottom-up mode. Bottom-up is an "outside-in" information process that is, a variety of information from an external environment stimulates nervous system and then reflected on mind. Top-down means an inside-out target-tracking task driven by conceptions or posteriori knowledge obtained from previous experiences. The external information is selectively captured through sensory systems [3-5]. Therefore, eye movements obtained during visual perception process is considered a result of the interaction between human mind and the outside information. By measuring the eye movements, we can clearly see where, how long and frequent the object was viewed, but we can't understand why it was viewed in that pattern. There are various explanations yet they mainly focus on two sides, the object's attributes and the social demographics. The attributes are color, light, shape, material, layout, etc. which are expressed in the physical appearance of the outside object. The social demographics are identifiable groups classified by gender, age, expertise, ethnicity etc. and the certain experiences, values, or attitudes are shared within a group [6-8].

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LITERATURE REVIEW

How we use the eye tracking method in tourism research? Eye tracking functions by combining with other methods research questions need to be well defined so that the appropriate method could be chosen. How to measure the visual perception, cognition and attitude in the "mind brain environment" information process requires a skillful research design. Up to now, the eye tracking method is still used as an assisted method in tourism research. For example, two approaches are developed in landscape evaluation: Expert/design approaches and public perception-based approaches [9]. The first focuses on the knowledge of landscape attributes and evaluated by several experts; the later conducting evaluation from public perspective and was considered as a more reliable measure [9-11]. Although public participation method has been widely used in urban and tourism planning, human's perception is still difficult to be quantitatively measured, and often calls for the use of more holistic and innovative approaches and methods [12,13]. Most recently, some landscape perception research was conducted by combining the traditional questionnaire survey with the newly used eye tracking method to get more real information. Eye tracking is still a new tool in tourism research, and it might be more rational to use the technique as an assisted method function with other methods. Two important points in experimental design stimulus images have been proven consistent with the results obtained on the site. However, because of the limited number of images and photographic techniques, they cannot completely replace the actual entities. Additionally, environmental information may be omitted from the images. Panoramic photos, virtual reality have been used with the hope of obtaining more accurate valuation results. In some conditions, the experiment need to be conducted in the real world with a pair of eye tracking glasses because acoustic or aural variables are also important for tourism experience in some special scenic spots. Subject groups with different educational backgrounds or age levels should be included so as to ensure a rich and diversified sample, thereby guaranteeing the validity of the study. Number of participants is a key factor in ensuring the validity and efficacy of a study. Though 30 has been reported as a valid sample size in previous eye movement studies [14-16], social surveys, such as attitude and satisfaction survey, may generally need a larger sample size, perhaps between 300 and 500 participants [17]. It is equally essential to a build a method to connect psychological experiments and social surveys so that they work together to discover underlying implications.

Related tourism research using the eye tracking method tourism advertising effectiveness, scenery evaluation and tourism map cognition are three main topics in eye tracking tourism research. Tourism is a process of access to information. Tourism advertising exerts an impact on the tourist' decision-making. Subjects' response to an advertisement can be affected by the site structural and visual complexity [18,19]. By comparing the eye movement's characteristics of different advertising designs to find the more effective layout. Effectiveness of online tourism advertisement and the website of an online travel agency [20,21]. The advertising effectiveness of tourism destination images used in tourism promotion was also tested [15]. Scenery viewing behavior is an excellent research point to reveal the tourist's interest and their experience creating during their travels. Much research has been conducted involving the visual aspects of tourism landscapes; most fall under a psychophysical paradigm that regards landscape aesthetic appreciation and evaluation as a stimulus-response relationship [22-24]. An index system consisting of common indicators such as harmony, diversity, and mystery have been studied, established, and applied to test the tourist's perception, evaluation, and attitude towards a place, landscape or tourism destination [25-27]. By introducing the eye tracking methods, more objective data can be obtained rather just from self-report questionnaire. The research validity is improved. Famous tourism destinations were studied, such as the Great Barrier Reef in Australia [28], the Qianjiangyuan National Park in [29], and famous mountains in East China [30]. Social demographic effects on tourism image evaluation like cultural background were also [16]. Here, the eye tracking experiment is usually conducted along with an attitude scale questionnaire. Tourism map is a kind of information media which expresses tourism object to tourists by the map rules. Eye tracking method used in the tourism map mainly to explore whether tourism behavior is affected by the material content, text size, color and other attributes in a tourism map. As a special element in tourism map, the visual cognition on space symbol has been studied [31]. The visual behavior difference between the tourism map and normal map [32]. More related research is needed in the near future.

DISCUSSION

Critical thinking about the eye tracking method The cognition of the outside object results not only from its intrinsic physical appearance (i.e., according to the psychological paradigm of stimulus-response theory) but also from a posteriori knowledge of socio-demographic factors (i.e., theories of human-landscape interaction operating under an experiential paradigm). It is an outcome of the integration of both processes. Human visual perception and psychological cognition are processes of mutual influence and interaction; the relationship between people's visual attention to tourism destination and their real interest needs to be discussed further. For example, in human vision, acuity and color sensitivity are best at the point of fixation, and the visual-cognitive system exploits this fact by actively controlling gaze to direct fixation toward important and informative visual cues in real time as needed. The layout, colors, lighting, and other elements of tourism photos need to be carefully controlled in some tourism research. We know clearly what the eye tracking method can measure.

CONCLUSION

However, what can really be revealed by these measured eye movements characteristics remains obscure. Some studies were conducted without a clear mechanism construction. The connection between visual behavior and tourist' attitude should be declared before starting a study. Theories from environmental psychology, neuro/physiological psychology may need a wider reference. More inter-disciplinary theory research is required. Meanwhile, more empirical studies should be

conducted so as to obtain the sufficient knowledge accumulation to have a theory innovation in the future.

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