

LOOP CONTROL OF EMOTIONAL BALANCE IN A MUSEUM REALITY-VIRTUALITY CONTINUUM

PROBLEM DEFINITION AND PROPOSED APPROACH

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Abstract

The authors collaborate in exchange of knowledge and problem definition in the field of museum studies in control loop of a reality-virtuality continuum. Their research activities focus on accessibility to cultural heritage museum collections in Russia and communication studies related to nonverbal signs of stress or negative reactions of visitors, aiming to improve emotions in virtual space. Consequently, adaptive interfaces to overcome such stress are developed, deriving from research, design and validation of new methods and tools for personalized storytelling and adaptive guides, combining the Museum physical and digital world.

INTRODUCTION

The popular term “virtuality” is very attractive, especially in the field of digital heritage. Advertising the accessibility and the participatory culture in digital worlds, one forgets the pure value of cultural heritage and the main role played by new technologies applied for its dissemination. In the beginning of 21st century, web-sites on cultural heritage were uncommon. Today their percentage still is very low compared to the business sector of the global net. [1: 126] This fact shows weak relevance of the products in the field of digital heritage. The studies of this relevance and feedback from consumers of such products became effective tools for collaborations between museums. [2] While there is a set of

international standards and recommendations for websites and multimedia programs in the field of cultural heritage [3,4,5,6,7], none include methods of feedback evaluation and psychological aspects of museum communication [8,9]. The next step in exploring virtual worlds should consider human aspects in adaptive and personalized environments [10].

Traditional museum studies take into account visitors' preferences according to gender, age or personal thematic preferences, so, they fix only grounding. Adaptive software takes this data and personalizes interface and content from the cognitive component point of view [11-17]. The cases of implementation in museums are still a few. The set and quantity of information are recommended by level and preferences of a curator without psychological specifics of an individual. We could title this type of human-orientated adaptability – differential, not personalized. The positive experience during museum visit is related to the positive emotions experience. Strictly speaking, this is not the joy of cognition, but specific experience of museum communication, having a clear and valuable component. The research reported here focuses on this subject, by defining the problem in the field of museum studies in a control loop of a reality-virtuality continuum.

AIM OF INVESTIGATION

Our research goal is situated within the topic of museum communication studies aiming at defining a new social paradigm where the individual and the community are in the center of the cultural heritage narrative, situated in physical and virtual museums. Consequently, we are looking at designing an adaptive interface for virtual and mixed museums as a system of improved interaction and social accommodation.

There are various ways to enhance museum space and museums' visitor experience [8]. The various types of computer abilities allow developers a wide choice in the digital world [17]. The conservative museum society has little chance to follow all technological changes, resulting that they relate to virtuality as a new type of a book with images. A best example is a long-term discussion on the definition of "virtual museums" [18 - 20]. Any application of a common terminology describing the parts of a computerized virtual system [17] for museums or similar cultural institution needs is helpful and gives many advantages [21, 22]. One of them comprises the new communication media for museums, such as dedicated websites. It starts before the visit when potential visitors browse the website of a museum and get preliminary information on collections and exhibitions. Once visitors enter the physical museum they may get in contact with museum staff, explore exhibits, be led by museum guides or have implicit or direct contact with curators. Over the years several approaches and methodologies have been developed to collect feedback from visitors [23]. Recent research revealed that visitors who prepare their museum experience (through virtual interaction with the museum collection through the internet) have a richer visiting

experience than the casual visitors; there is a difference in age groups and gender between real and virtual visitors [24]. Consequently, adult visitors often come to museums not only for an edutainment experience but to experience positive emotions (good feelings) from dedicated cultural events.

Human-orientated platforms for education and training are innovative methods accessible to everyone. Online access allows distributed users to jointly operate in a common virtual space [25]. The same approach can be used in museums. In the same time, projects aiming to control behavior of visitors in a museum space should consider its cognitive component. Electronic devices may be applied to evaluate visitors' satisfaction from the information gained during their visit. [26] There are several reasons why many computer applications for communication of Cultural Heritage in museums, or those aimed at improving the museum experience, are not adaptive. A counter example is the experience to combine virtual models of museum objects with text information / Braille script and quick audio guides for augmented reality at archaeological exhibitions [27]. Apart from facilitating communication for disabled visitors, casual adaptation implies only age and native language. Now it is turn to make a human-centered system with virtual environments.

Communication plays a leading role in the formation of a positive visiting experience of museum exhibitions, particularly for the mutual adaptation of visitor and museum artifact: any communication process provokes changing of information and mutual adaptation of subjects [28]. The archaeological exhibition is a message with encoded information, including facts, ideas and emotions, which are translated to visitors by means of verbal communication (text description) or nonverbal (images). This encoded information relates to the object itself, as an archaeological artifact once part of a (non-existing anymore) culture, but it is also a museum exhibit in the modern present and as such often embeds values of a "precious", "art" object. Moreover, the message transmitted by the object and its communicative apparatus is manipulated by the curator of the exhibition, the archaeologist who excavated it, or the communication expert who prepared the communication material. The visitors' channels of reception can be natural (sensor systems) or artificial; the number of recipients may differ from single persons to a group. Their reaction becomes an indicator of effectiveness and adequacy of the communication apparatus to transmit the message and to be positively received by the visitor. The result of communication can be expressed as a change of behavior of the recipient or an increase of his resistance to absorb the message.

Within the artificial intelligence domain, cognitive psychology defines "frames" as the (ideal model) structures of information and certain stereotypes helpful for adaptation of human behavior in a new environment or an unknown situation. [29] Action and interaction during communication are on verbal and non-verbal levels. Ver-

bal communication uses human speech, while non-verbal communication uses para-linguistics, proxemics, body language, gesture, kinesthetic or olfactronics. [30] Thus communication is a synthesis of sensor and social processes that can be applied in the museum communication, resulting in a visitor model of personal exploration of a museum space characterized by an evaluative judgment.

Emotional state of museum visitor during museum communication is not abstraction. While the evaluative judgment is a social attitude, it is formed on three levels:

- expectation and satisfaction;
- attitude (affective and cognitive);
- behavior.

This way the emotional state is an attitude – ability to change behavior. The verbal instance of attitude is described by scaling psycho-physiological parameters that express emotional (affective) components (Thurstone-type Scale, Likert Scale etc.); one-dimensional scales and factor analysis measure the cognitive component. Unfortunately, the revealed contradiction between fixed verbal reactions and real behavior of humans during the attitude measurements makes unreliable any prediction of behavior. Adaptive software and personalized interface attempt to change attitude and frame. The idea of research consists in analyzing the change in attitude, relying on existing psychological theories (Congruence theory, Cognitive Dissonance theory, Balance theory), individual specifics of recipients and the study of structure of their attitude. The authors suggest to study the emotional basis of cognitive dissonance of visitors interacting with virtual environments designed at enhancing their museum experience and located in the physical museum space. Such a study must consider the special character of the stimulating materials (museum collections) and the possibility to field-modeling cognitive and emotional components of visitors.

DISCUSSION

Traditional information services in museums still rely on notes on paper or screen, sometimes with some photos or video recordings. All these sources are passive. Individual visitors are able to manage language or to make a choice between digital data. Active interaction in virtual world requires additional efforts mainly from curators. Modern museum world applies various types of virtuality, as defined by Milgram: reality, virtuality, and augmented reality and augmented virtuality between them [31]. Taking advantage from the attractive side of new technologies, designers and museum curators do not take in account the most part of possibilities and advantages. New approaches require fast and stable Internet connectivity, additional installations or even establishing networks, all difficult to install in old buildings or historic monuments, such are most major museums. Projects become too expensive to be implemented and sustained without proven evidence of their relevance and added value. The design of an adaptive virtual / mixed museum requires analysis of the factors of complexity of object/

events of Cultural Heritage. Adaptive interface for visitors of virtual or mixed museum can be human-centered, system-centered or cross-adaptive. Semi-custom survey results, qualitative questions and demographic reports of museum audience allow developers to get initiation factors and their source, to find ways of adaptation (instance, navigation) and criterion for design, realization and implementation of effective communication applications.

Different types of museums (traditional, virtual and mixed) have similar problems of interaction with visitors, caused by complex materials such as cultural heritage collections misunderstanding. One needs an introduction to a world of an unknown culture as it is for anyone visiting a foreign country. The archaeological exhibition on Pazyryk culture at the State Hermitage Museum, a famous and impressive example of multicultural relations in ancient world, is proposed for experimental work on emotional experience and a cognitive dissonance in museum space.

The attention of museum experts, sociologists and psychologists is focused on demands of modern museum visitors. We need to consider artifacts because our case study includes modeling of emotional state of a priori non-motivated visitors of the archaeological exhibition, and emotion is always subjective to the relation to an object. This is the reason why we propose to address the experience of museum communication at the archaeological exhibition as an attitude including three elements: affective, cognitive and conative. Selected archaeological finds will play a role of visual stimuli of emotions for a psychological study.

Typical fruitful communication is followed by the elaboration, some psychological positive or negative stimuli, e.g. encouraging noises or puckered brows. Evidently, the museum artifacts, even the world known ones, have no ability to support communication this way. Absence of psychological stimuli demonstrates interruption in contact. Because of this failure, the numerous attempts to make museums interactive appeared. That was the reaction to the demand of communication with visitors in case of absence of communication with other visitors or museum staff.

In order to make the interface of a computer system interactive and adaptive one needs a system backed by scientific evidence of parametric criteria for the estimation of human state [32, 33]. Our aim is to formalize emotional estimations in reality-virtuality continuum of museum in order to stabilize the reaction. The empirical scale of estimations of tones/levels of emotional experience will be elaborated and tested at the exhibition: visual evaluation of non-verbal messages, sensor data and self-estimation. Collected data will permit to design an optimized scenario of behavior in the reality-virtuality continuum and develop a technical decision for control loop. Consequently, we need methods for the evaluation of psycho-physiological parameters of visitors in museum space. In order to solve the problem we need to collect and analyze changes of these parameters and self-estimation of subjects at the test exhibition (Fig.1).

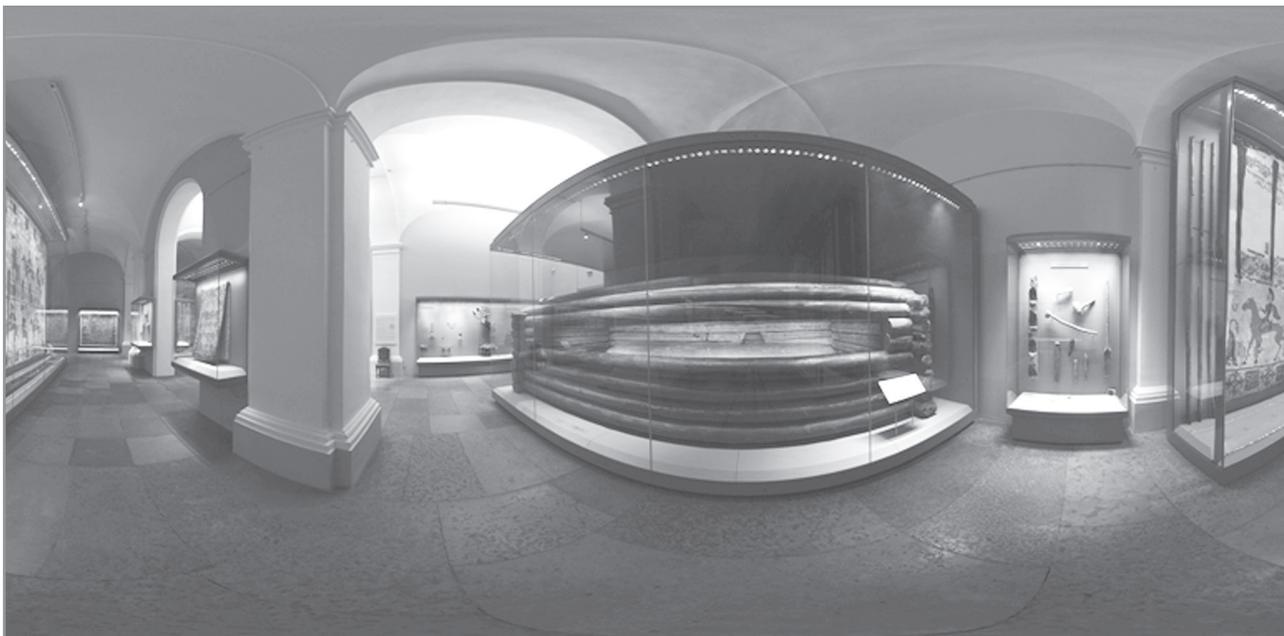


Fig. 1. View of the exhibition in room 26 at the Winter Palace. First look from entrance

CONCLUSIONS

An evaluative component of museum communication is based on a positive emotional experience. Visitor and museum exhibition interact during museum communication. Sometimes there is a direct influence of the space, the exhibits or the information field on the viewer, included in the community of museum visitors. Elementary act of communication in a museum is in seeing the point of the exposed objects. The implications can be perceived on the different level of conscious. The museum task is to manage information and to control with the help of the information.

Numerous theories on emotions and approaches to study them prove the complexity of phenomenon in psychology. The further research activities will focus on accessibility to cultural heritage museum collections in Russia, for communication studies on nonverbal signs of stress or negative reactions of visitors, aiming to improve emotions in virtual space and the consequent development of adaptive interfaces to overcome such stress and on research, design and validation of new methods and tools of personalized storytelling and adaptive guides, combining the physical with the digital world of the Museum based ICT.

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