Emotions, words and colors: a strategy to visualize and analyze patterns from visitors' narratives in museums

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Abstract— How can the emotions expressed by visitors after visiting a museum be analyzed through audio recordings and transcripts of interviews? Can an analysis based on colors help the qualitative researcher to identify patterns in the data? What can visual analysis of emotions tell the researcher? This paper presents a concept and some initial reflections on the data gathered from visitor experiences to identify patterns based on emotions, using a qualitative data analysis software - NVivo - or new types of 3D visual data analysis in immersive environments

Keywords-emotion; qualitative; immersive; colors; museum

I. INTRODUCTION

This paper presents the first step of a qualitative visual analysis of emotions expressed in visitors' narratives of their immersive experience in museums.

The narratives were collected during the 'From Spark to Pixel' exhibition at Martin Gropius Bau, Berlin, Germany, in 2007 and 2008 [1] and the 'Ancient Hampi' [2] exhibition in 2009 and 2010 at the Immigration Museum, Melbourne, Australia. The main object of 'Ancient Hampi' was PLACE-Hampi, an immersive environment designed by Sarah Kenderdine and Jeffrey Shaw [3].

The features of these environments have already been described in other papers [4, 5, 6] and the designers defined the project in this way: *"PLACE-Hampi is a vibrant theatre for embodied participation in the drama of Hindu mythology focused at Hampi's most significant archaeological, historical and sacred sites". The installation's aesthetic and representational features offer a new approach to the rendering of cultural experience and offers participants a dramatic representation of the many layered significations of this site* [7].

The role of emotions is essential in understanding visitors' experiences and, especially, in analyzing their engagement with immersive environments. Norman [8] defines "emotional" the design to creates fun and entertaining experiences. Users will engage with less usable objects if they have fun with them [9]. Anceschi [10] expressed the idea of an object that can 'dance' with the

user. Museums as playgrounds can offer visitors highly emotional experiences but there is a lack of qualitative analysis on these emotions in the field of museum studies and in the field of immersive experience design research.

I started to reflect on this aspect when I saw evidence and patterns emerging from the data and I was faced with what Malinowski called 'the pressure of evidence'[11]. For example, when a visitor told me that 'I was so shocked that I need to come back to visit the exhibition again' (in this case the visitor meant that she was so emotional that she needed to come back again when she was in a different mood; and, indeed, she came back 4 times).

In this paper I will present one case in depth (1), providing a visual qualitative analysis of one interview (2). This case could become a model for the re-analysis of all of my data, focusing on emotions and their relationship with engagement (3).

I will present the paper in the first person and give detailed descriptions, in the tradition of ethnographic research and in the practice of digital ethnography [12].

II. COLLECTING DATA AND SELECTING A CASE

I collected the data during my field work at the Immigration Museum, Melbourne, Australia, at 3 different moments of time (triangulation of times) during the period of the Ancient Hampi exhibition, focusing on the main object, PLACE-Hampi. My research question aimed to understand visitors' experiences in an immersive environment, from observations carried out inside the environment and interviews. I also tried to triangulate the observations and interviews by observing and interviewing the same visitors. I collected documentation from the museum such as comment cards, a marketing survey conducted by the museum and I had informal and formal interviews with the museum staff.

In this paper I will focus on the observation of two friends and the interview with one of them about their experience. My field notes show that the two friends spent one hour in the environment and were alone there, just them and myself, the researcher. One woman operated the platform and the other observed. They talked to each other

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during the exploration of the virtual landscapes and of each panorama. They explored the entire panorama and the "driver" moved very slowly inside each one, zooming in on some details. They also visited all the other rooms of the exhibition and used the other interactive tools such as the table and photos with bar codes in the Archeology room. When they were in the environment the woman driving the platform asked me 'Can I stay here all day?' I usually avoided talking with the visitors so as not to interfere with or influence their exploration but of course I always answered any direct questions from them. This question already suggested to me that this person was highly engaged in the experience. When they left the exhibition, one of them went off immediately while the other accepted to be interviewed. The interview took about one hour, in English and Italian, because this visitor was an Australian Italian and she spontaneously mentioned her home town in Italy; we therefore decided to continue the interview in Italian. In the interview she defined herself as the 'wife of an Indian man', 'mother of an Indian boy', 'a teacher', 'an Australian'.

III. ANALYZING DATA

I coded the notes and interview into 3 main stages: initial, focused and advanced coding.
I coded the behaviors twice and later coded by roles played in the experience. Based on this I can say that one visitor played the role of platform driver and the other that of observer. They were collaborative; in her words 'I taught her something and she taught me something' because both of them had been to India. They also expressed enjoyment, smiling during the exploration, spending a long time inside the environment and exploring all of the content.
I coded the interview by interpretative community, by interpretation, by learning outcome and by inclusion [13].
This visitor shared the same interpretation strategy as other visitors who have a strong emotional connection with India. She had been to India several times because 'I am the wife of an India man', and 'To show his culture to my son'. She defined her trip to India as an 'unforgettable experience', from being disoriented at the start, to becoming involved and then to utter enjoyment and she said 'it (the trip to India) is still a part of me'. She used her memories of the trip to interpret this exhibition: for example, she mentioned the work of the women at the archeological site, the memories of the patterns on the floor, linking what she saw in the exhibition to what she remembered from her trip.
She also used her imagination, adding elements to the exhibition, for example, when she said to her friend and later repeated in the interview, 'Imagine this temple at night, with pillows, candles, etc.', merging the photographs in the exhibition with her memories of India. This analysis was made in NVivo using tools such as the NVivo code and the tree node. In this case I also started to code by emotions, to fully understand this woman's experience when she said

'*I needed to come back because the first time I was so shocked*'.

IV. TEXT AND VISUAL ANALYSIS OF EMOTIONS

In order to find emotions in the text, first of all I did an initial coding in vivo, using the visitor's words.
Emotions are "abstract, value construct referring to 4 different phenomena: a change in the brain activity to select incentives, a conscious detected change in feelings that has sensory qualities, cognitive process that interpret the feelings with words, a display of a behavioral response" [14]. Mood is a long lasting emotional state and it can embrace many different feelings at the same time [15].
Later I reorganized the list of emotions in a tree node and recoded the same interviews by emotions.
During the interview the woman expressed the following emotions:

a) *Borodem* (before to coming to the exhbition)

b) *Disappointment* (about an exhibition where she couldn't touch the objects)

c) *Shock* (being highly emotional and surprised)

d) *Relaxation*

e) *Love*

f) *Empathy*

g) *Connetion*

h) *Enjoyment*

i) *Amazement*

j) *Immersion*

k) *Feeling the beauty*

l) *Desire to visit the exhbition again*

m) *Desire to share with other people*

n) *Desire to visit India*

o) *Admiration (for the designers, for the museum, etc.)*

p) *Ect.*

From the code density and using the Menu View in NVivo I began to see that in the first part of the narrative an emotion is expressed in almost every sentence.
At this point, inspired by Lancaster's presentation at Hong Kong [16], I decided to try to move from text to colors, to obtain visual evidence that this interview was 'highly emotional', especially in the first part, and then to visually answer the following question: 'was this experience a positive one' or, in other words, 'did the visitor express more positive emotions about the experience than negative ones'? Based on the results, I can say that the experience was positive for this woman, not only because she learned something or was able to interpret the Indian symbols but because she enjoyed herself in the environment, feeling very positive emotions.

A. Visual Analysis

In a visual way, it can be seen that this interview was very emotional in the first part. To show this I highlighted in red all the words or expressions that expressed an emotion. The essence of emotions is feeling, notably that of pleasure or pain [17]. From this visualization alone, using just one color, the text appears dense in emotions, as she expressed an emotion in almost every sentence (Fig.1).

In the second part of my visual analysis, I highlighted positive emotions in yellow and negative ones in black.

Positive emotions are emotions that help people to build a good life [18, 19] while negative emotions help people to survive and satisfy short-term material needs. Through the experience of positive emotions people transform and become more creative, knowledgeable, resilient, socially integrated, and healthy [20]. Positive emotions tend to be repeated: 'an initial experience of positive emotions produces an upward spiral towards further experience of positive emotions' [21].

Coming back to the narrative, we can see that the text is full of 'yellow', full of positive emotions (Fig.2). The visitor expressed just one negative emotion, disappointment about an exhibition where she couldn't touch the exhibits, but this again is positive for the PLACE-Hampi experience because, comparing the two experiences, she enjoyed the interactivity and possibility of choosing content at PLACE-Hampi by actually operating the main object of the exhibition, the PLACE-Hampi platform.

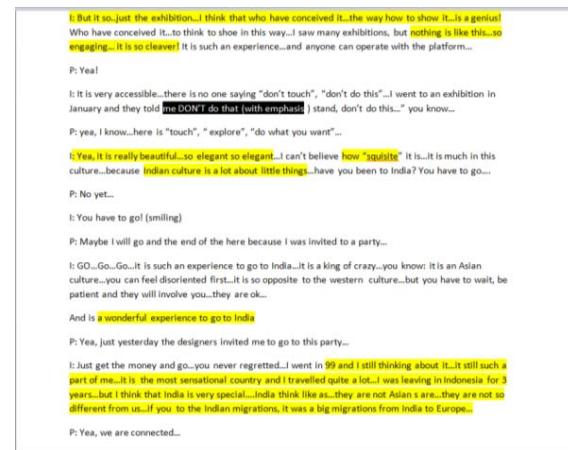

Figure 1.   Density of emotions

Figure 2.   Positive emotions

V.   BACK TO THEORY

I compared the list of emotions emerging from the data with the classification of emotions and moods proposed by the "Humaine Emotion Annotation and Representation Language" (48 emotions, classified in 10 groups) [22] and I recoded the emotions in my data. From this new classification it became clear that the visitor expressed only two negative emotions in her narrative (boredom and disappointment, her emotion before coming to the museum and her emotion about another exhibition, both in the 'negative and passive mood' category) while all the other emotions she expressed fall into the Positive and lively (i.e. pleasure) , Caring (i.e. empathy), Positive thoughts (i.e. satisfaction), Quiet positive (i.e. relaxed) and Reactive (i.e. interested) categories.

VI.   FUTURE DEVELOPMENTS

The possible future development is to code by emotions all of the 92 interviews I conducted. This kind of analysis can open up new ways of understanding visitor experiences in immersive environments, with a deeper comprehension of the relationship between emotions and engagement.

This case study helped me to understand why this woman came back to visit the exhibition 4 times and why she said to me 'Can I stay here the all day?' and 'I will come back again'. She was very excited the first time, the experience was so emotional - magical as she said - that she was not able to focus on all of the content. She needed to come back in a less emotional frame of mind. She also expressed the pleasure of being in the environment with several positive emotions: the music relaxed her and she felt that the entire experience was beautiful. She used the words love and beauty many times in her narrative. She was also keen to bring more people to the exhibition, to share this experience with friends and with her son; she also hoped that all schools in Victoria would arrange visits to the exhibition.

Visual analysis performed in World can be further processed in NVivo or another 3D immersive environment. This second possibility was inspired by the presentation of the 'Blue Dot' project given by Lancaster in Hong Kong [16].

CONCLUSIONS

The visual analysis of emotions from visitors' narratives is a possible development of my research on immersive experiences in museums. In this paper I presented one case from my field work in Australia, showing how a visual analysis based on one or two colors can already help the researcher to see patterns in data, for example about how emotional a narrative is and how positive an experience is. A possible development that could be explored is to analyze a full collection of data in an immersive environment where the researcher can code the text by colors and see patterns across all data, completely immersed in the data.

ACKNOWLEDGMENT

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