Virtual Journalist: Measuring and Inducing Cultural Empathy by Visualizing Empathic Perspectives in VR

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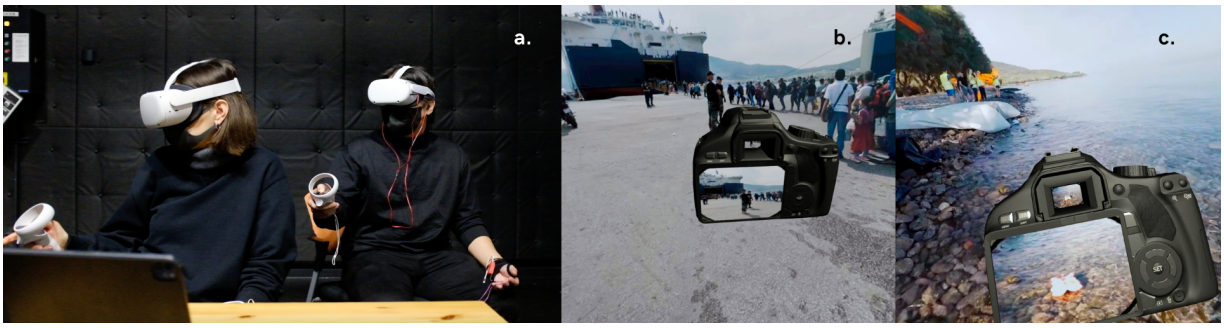

Figure 1: Users experiencing Virtual Journalist where they are equipped with a virtual camera while being in the shoes of a journalist exploring diverse cultural settings

Abstract

The concept of cultural empathy, which entails the ability to empathize with individuals from diverse cultural backgrounds, has garnered attention across multiple disciplines. However, there has been limited research focusing on the utilization of immersive experiences to deliver journalistic encounters that foster cultural empathy. In this regard, we propose the development of Virtual Journalist, a virtual reality (VR) system that immerses users in the role of a journalist, allowing them to consume 360° video documentaries and capture moments that evoke cultural empathy through photography. Furthermore, this system integrates both cognitive and affective dimensions of empathy by linking physiological data, namely electrodermal activity (EDA) and heart rate variability (HRV), to the captured photographs. Our findings suggest that the impact of Virtual Journalist varies based on the user's cultural background, and we have observed that empathic accuracy can be achieved by combining user-generated photographs with corresponding physiological data.

Index Terms: Human-centered computing—Visualization—Visualization techniques—Treemaps; Human-centered computing—Visualization—Visualization design and evaluation methods

1 Introduction

Cultural empathy is defined as the ability to feel and understand the situation of a person from another culture [22]. Originally, cultural empathy was studied in the context of counseling [20], focusing on how therapists can utilize knowledge about clients' cultures in therapeutic sessions. The utilization of this knowledge for cross-cultural communication is considered as cultural empathy [21]. In recent years, with the increasing globalization, cultural empathy has gained prominence in other research fields such as management and education [5, 27]. However, researchers have differing opinions on which components of empathy should be emphasized when evaluating cultural empathy [21]. This aligns with the research of Cuff et al. [2], which highlights the affective and cognitive aspects as the most discussed dimensions of empathy.

Cognitive empathy refers to the ability to recognize and identify another person's feelings, while affective empathy represents one's emotional response to another person's feelings [21, 26]. Early and recent research suggests that cognitive and affective empathy are interconnected [2, 8]. The relationship between these two concepts is characterized by their interactive nature. Cognitive processes can influence affective empathy since they are subject to manipulation [2, 3]. Therefore, this research aims to develop a new measurement construct that encompasses both components with respect to cultural empathy.

The concept of *Compassion Fatigue* serves as the initial inspiration for this research. Compassion Fatigue refers to the phenomenon of indifference and dehumanization as a reaction to individuals experiencing different situations from our own [6]. Consequently, there is a need to further develop systems that promote empathy, as they can enhance social awareness and social action in the face of new technological realities. Although there has been extensive research on enhancing empathy levels through immersive technology, there are limitations regarding the cultural implications of empathy in immersive environments.

In this paper, we present Virtual Journalist, a virtual reality (VR) system that aims to translate cultural empathy levels. The system allows users to role-play as journalists, providing them with a virtual camera to capture pictures while being exposed to various cultural scenarios in 360° settings. We contribute to this field in three ways:

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1) we propose Virtual Journalist as a VR tool for journalism in diverse cultural settings using a virtual camera, 2) we evaluate the system based on physiological responses and subjective feedback, and 3) we attempt to communicate cultural empathy levels among users.

2 Related Works

2.1 Evaluating Cultural Empathy

Due to the paucity of empirical evidence, the relationship between cultural traits of psychological and social behavior and empathy has not been extensively investigated. Comparisons between collectivist and individualistic societies in terms of their levels of trait empathy have led to inconsistent conclusions. Notably, research focusing on children and adolescents has examined disparities between Western and Asian countries [9, 29]. Trommsdorf et al. [9] discovered that children from South-East-Asian countries exhibit higher levels of personal distress and lower levels of pro-social behavior compared to their counterparts from Western countries. Similarly, Chung et al. [29] identified a prevalence of personal distress in East-Asian subjects, whereas empathic concern prevailed among Western subjects according to the Interpersonal Reactivity Index (IRI) developed by Davis [19, 29]. Expanding on these findings, Atkins [7] investigated cultural disparities in emotional and cognitive empathy by measuring empathic responses to physical and social pain. The study revealed that British individuals exhibit greater emotional empathy than Chinese individuals, while the latter demonstrates higher empathic accuracy. Furthermore, Chopik et al. [33] conducted a comprehensive examination of cultural differences in trait empathy across 63 countries, using a large sample. The results indicated that collectivist countries exhibit heightened empathic concern, while other cultural dimensions showed no significant association with any form of empathy trait. These findings contradict earlier studies that predominantly linked empathic concern with Western countries [7, 29].

2.2 Empathic Accuracy

There has been an ongoing debate among researchers regarding the relevance of emotional congruence in relation to empathy [2]. The degree of congruence is influenced by the personality, experiences, and perspectives of each individual. Therefore, it is crucial to consider the accuracy of emotion and thought recognition between individuals, commonly referred to as *Empathic Accuracy* [32].

Empathic Accuracy is a concept that describes the extent to which an individual can infer the emotional state of another individual [30]. It represents one of the most frequently examined indicators of cognitive empathy [7]. When measuring empathic accuracy, it is important to take into account the validity of self-reports [31]. By incorporating measurements of physiological responses, the biased implications of self-reports can be mitigated, thereby increasing the overall validity [14].

Moreover, research has demonstrated a positive correlation between Empathic Accuracy and Personality Predictors, such as the dimension of perspective taking included in the Interpersonal Reactivity Index [23].

2.3 VR as an Empathy Tool

Researchers have identified three essential factors in the design of empathy tools: the degree to which the tool enables agency, as well as its perspective and sensations [24]. Previous studies have employed tangible devices, such as camera glasses or embodied games using Kinect applications, to create perspective [1, 4, 13, 34]. For example, Kors et al. developed "A breathtaking journey," a multisensory game that allows users to experience a refugee's journey from a first-person perspective [17]. The embodiment of the game resulted in visceral feelings, attributed by the researchers to the immersive nature of the experience.

The embodiment and type of perspective play a crucial role in exploring cultural empathy. As demonstrated in "A breathtaking journey," a first-person perspective achieved through immersive technologies generally garners positive feedback from users regarding the level of immersion [17, 24]. However, assuming the role of the protagonist undermines the essence of empathy, which entails feeling *with* another person by reflecting on one's own experiences and emotions. This aspect is critical for investigating cultural empathy. Therefore, it would be beneficial to consider alternative forms of agency that allow for a better understanding and shared emotional experience with individuals from different cultural backgrounds. Such forms of agency align with cognitive empathy, which refers to one's capacity to perceive and recognize another person's feelings [19]. According to Pratte et al. [24], virtual reality (VR) is the most commonly used immersive technology for facilitating perspective. VR presents an opportunity for researchers to overcome previous challenges in measuring empathy, such as inconsistencies arising from observational methods or biased responses in self-reports [15]. Compared to other technological devices, VR enables a more direct channelling of perspective within a distant target context. In this research, the context is culture. Consequently, the content of the empathy tool needs to be adaptable to each user's cultural background and experiences.

3 Virtual Journalist System

Virtual Journalist integrates empathy-inducing design by incorporating agency and perspective while considering affective components and empathic accuracy. The Virtual Journalist system consists of various components for measuring empathy (see Figure 2).

In this system, users immerse themselves in a 360° video documentary by wearing a virtual reality headset and operating a virtual camera using a controller. At the beginning of the experience, users are given a task: to capture moments in the narrative where they feel the highest level of empathy towards the protagonists. These captured photographs serve as representations of the users' cognitive empathy levels.

Furthermore, the system records users' physiological data, specifically electrodermal activity (EDA) and heart rate variability (HRV), in order to capture their affective empathy. These physiological measurements provide additional insights into the users' empathetic engagement with the narrative [10].

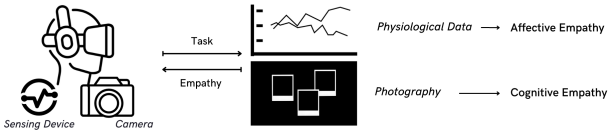

Figure 2: Virtual Journalist System

3.1 Hardware

The Virtual Journalist system adopts virtual reality (VR) enabling hardware to display and measure empathy towards different cultures. The cultural context of this experience is established by both the content and the users themselves. The Meta Quest 2[1] headset is utilized to play a 360° video documentary that focuses on a target culture distant from each user. By using the controller, users are able to operate a camera during the experience, enabling them to capture arbitrary pictures. This is illustrated in Figure 1. However, users are initially tasked with capturing moments that represent their empathy towards the displayed culture. There is no restriction on the number

[1] https://www.meta.com/jp/en/quest/products/quest-2/

of pictures that each user can take. These pictures are automatically saved to the user's device.

In addition, a physiological data sensing device, as utilized in previous research by Yan and Kinga [11, 25], captures heart rate variability (HRV) and electrodermal activity (EDA) during the VR experience. This physiological data provides valuable information about the user's emotional state. After completing the VR experience, researchers have access to both the photographs taken by the users and the captured physiological data. These resources allow for the evaluation of the cognitive and affective components of empathy, respectively. Furthermore, the photographs can be utilized to communicate empathy levels among users, facilitating the exchange of different perspectives.

3.2 Photography and Physiological Data

To date, researchers have engaged in debates regarding the significance of cognitive and affective processes in relation to empathy [2, 8]. However, it has been reported that these processes are intricately interconnected [2, 8]. As perspective represents a cognitive process, the utilization of photographs serves to visually represent the cognitive empathy of the user [19]. The task of capturing photographs enables the user to select and depict the most significant moments from their subjective perspective. Furthermore, it facilitates the immersion of the user in the displayed culture, fostering a sense of shared emotional experience. By assuming the role of a journalist, the user can achieve a heightened sense of presence without adopting a first-person perspective. Consequently, the collected photographs from users belonging to diverse cultures can be compared to unveil insights into various forms of perception. When combined with physiological data, researchers can generate a comprehensive empathetic profile of the user, thus contributing to the advancement of empathic accuracy measurement.

4 Initial Study

We conducted an initial study to address the limitations of previous research in inducing and communicating cultural empathy, with the aim of bridging cultural empathy gaps. This study encompasses three main objectives: 1) examining the extent to which cultural empathy differences can be determined in an immersive environment, 2) testing the effectiveness of the Virtual Journalist in inducing cultural empathy, and 3) investigating the potential of cross-cultural exchange of empathetic responses in overcoming cultural empathy gaps. While the first study addresses the first two objectives, the subsequent study will focus primarily on the third objective.

To ensure the participants' cultural backgrounds are significantly distinct from the target culture, we carefully selected three scenarios for this study. The chosen videos focus on the regions of the Middle East and Africa, with the overarching theme of "refugees." The selected videos include "The Displaced" from The New York Times[2], "Refugees" by Edu Hernandez[3], and "Sidra's Story" by the United Nations[4].

4.1 Participants

Eighteen participants, consisting of one researcher and seventeen graduate students, participated in this study. The age of the participants ranged from 22 to 38 years old, with a mean age of 27.61 and a standard deviation of 4.36. Regarding gender identity, 50% of the participants identified as male, 44.4% as female, and 5.4% preferred not to disclose their gender. The selection of participants was based on their cultural background and the classification by Hofstede and Minkov (2021) [12], with the aim of representing empathy levels among individuals from diverse cultural backgrounds. Each session consisted of a cross-cultural dyad, where one participant, labelled as Participant A, belonged to a culture distant from the other participant, labelled as Participant B.The sample comprised of nine East Asian subjects, six Caucasian subjects, one African American subject, and two bi-cultural subjects. The bi-cultural subjects identified themselves as both Caucasian and East Asian, but they were primarily raised and educated in Western cultures. Based on previous research on cultural dimensions, eleven participants were assigned to the collectivist culture group, while seven participants were assigned to the individualist culture group [12, 18].

4.2 Study Procedure

The study procedure consists of two parts: a comparative within-subject study and a follow-up workshop discussion. The first study aims to compare the baseline condition with the adoption of the Virtual Journalist. In the baseline round, participants were instructed to passively watch a video without any further interaction. In the Virtual Journalist round, participants watched the video while capturing photographs that represented their most empathetic moments.

In the follow-up study, participants took part in a perspective exchange workshop. From the collection of photographs taken during the first study, participants were asked to select three to five pictures to exchange with their cultural counterparts. During this exchange, participants were required to explain the motivations, thoughts, and feelings behind each selected photograph. A researcher facilitated the session to ensure a stable and productive discussion. Following the workshop, participants watched a third 360° video while utilizing the Virtual Journalist.

The study was conducted in a quiet room that was free from distractions or stimuli that could potentially affect the participants' experience. Prior to commencing the study, participants were familiarized with the procedure, the hardware, and were connected to a physiological data sensing device. The study began with the completion of a demographic questionnaire, which gathered information on each participant's age, gender, nationality, ethnicity, and intercultural experience. Subsequently, the Interpersonal Reactivity Index (IRI) by Davis [19] was administered to assess the participants' dispositional empathy levels. Experience questionnaires, based on the IRI, methods from Haegerich and Bottoms [28], as well as the Scale of Ethnocultural Empathy by Wang et al. [35], were filled out after each round of the study.

5 Results and Discussion

5.1 Experience Feedback

To some extent, the evaluation of results can also be based on qualitative data obtained from interviews, complemented by data derived from questionnaires. Due to the limited size of the sample, only statistically significant items from the 5-point Likert scale experience questionnaire will be included in this evaluation.

Participants from both cultural groups reported an improvement in their focus on the content when using the Virtual Journalist. A participant from the collectivist group stated, "Sometimes I have a hard time focusing, but Virtual Journalist helped me to slow down [...] and helped to get bookmarks from moments in content; it increased my memory." This finding aligns with the results of the questionnaire from the collectivist group regarding the cognitive empathy item "I can really see myself in the protagonist's shoes." As shown in Figure 3, collectivist participants demonstrated higher scores after the Virtual Journalist experience ($t(9) = 3.4$, $p = 0.026$).

Conversely, individualistic participants expressed reluctance towards taking photographs during the experience, which supports the observed decrease in cognitive empathy scores after using the Virtual Journalist, as depicted in Figure 4 ($t(6) = 3.2$, $p = 0.0039$). Moreover, collective subjects not only scored higher in cognitive empathy after the experience but also exhibited increased levels of

[2] https://www.nytimes.com/2015/11/08/magazine/the-displaced-introduction.html

[3] https://www.eduhernandez.com/project/refugees/

[4] https://encounteredu.com/multimedia/videos/sidras-story-360

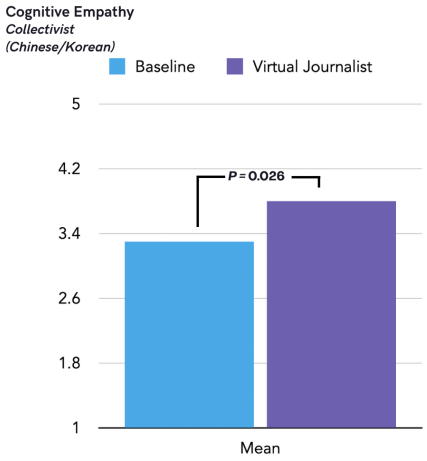

Figure 3: Collectivist Group Cognitive Empathy Development

affective empathy. This can be seen in Figure 5, where collective subjects demonstrated enhanced sensitivity in understanding the feelings of the protagonist (t(9) = 2.7, p = 0.011).

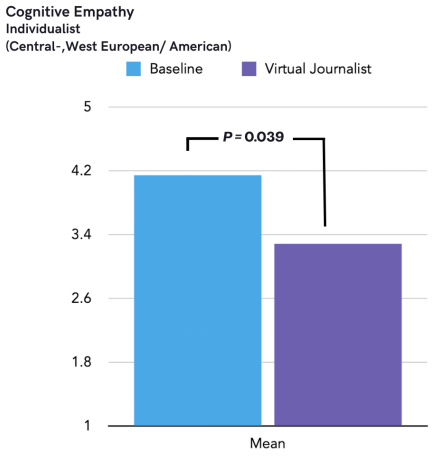

Figure 4: Individualistic Group Cognitive Empathy Development

5.2 Overcoming Cultural Empathy Gaps

Due to a limited data sample, the statistical significance of the questionnaires assessing dispositional empathy traits before and after the study could not be determined, except for two items. However, the findings from these two items are consistent with statements obtained during the post-interview. One participant mentioned that, particularly after the workshop, they intended to "capture photographs from a different perspective." The Perspective Taking sub-scale demonstrates a convergence in scores after the study. Collectivist subjects exhibit slightly higher scores on this perspective-taking item after the workshop, t(9) = 3.8, p = 0.046. Similarly, as shown in Figure 6 individualistic subjects increase their scores to a level closer to their collectivist counterparts, t(6) = 3.7, p = 0.037. Davis (1983) describes Perspective Taking as "the tendency to spontaneously adopt the psychological point of view of others" [16].

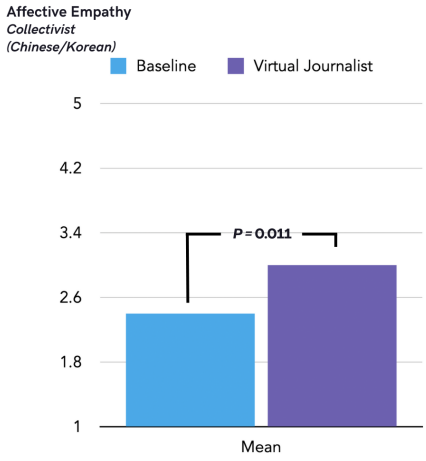

Figure 5: Collective Group Affective Empathy Development

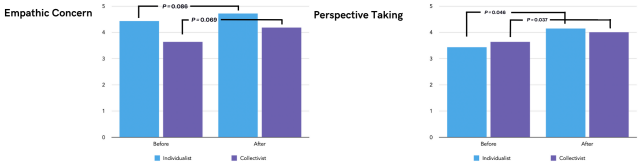

Figure 6: Empathy levels before and after the study.

A similar trend is observed in the empathic concern scale, as indicated by the item "Other people's misfortunes do disturb me a great deal." Based on this item, collectivist subjects show an increase in scores after the workshop, t(9) = 3.6, p = 0.069. Individualistic subjects demonstrate a similar pattern, as depicted in Figure 6, t(6) = 4.3, p = 0.086. For both items, the results show a tendency to align after the study, with scores becoming closer to each other.

5.3 Photographs for Perspectives

While individualistic subjects took 44 photographs or 5.5 photographs per person during the experience, collectivist subjects people took 57 photographs or 1.62 photographs more than their counterparts during the experience. This implies that collective participants had the general urge to capture more empathetic moments than individualistic participants. As seen in Figure 7, the photographs of collectivist subjects are more scattered throughout the experience, while the photographs of individualistic subjects are more concentrated at specific points in time. Comparing photography, collective subjects tend to portray details and surrounding aspects that contribute to the narrative more than their individualistic counterparts.

Furthermore, both cultural groups exhibit a tendency to capture photographs at identical moments. On average, these moments depict protagonists experiencing extreme levels of distress and helplessness. Figure 8 demonstrates that each cultural group has a distinct approach to framing these moments.

On the one hand, collectivist participants have a tendency to focus on capturing specific details rather than perceiving the overall context. On the other hand, collectivist subjects exhibit a preference

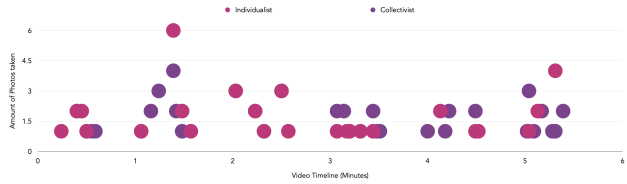

Figure 7: Photographs taken by both cultural groups during the experience.

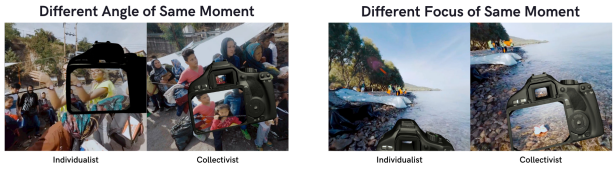

Figure 8: Photographs taken by both cultural groups with different angles or different focus.

for photographing protagonists in distress as opposed to other protagonists. In contrast, individualistic subjects tend to photograph authoritarian or administrative figures. The interviews conducted also unveiled that Chinese participants, in particular, demonstrated a propensity for capturing the positive moments of the protagonists during the experience. These moments were often associated with themes such as family and friends.

5.4 Mapping Photographs to Physiological Data

The physiological data recordings assist in complementing the self-reports to determine the affective responses of the participants towards the cultural content, as well as the validity of the photographs as a reflection of this empathic response, thereby establishing empathic accuracy. However, two out of eighteen participants were excluded from this analysis due to data noise. These two datasets correspond to two collectivist participants.

The presence of noise in the Electrodermal Activity (EDA) data, along with its limitations in interpreting empathy levels, prompted the decision to focus on Heart Rate Variability (HRV) for the analysis. The correlation between the physiological data and the photographs reveals positive aspects of empathic accuracy measurement. As illustrated in Figure 9, instances of emotional arousal align with the participants' photographs (represented by green dots).

In general, participants with volatile HRV tend to take more pictures than participants with stable HRV. In cases where the photographs do not correspond with the physiological data, the empathic accuracy of the participant may need to be reconsidered.

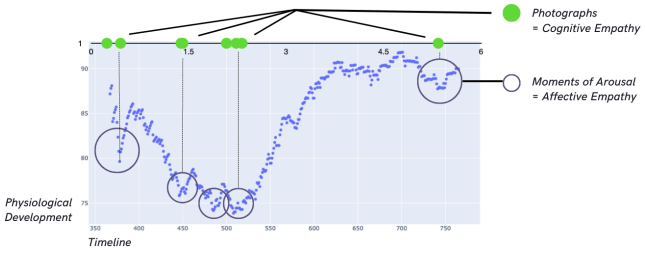

Figure 9: Mapping the photographs to the physiological data contributes to Empathic Accuracy.

6 Conclusions and Future Work

We present Virtual Journalist, an immersive virtual reality (VR) application designed to measure and foster cultural empathy. Initial findings indicate that the collectivist group exhibited an increase in both affective and cognitive empathy. In contrast, individualistic participants reported a rise in empathy only after engaging in a workshop and subsequently exchanging perspectives with the other cultural group, followed by a second use of the Virtual Journalist. User feedback generally supported the notion that the Virtual Journalist facilitated improved focus and memory retention of the encountered content. By capturing cognitive and affective aspects through physiological data and photographs, we aimed to assess empathic accuracy. The results from the two cultural groups following the workshop suggest promising prospects for bridging cultural empathy gaps. However, to ascertain a genuine shift in perspective within both cultural groups, a long-term study is necessary to examine the enduring effects.

Certain variables may require modification to ensure a seamless user experience and effective evaluation. The sensing device used to capture physiological data was susceptible to user-induced movements, resulting in data noise and analytical challenges. Therefore, we recommend refining the design of the physiological data-sensing device to enhance its resilience. Additionally, participants' varying levels of experience with VR may have influenced their overall engagement and subsequently impacted empathy levels. In order to achieve comprehensive insights into the efficacy of the Virtual Journalist and its potential to foster cultural empathy, further investigations are warranted. These should encompass extended observation periods and meticulous consideration of confounding factors, such as user familiarity with VR technology.

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