https://doi.org/10.48417/technolang.2023.03.03
Research article

Emotional Visualization: The Metaverse Social in Embodied Cognitive Contexts

Wenling Xu (✉) and Yun Wang
China Academy of Art, 16 Bld., 352 Xiangshan Road, Zhejiang, Hangzhou, 310000, China
20212719@caa.edu.cn

Abstract

In recent years, the concept of Metaverse has become popular. With the development and application of the metaverse, the Metaverse Social is gradually replacing the traditional Social and has become a way of socializing between people in the new era. The Metaverse Social is able to fuse technology and humanity, virtual and real, making it possible to communicate with people even further. This study analyzes the generation of the metaverse and the characteristics of the metaverse social, adds the perspective of embodied cognition, and discusses the design method of the four levels of the metaverse social in the context of embodied cognition. Emotions, as an integral part of social interaction, can facilitate emotional exchange and enhance the user's interactive experience in the Metaverse social platform. Using emotional visualization as an entry point, this study constructs a social design model of the "embodiment, symbolism, gamification, and resonance" metaverse of emotional visualization. The proposed design model is validated by four design highlights in the specific design case of the Emotion Meta social app: "real-time mapping – emotional visualisation – social entertainment – emotional resonance," demonstrating the immersive and emotional experience which the metaverse social can give users by blending the real with the virtual.

Keywords: Emotional visualization; Embodied cognition; Metaverse; Social; Design

Citation: Xu, W., & Wang, Y. (2023). Emotional Visualization: The Metaverse Social in Embodied Cognitive Contexts. *Technology and Language*, *4*(3), 24-39. https://doi.org/10.48417/technolang.2023.03.03

УДК 130.2:004:159.942
https://doi.org/10.48417/technolang.2023.03.03
Научная статья

Эмоциональная визуализация: социальная метавселенная в воплощенных когнитивных контекстах

Вэньлин Сюй (✉) и Юнь Ван
Китайская академия искусств, 16, улица Сяншань, 352, Чжэцзян, Ханчжоу, 310000, Китай
20212719@caa.edu.cn

Аннотация
В последние годы стала популярна концепция метавселенной Metaverse. С развитием и применением метавселенной социальная метавселенная постепенно вытесняет традиционное социальное и становится способом общения между людьми в новую эпоху. Социальная метавселенная способна объединить технологию и человечество, виртуальное и реальное, сделав общение людей еще более тесным. В данном исследовании анализируется возникновение метавселенной и характеристики социальной метавселенной, добавляется перспектива воплощенного познания и обсуждается метод проектирования четырех уровней социальной метавселенной в контексте воплощенного познания. Эмоции, являясь неотъемлемой частью социального взаимодействия, могут способствовать эмоциональному обмену и повышать интерактивный опыт пользователя в социальной платформе Metaverse. Используя эмоциональную визуализацию в качестве отправной точки, в этом исследовании создается модель социального дизайна “воплощение, символизм, геймификация и резонанс” метавселенной эмоциональной визуализации. Предложенная модель дизайна подтверждается четырьмя основными моментами дизайна на примере социального приложения Emotion Meta: “картирование в реальном времени – эмоциональная визуализация – социальное развлечение – эмоциональный резонанс”, демонстрируя иммерсивный и эмоциональный опыт, который социальная метавселенная может дать пользователям, смешивая реальное с виртуальным.

Ключевые слова: Эмоциональная визуализация; Воплощенное познание; Метавселенная; Социальное; Дизайн

Для цитирования: Xu, W., & Wang, Y. Emotional Visualization: The Metaverse Social in Embodied Cognitive Contexts // Technology and Language. 2023. № 4(3). P. 24-39. https://doi.org/10.48417/technolang.2023.03.03

INTRODUCTION

In recent years, the “metaverse” has received more and more attention and exploration as a way of presenting virtual worlds. Used in a variety of fields and building a new type of digital society, the metaverse is a new ecology that is moving from concept to reality and is one of the characteristics of a new phase of cultural and technological integration. Technologically speaking, it is not a new technology, but an integrated application of multiple innovative digital technologies in future contexts. It is an integrated product with multiple human characteristics created using the internet and computing technology, interaction technology, graphic rendering, face capture, deep learning, blockchain, and the Internet of Things. It can be said that the metaverse essentially serves the human spirit, and it has both technical and humanistic attributes. Virtual and digital is the deep integration of technological advancements, while the human comes in through the emotional attachment of users.

Since the first attribute of human beings is social, social interaction is particularly important as an important way of transmitting social attributes. However, there are still certain problems with most of the current social methods on the internet, such as low friendliness due to the inability to meet online, weak interactivity due to physical absence, and lack of authenticity due to weak social sensory experience. In general, the current social emotional experience is inadequate and the emotional needs of human beings are not fully met.

Hermann Schmitz (1997) who introduced the concept of tangibility in his phenomenological research, argued that human emotional experience is based on the physiology of the senses (pp. 16, 50). Furthermore, emotions and the body are in a mutually integrated and interactive relationship. The human being possesses emotions which originate in consciousness, and consciousness depends on the body, so that the perception of the existence of the self is also the perception of the existence of the body. Now that the imagination of the metaverse has shifted from the traditional single-sensory screen-reading era to an era of embodied cognition with full bodily perception, it is particularly important to involve the body in the socialization of the metaverse, and embodied cognition theory explores the non-representational mode of interactive cognition (Lin, 2023). Consciousness exists in the body and the body exists in the environment, and the so-called immersion experience is the integration of body and environment.

This study applies embodied cognitive theory to the metaverse of social interaction by visualizing emotions to represent the symbiosis between technology and the body, and the coexistence of humans and the environment, to give people a better social immersion experience.

THEORETICAL RESEARCH

Metaverse Craze

The Metaverse was first mentioned in 1992 in Neal Stephenson's science fiction novel Snow Crash, as a new type of world that transcends the realm of space and is of a

higher dimension. The novel also deals with the concept of “avatar,” a Sanskrit word that originally referred to the transformation of a Hindu god into a physical body, a process of movement from the virtual to the real (Boellstorff, 2008). In today's digital information age, though, “avatar” represents the reverse movement from reality to the virtual, implying the virtualization of self-consciousness.

On 10 March 2021 the online gaming company Roblox went public on the New York Stock Exchange, demonstrating the business opportunities of the metaverse. On 28 November of the same year, Facebook announced its entry into the metaverse and officially changed its name to Meta, setting off the metaverse craze. Subsequently, Internet companies such as Microsoft, Baidu, and Tencent entered the metaverse market one after another, and various countries also introduced policies and plans related to the metaverse. Therefore, 2021 is called the first year of the “metaverse” (Zhang & Huang, 2023). At present, there is no unified explanation for the concept of metaverse. Anling Xiang et al. (2022) believe that the metaverse is an independent virtual space close to the real world and a new social form; Guoming Yu et al. (2022) believe that the metaverse transcends the real space and is a new, higher-dimensional world, and that humans enter the metaverse through three ways: embodiment, space, and social interaction.

The innovative application of the metaverse has led to profound changes in the current social structure and human life, and the metaverse has begun to derive new characteristics and logical relations, with completely new ways of application in different fields. In traditional social activities, as human beings are the sum of all social relations, the medium can be seen as a metaphor for social relations. Therefore, social activities in general are centered on human beings and spread outwards through the medium. In today's metaverse, the medium becomes an extension of the person, and the person's consciousness can be transmitted and extended virtually through different media, regardless of time and space.

Metaverse Social

It can be observed that social interaction as a realization of human social attributes is transforming into a metaverse social. The characteristics of the metaverse social can be divided into six layers of relationships:

1. **Integrated application of innovative technology**: technology innovation is the framework and builds the foundation of the entire metaverse;
2. **An immersive experience of human-computer interaction**: today's Internet of Things, artificial intelligence, and interactive technology can already achieve the integration of humans and machines, giving people a more immersive interactive experience through the means of innovative technology;
3. **Multidimensional presence of spatiotemporal expansion**: The maturation of technologies such as VR, AR, and XR has directly expanded the three-dimensional, four-dimensional, and even higher-dimensional space, realizing the multi-dimensional presence of the body online and digital presence;
4. **Real-time mapping of virtual reality**: the digital twin, the real mapping of real-time content enables users to have a more realistic and immediate experience;

5. **Media convergence of the Internet of Everything**: with the dramatic increase in media, the media ecology shows a trend of convergence, gradually forming a network environment of the Internet of Everything;

6. **Social approach to personalized co-construction**: metaverse social gives users more freedom and playability, and the change of network structure The change in the structure of the network allows for the creation of more personalized individual and group values (Duan & Wei, 2022).

The metaverse social network presents a hierarchical relationship of “technology integration – immersive experience – multidimensional presence – real-time mapping – the interconnection of everything – social co-construction,” which constitutes a new social scene and changes the social connection between people. In essence, the metaverse social can be seen as a "compensatory" medium (He, 2023), where technology and the body are combined to achieve human-computer integration and manifest the characteristics of embodiment.

Embodied Cognition Theory

Embodied cognitive theory was first introduced in *The Embodied Mind: Cognitive Science and Human Experience* by Valera et al. (1991). Embodiment refers to “a process of practice in which the body comes to terms with others and the environment through intentionality” (Zhang et al., 2022). The embodied cognitive theory views the body as the subject and precondition of cognition. It argues that consciousness and cognition are not closed activities independent of the body, but that cognition should be dependent on bodily feelings and experiences, and that the body plays a very important role in the process of cognition (Adam, 2010).

Currently, researchers have zeroed in on the theory of embodied cognition with the following three main points: 1. sensory and perceptual experiences directly influence the cognitive process; 2. the motor system is an important channel to connect the brain with the body's cognition; 3. the embodied context, the nervous system, the body, and the environment are intertwined to form a dynamic cognitive system for humans (Zheng et al., 2017).

In the digital age, the media have fully penetrated the human environment, technology and the body are closely linked, and the limits of space and time are broken. The embodied body is becoming a basis for the generation of interactions between humans, media, and technology (Rui & Sun, 2020). Embodied cognitive theory can provide us with a new perspective on metaverse social, laying the theoretical foundation for further research on metaverse social in the digital age, to optimize the user's sense of presence and experience in metaverse social.

METHODOLOGY

Embodied cognition theory has four distinctive features: ontology, schematism, affordance, and emotion (Lu, 2023). Four design approaches to embodied cognition have been summarised based on previous research, and also their characteristics – the embodied perception level, the embodied behavioral level, the embodied interaction level,

and the embodied emotion level. These four layers also correspond to the visceral level, the behavioral level, and the reflective level of the emotional design methodology.

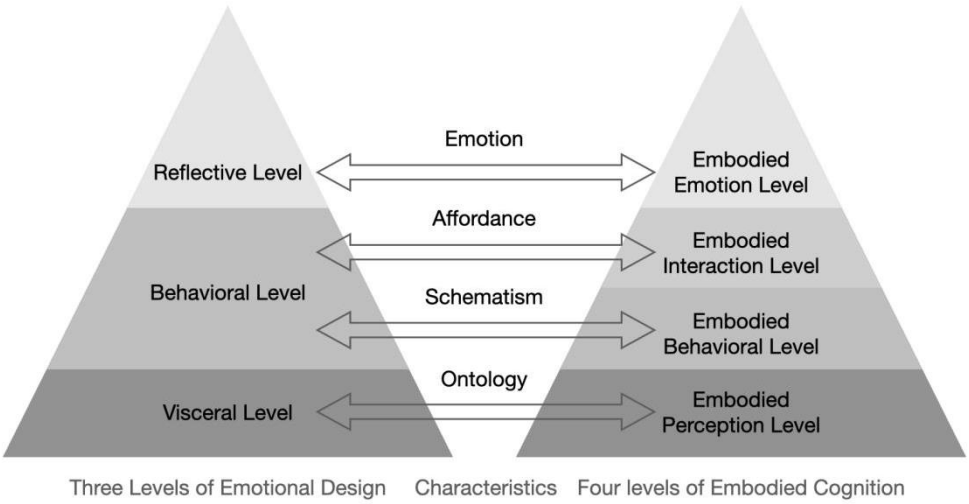

Figure 1. Embodied cognition and emotional design

Embodied Perception Level – Ontology

Humans perceive the world through five organs that interact with the external environment to produce the senses of sight, hearing, smell, taste, and touch. Physical perception is the basis of human understanding of the world. In virtual worlds, people interact with the outside world through avatars, in which the organs of the body become an extension of the mediating technology, and humans use the environment, the body, and language to express their interactions. Embodied perception is formed through the embodiment of technology and the virtualization of the body. However, the vehicle of the virtual self is still the body, and the perception of the embodied body is still based on the real body, giving the user the most genuine sensory experience, and the main feature is the ontological nature of embodied cognition (Lu, 2023).

Embodied Behavioral Level – Schematism

In the formation of cognitive information, people can interact with the external world through the body as a medium. Brain consciousness helps us to integrate and process information. In this way, the body engages in behavioral activity, which is the outward appearance of the brain's integration of information and relies on our past behavioral experiences. Behavior is the conduit between perception and emotion in embodied cognition, and the focus is on how to establish the user's control and form of interaction with the virtual self in the virtual world. This stage involves matching the body to the behavior, reducing physical distance, and enhancing the user's sense of presence and immersion. Body schema refers to the patterns, forms, and laws of human orderly activity that can be followed. The main characteristic of the embodied behavioral level is schematism.

Embodied Interaction Level – Affordance

The embodied interaction level focuses on the interaction between two parties in the social process and is mainly characterized by affordance. Affordance is concerned with the multidimensional and complex networked interactions between people and objects such as media, technology, and instruments. Currently, technology can merge real space with virtual space. It is a super digital space with multiple scenarios imagined and multidimensional human-machine interactions. Different users can use their digital identities to enter a common scene to share information, communicate and interact, and participate together in the multimodal information production and interaction of the virtual scene. In virtual interaction design, the element of affordance can be analyzed in terms of the body schema. It can provide users with multi-dimensional communication and interaction, increase their participation in interaction, and use it as a basis for building their virtual social networks, thus forming new virtual social relationships.

Embodied Emotion Level – Emotion

According to Maslow's Hierarchy of Needs, we know that the highest level of human needs is the need for self-actualization. Emotion is a higher-dimensional experience for humans, and emotion is also a form of embodied cognition. The human brain and body act on emotion in a reciprocal way, and the emotional experience has a great impact on human social behaviors. The real world and the virtual world have now been completely bridged, presenting several highly integrated and realistic virtual situations. Users express their sense of self through different dimensions in virtual scenarios and want to be able to project their emotions through interactions with others, satisfying their spiritual needs and bringing about a deeper immersion experience.

DESIGN MODEL

The metaverse presents an unprecedented convergence of social approaches and scenarios, with Donald Norman saying that “Once the technology has satisfied basic needs, user experience begins to dominate.” Emotion is extremely important in user experience. Emotional visualization can be used in metaverse social platforms to facilitate emotional communication, enhance user interaction and improve the stickiness of the platform. Embodied cognition can play an important role in the process of communicating and visualizing emotion, and can be combined with physiological signal acquisition techniques to achieve a more realistic and accurate visualization of emotions.

Based on the four design methods of embodied cognition, an emotional visualization approach is introduced to construct the design model of this study. The emotional visualization design model of metaverse social is also divided into four levels: embodiment, symbolism, gamification, and resonance. Embodiment is the combination of body and technology, symbolism is the interaction of senses and media, gamification is entertainment and social expression, and resonance is the interweaving of self-resonance and resonance with others. In this process, the most fundamental aspect is the fusion of reality and the virtual.

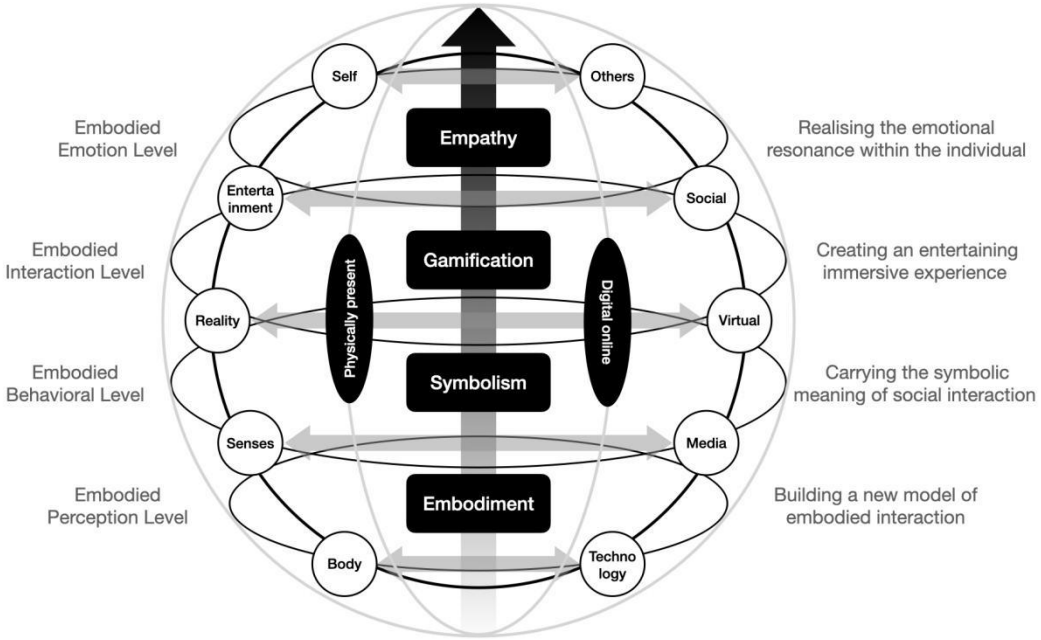

Figure 2. The emotional visualization design model of the metaverse social

Embodiment: Building a new model of embodied interaction

The embodiment of technology is the internalization of technology, while the virtualization of the body is the externalization of the body, with technology widening the boundaries of the body and integrating with it (Li, 2023). The current technology is evolving rapidly and users can realize the embodied virtual body through key technologies such as Virtual Reality, Augmented Reality, and Mixed Reality at the interactive level. The subject of the virtual world is still human ontology, where the body and technology are structurally coupled so that the ontology generates new perceptions and thoughts, and the ontological perceptions are mapped into the virtual space in real-time through digital simulation, giving the user a rich sensory experience.

The emergence of the metaverse has changed the traditional way of social interaction, allowing users to achieve a form of embodied interaction in virtual scenarios, where the body can spread and merge between reality and the virtual. The construction of a virtual self for social activities, through the expression of emotions as an externalization of the body's facial organs, enables a strong visual representation of the user's mood state. Visualizing emotions involves an all-encompassing sensory connection, using the body entirely as a connection point between the person and the medium, enabling decentralized, face-to-face, virtual, and real communication between people. Emotional visualization in metaverse social can closely integrate technology and the body, bringing technology and humanity together, interconnecting the virtual and real self, and making the virtual self more tangible and three-dimensional. The ontology of human-machine integration can redefine the “new human.” A new form of social interaction that is truly digital online and physically present.

In this way, the virtual self in the metaverse can better match the identity and cultural identity of the real self, blurring the boundary between physical space and psychological space. The virtual self can connect the dual carriers of body and technology, the dual roles of media and senses, and the dual spaces of the real world and virtual space, making them intertwine with each other. During this process, the real body, the virtual body, and the ontological consciousness reach a state of coupling. At the same time, the virtual self also has the characteristics of personalisation and customisation, and the virtual world, as a virtual place for self-expression, can liberate people from the real world. People can use their virtual selves to extend and make up for their real lives, and realise some things that they cannot do in real life (Wang et al., 2022).

Symbolism: Carrying the symbolic meaning of social interaction

Technology has turned the body into a symbol, and the schematism of embodied behavior is a traceable structure of regularity, an abstract concept formation with a symbolic representation. It acts in human bodily movements, object manipulation, sensory dynamics, and behavioral interactions. It can be used to analogize real situations utilizing environmental analogies, digital twins, and virtual mappings, to simulate real interaction behavior, to find mapping relationships that correspond to real life, to combine the user's personal cognitive and behavioral experiences, and to evoke cognitive behavior through symbolic symbolism and schematic expressions.

The metaverse, as a new form of social media, simultaneously carries the function and role of social interaction. Users can produce and convey the messages they want to express through body symbols in metaverse socialising. Not only limited to words, but also actions, expressions, and other related information can be communicated through the virtual full authenticity of the metaverse. In the process of this non-verbal interactive expression (Nah et al., 2022), emotional visualization can be simple and intuitive yet carry a lot of meaning, and such emojis enable users to enter the context more quickly and experience virtual social interaction in a more immersive way. When the traditional figurative emoji are dissolved, everyone can create their abstract emoji, which carry the user's consciousness and are an external expression of their emotions and thoughts, and can enhance their sense of self-identity. At the same time, abstract emojis can carry more elements in the social process, convey emotions, gain intimacy, establish group identity, and enhance the sense of mutual identity in the social process.

Gamification: Creating an entertaining immersive experience

The metaverse is a new kind of virtual network relationship which can transcend the limitations of time and space, giving users more space to enrich the form of social interaction and build their own social networks. Digital life further expands the boundaries of human experience in which users can truly transform their "conscious imagination" into "sensory reach." This will create a multi-dimensional social scene, enhance social entertainment and enrich their social experience (Jiang & Zhu, 2022).

The game world itself has been around for a long time and it can respond to all the desires of people. Gamification has become a crucial attribute of the metaverse, and the need to entertain and share experiences during socialisation is increasingly important to

be valued (Cruz et al., 2023). The metaverse transcends the traditional three-dimensional space, allowing humans to socialize without the limitations of static and dynamic space, bringing the human body and consciousness into a more multi-dimensional digital space through technology, and giving humans a more diverse emotional experience. As the digital space has richer and more radical technologies and environments, it can be personalised to the users themselves according to their desires and behaviours, thus creating more desires to influence their future behaviours (Milani, 2022). The space of the metaverse is both derived from and transcends reality, and can greatly satisfy the spiritual needs of users. As the richest body language, the interactivity of emotions can enhance users' social engagement. Realistic environments can enhance the credibility and immersion of the game and attract users more (Jamshidi et al, 2023). Diverse game mechanics can give more interesting expressions to emotional visualization, and central nervous stimulation can generate long-lasting, real, and sustained social experiences of game interaction, giving users the ability to explore and create. Gamification broadens the social space and content, creates a relaxed social atmosphere, and enables emotional and immersive social expression.

Resonance: Realising the emotional resonance within the individual

From the perspective of dualistic ontology, the body is one of the many dimensions of human beings, not all of them. Spirit, emotion, soul, and thinking will always become more connotative dimensional characteristics (Quintas, 2023). Emotional empathy, as a psychological state, is the highest of emotions, the essence of which is still preceded by a physical response, using past experiences to gather and evaluate captured emotional information within multiple systems simultaneously. In today's narratives where technology is integrated into culture and emotion, technology and people are able to influence and create each other (Liggieri, 2023). It can be argued that embodied emotion is the result of the synergy between human-computer interaction, bodily mechanisms and emotional information. We can fully know ourselves and understand ourselves through the embodied emotion level, and realise the inner shaping of the self.

Emotional design is the highest dimension in design. Social interaction itself has great social and emotional properties, and in metaverse social interactions, the realization of personal emotions should be fully reflected. Through the combination of the virtual and the real, we can fully reveal our entire being, express our ideology, convey our emotional state, and shape our inner world. The impact of the metaverse on users can be understood as the socialisation of the individual and the personalisation of society. In the intertwined space and time between the virtual and the real, we can resonate emotionally with others, society and ourselves. A deeper exploration of the user's emotional needs allows the user's consciousness to build a more self-referential and direct social relationship in the metaverse. At the same time, a real virtual self gives users the possibility to explore more inwardly, allowing them to see and feel themselves and to understand themselves better through their virtual self. This can bring users a deeper immersive emotional experience and a more positive emotional drive, thus achieving an emotional resonance that blends the real and the virtual.

DESIGN RESULTS

Based on the design model constructed, the author has built an emotion-social application called Emotion Meta, using the visualization of emotions in metaverse social as an entry point. It can bring emotions into the virtual world for real-time chatting and interaction, making social interaction more vivid and allowing every social interaction to have emotional resonance. The most salient features of the application correspond to the four levels of the design model, which are real-time mapping, emotion visualization, social entertainment, and emotional resonance.

Real-time mapping

The first step is to create an exclusive virtual self-image in the metaverse, which is personalized according to the user's sense of self, forming a virtual self with thousands of faces. According to Sung Park's experiments, users perceive virtual selves that embody their habitual expressions as more similar to themselves than those that do not (Park et al., 2021). The virtual self is mapped to the real self in real-time through real-time facial capture and micro-expression algorithm analysis. This extends the full sensory perception of the body, enabling users to see their own and each other's emotional expressions in real-time in social scenarios. This is the manifestation of embodiment, giving the user the most realistic sense of presence.

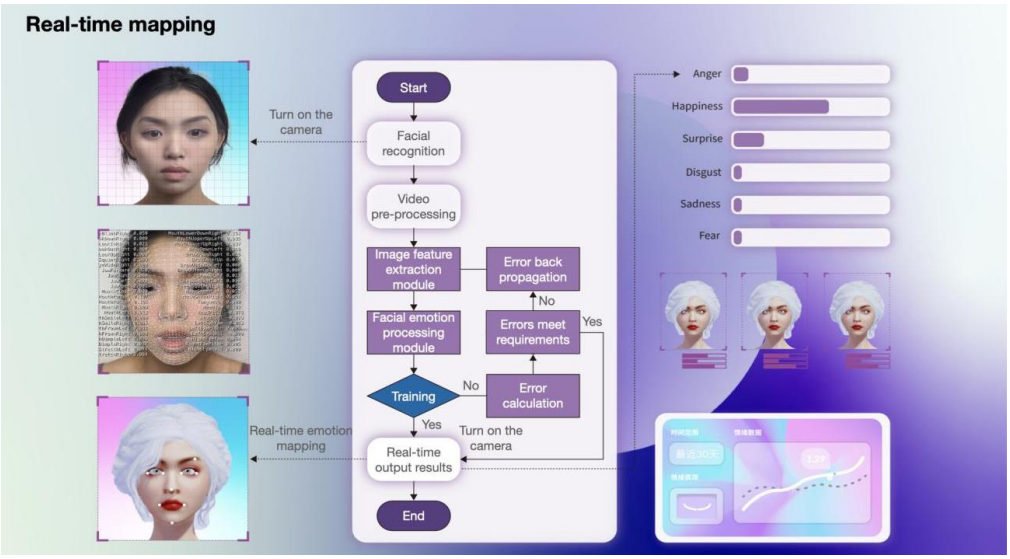

Figure 3. Real-time mapping

Emotion visualization

The emotions, expressions, and behaviors that are mapped in real-time during social interaction can also be recorded and saved in a visual way to form a personal and exclusive emotion symbol. Users can view their own personal status, such as emotional states, frequently used expressions, and exciting moments. This interface is like a memoir,

allowing us to see our pleasant or painful moments. When we press and hold an emoji, we can see when and how often we have used it during social interaction, related contacts, and events that have occurred. Such emotional symbols can better communicate our awareness in social situations, build good behavioral interactions and allow users to understand more about each social relationship.

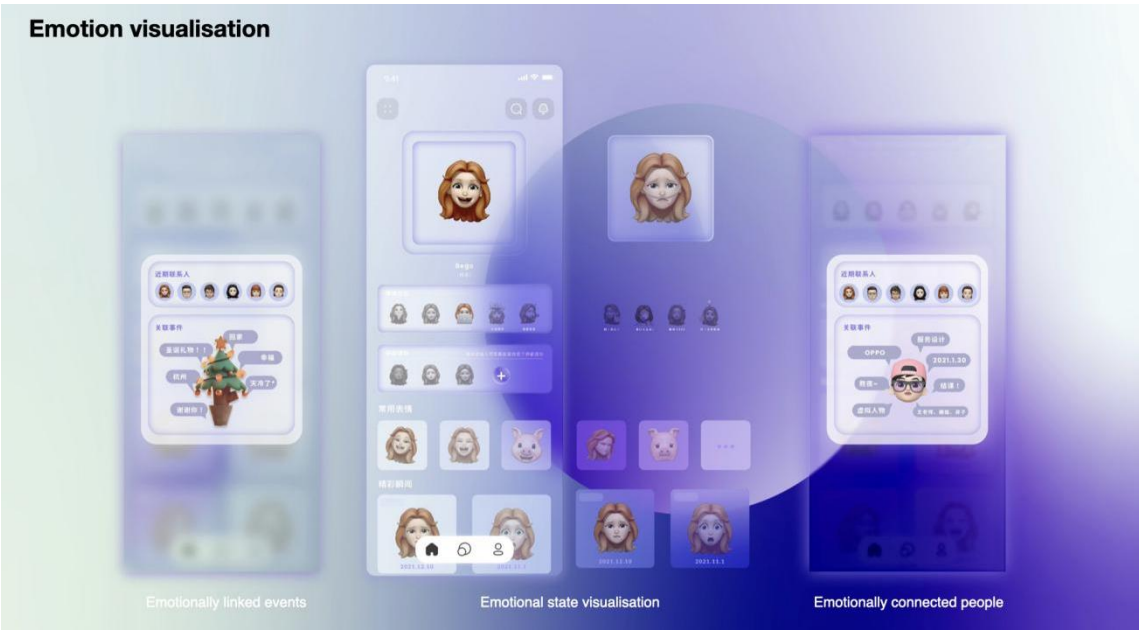

Figure 4. Emotion visualization

Social entertainment

Add gamification to the social journey by quantifying the social relationship as several steps in the social journey: the closer the distance between the two parties the higher the intimacy. The frequency of chatting, the length of chatting, and the richness of the expressions appearing in chatting will increase the intimacy, and when a certain value is reached the chat window will be allowed to throw the dice. Through the entertaining game mechanism of dice throwing, we can slowly get closer to each other, making every emotion worth recording a step forward in our relationship. The social journey scenario can also be freely chosen by both users, adding to the sense of personalization and immersion. And each friend's social interaction will have an exclusive social report for both users to access, giving them a better understanding of each other's social status.

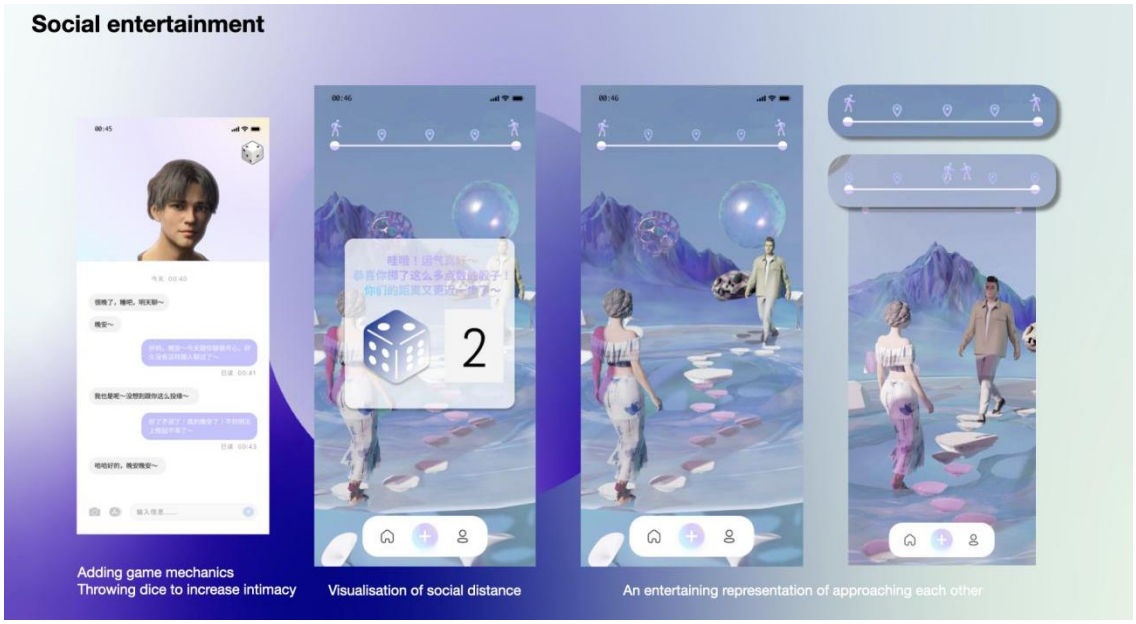

Figure 5. Social entertainment

Emotional resonance

Returning to the user's own emotions, the emotion visualization records the user's behavioral expressions symbolically in the backend, which can be viewed and used by the user. The backend can also be clearly labeled with the people, things, and objects that correspond to the emotion, and by recording and analyzing the user's emotional nodes a dynamic personal visualization of the emotional shape is automatically generated, creating a real third emotional space. Users can feel their inner state according to color and shape changes, and they can use this virtual third perspective to better understand their emotional state and the people and things that correspond to it. This helps users to better understand themselves and interact socially, giving them a richer and more diverse emotional and social experience. Users can also recognize their own emotions to shape their inner selves, understand themselves, and achieve a self-healing effect.

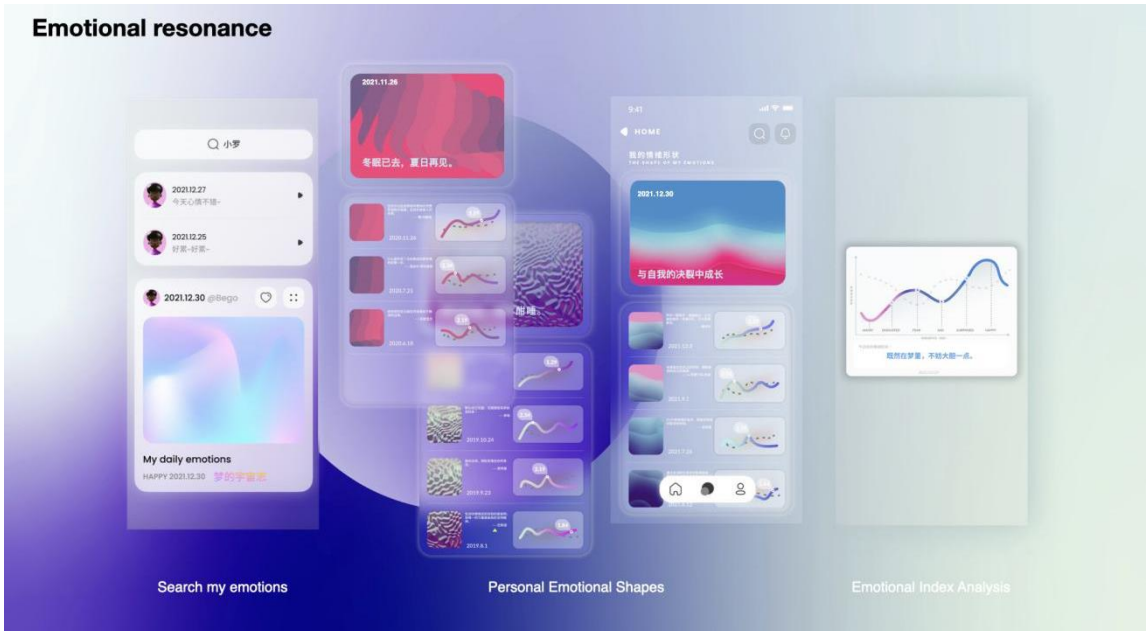

Figure 6. Emotional resonance

CONCLUSION AND DISCUSSION

In the digital age, the metaverse social has become a paradigm of the social, and the depth and breadth of the body's involvement in the digital world in metaverse social is gradually increasing. On this social basis, the function of the body as a medium has been extended, social scenarios have become more diverse, and humans need a higher-dimensional emotional environment to balance technology and emotion.

Starting from the design method of embodied cognition, this study implements emotion visualization into metaverse social, and puts forward as a metaverse social design model “embodiment, symbolism, gamification, and resonance.” The metaverse social process is more experiential, immersive and present, meeting the needs of users for emotional expression. Based on this model, a metaverse social application called Emotion Meta was designed, corresponding to four design levels, highlighting the four design features of “real-time mapping, emotional visualization, social entertainment, and emotional resonance.”

Therefore, the proposed metaverse social design model of emotion visualization has a certain degree of reusability and allows for a broader ecological space for social activities in a surreal digital space, which can provide a certain basis for subsequent research and practice. It can be foreseen that the metaverse will be more and more deeply involved and integrated into human life, and human beings need to be more active in facing and coming to terms with it.

REFERENCES

Adam, F. (2010). Embodied cognition. *Phenomenology and Cognitive Science, 9*, 619-628.

Boellstorff, T. (2008). *Coming of Age in Second Life: An Anthropologist Explore the Virtually Human*. Princeton University Press.

Cruz, M, Oliveira, A, & Pinheiro, A. (2023). Meeting Ourselves or Other Sides of Us? – Meta-Analysis of the Metaverse. *Informatics, 10*(2), 47. https://doi.org/10.3390/informatics10020047

Duan, C. & Wei, F. (2022). Embodied Interaction, Super Digital Scene, and Social Availability: The New Logic of Metaverse Brand Communication Paths. *Youth Journalist, 22*, 28-31. https://doi.org/10.15997/j.cnki.qnjz.2022.22.022

He, W. (2023). Interembedding, co-occurrence and breakout: A new exploration of social interaction in the metaverse scene. *Audiovisual, 4*, 91-94. https://doi.org/10.19395/j.cnki.1674-246x.2023.04.007

Jamshidi, M, Dehghaniyan, S., Jamshidi A, & Moztarzadeh, O. (2023). The Meta-Metaverse: Ideation and Future Directions. *Future Internet, 15*(8), 252. https://doi.org/10.3390/fi15080252

Jiang, Y., & Zhu, Y. (2022). Concepts and application scenarios of metaverse: research and market. *China Media Science and Technology, 1*, 19-23. https://doi.org/10.19483/j.cnki.11-4653/n.2022.01.004

Liggieri, K. (2023). Between Technology and "Humans". The Idee of an Anthropological Signature in Human-machine Interactions. *Technology and Language, 4*(2), 129-144. https://doi.org/10.48417/technolang.2023.02.12

Lin, Z. H. (2023). The "Body" of the Body: The Dislocation between Embodied Cognition and Phenomenological Body Theory. *China Book Review, 4*, 32-42.

Li, Z. (2023). The real self and the virtual body – A study of the embodiment of virtual bodies in the metaverse. *Nature Dialectics Letters, 2*, 19-27. https://doi.org/10.15994/j.1000-0763.2023.02.003

Lu, J. S. (2023). Research on the Influencing Factors of Virtual Reality Interaction Design from the Perspective of Embodied Cognition. *China-Arab Science and Technology Forum (in English and Chinese), 4*, 111-115.

Milani, B. (2022). On the Mythical Atmosphere of the Digital World. *Technology and Language, 3*(4), 21-29. https://doi.org/10.48417/technolang.2022.04.03

Nah, K., Oh, S., Han, B., Kim, H., & Lee, A. (2022). A Study on the User Experience to Improve Immersion as a Digital Human in Lifestyle Content. *Applied Sciences, 12(23),*12467. https://doi.org/10.3390/app122312467

Park, S, Kim, S.P., & Whang, M. (2021). Individual's Social Perception of Virtual Avatars Embodied with Their Habitual Facial Expressions and Facial Appearance. *Sensors, 21*(17), 5986. https://doi.org/10.3390/s21175986

Quintas, A. (2023). Degradation of the Body in Idealist–Dualist Philosophy. *Philosophies, 8*(2), 36. https://doi.org/10.3390/philosophies8020036

Rui, B. & Sun, S. (2020). From Disembodiment to Embodiment – The Existential Turn in Media Technology. *International Journalism*, *5*, 7-17. https://doi.org/10.13495/j.cnki.cjjc.2020.05.001

Schmitz, H. (1997). *The New Phenomenology*. Shanghai Translation Press.

Varela, F., Thompson, E., Rosch, E., & Rangarajan, A. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press

Wang, J., Zhang, H. & Dou, W. (2022). Imaginary Availability: Analysis and Reflection on the Relationship between Human and Meta-cosmic Scenes. *Journalism and Writing*, *4*, 70-78.

Xiang, A.-L., Gao, S., Peng, Y.-T. & Shen, Y. (2021). Knowledge Reorganization and Scene Reconfiguration: a Meta-Universe for Digital Resource Management. *Library and Intelligence Knowledge*, *1*, 30-38. https://doi.org/10.13366/j.dik.2022.01.030

Yu, G., Zhao, X. L. & Tan, X. (2022). Embodied Ways, Spatial Ways and Social Ways: a Study of the Three Entrances to the Metaverse – an Analysis of the Near, Medium and Long Term Development Based on the Logic of Communication. *Journalism*, *9*, 4-12. https://doi.org/10.15897/j.cnki.cn51-1046/g2.20220914.001

Zhang, H. Z., Dou, W. H. & Ren, W. J. (2022). Meta-universe: scenarios of embodied communication imagination. *Journalism*, *1*, 76-84. https://doi.org/10.15897/j.cnki.cn51-1046/g2.20211228.001

Zhang, M.-Y. & Huang, Z.-X. (2023). Meta-universe: The Convergence and Symbiosis of Technology and Society in the Digital Age. *China Youth Studies*, *2*, 23-30. https://doi.org/10.19633/j.cnki.11-2579/d.2023.0027

Zheng, H.-Y., Ye, H.-S. & Su, T.-K. (2017). Three Theoretical Models of Embodied Cognition. *Psychological Inquiry*, *3*, 195-199.

СВЕДЕНИЯ ОБ АВТОРАХ / THE AUTHORS

Вэньлин Сюй, 20212719@caa.edu.cn

Wenling Xu, 20212719@caa.edu.cn

Юнь Ван, wy_james@126.com

Yun Wang, wy_james@126.com

Статья поступила 11 июня 2023
одобрена после рецензирования 28 августа 2023
принята к публикации 14 сентября 2023

Received: 11 June 2023
Revised: 28 August 2023
Accepted: 14 September 2023