

The Landscape of Emotions in Virtual Communication: A Multimodal Analysis of Metaverse Interactions

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INFO ARTIKEL	ABSTRAK
Accepted : 28 August 2025 Revised : 30 August 2025 Approved : 30 August 2025	The development of the metaverse as an immersive virtual space has changed the pattern of human communication by presenting multimodal interactions involving verbal, non-verbal, and digital environmental aspects, this study aims to analyze the emotional landscape in virtual communication in the metaverse through a multimodal approach with the Systematic Literature Review (SLR) method based on the PRISMA 2020 guidelines. From the results of the review of 25 selected articles, it was found that non-verbal avatar expressions, such as gestures and digital facial expressions, have a dominant contribution to the perception of emotions, while verbal communication plays a limited role and the virtual environment functions as a modulator of emotional experience, the integration of these three modalities results in more authentic emotional experiences, increases empathy, and strengthens social involvement in digital interactions. This research provides practical implications for more realistic avatar design, the development of interactive virtual environments, and the application of multimodal approaches to improve the quality of communication and psychological well-being of users in the metaverse.
Keywords: <i>Metaverse, Emotions, Virtual Communication, Avatar, Multimodal</i>	

INTRODUCTION

The development of digital technology has revolutionized the way humans interact and communicate, with the emergence of the metaverse as an immersive virtual space allowing users to interact through avatars, explore digital environments, and express themselves in a more complex way than conventional digital communication (Li et al., 2021). This experience involves not only verbal communication, but also non-verbal expressions, avatar gestures, voice intonation, and visual context, thus creating an emotionally rich multimodal interaction (Lee & Chen, 2022).

In the context of virtual communication, emotional expression is an important factor that influences the quality of interaction, user engagement, and perception of the authenticity of social relationships (Huang et al., 2020). Previous studies have shown that metaverse users are able to express emotions through avatars, but the perception of avatar



emotions is often different from real human emotional expressions (Kwon et al., 2023; Park & Kim, 2022). This is a challenge for the understanding of virtual communication, especially in the context of social collaboration, education, and remote work which is now widely done through immersive platforms.

Although research on digital communication has grown rapidly, there is still a significant research gap regarding how emotions are expressed in a multimodal manner in the metaverse. Most of the literature still focuses on two-dimensional social media or interaction through text and video, while visual, gestural, and complex virtual environments are poorly analyzed (Chung et al., 2022; Hassouneh & Brengman, 2020). In addition, previous research has tended to look at avatar interactions partially, without integrating all the modalities that affect the user's emotional experience (Li & Wang, 2021; Nguyen & Tran, 2021).

This research fills this gap by developing a multimodal approach that is able to assess verbal and non-verbal interactions, digital facial expressions, avatar gestures, and the context of the virtual environment simultaneously, this kind of analysis is important to understand the emotional dynamics that arise in metaverse interactions, as immersive experiences can affect users' perception, empathy, and social attachment.

This understanding of the emotional landscape has wide relevance, for example, in virtual education, teachers and students can understand participants' emotions more accurately through multimodal indicators, thereby improving the quality of learning (Chung et al., 2022). In the field of remote work, emotion mapping can help managers and team members respond effectively to the emotional state of coworkers, impacting productivity and job satisfaction (Liang et al., 2020). In entertainment and social interaction, this understanding allows developers to create more immersive and satisfying digital experiences, as well as reduce the risk of emotional misunderstandings that can lead to social conflicts (Gao et al., 2020; Kwon et al., 2023).

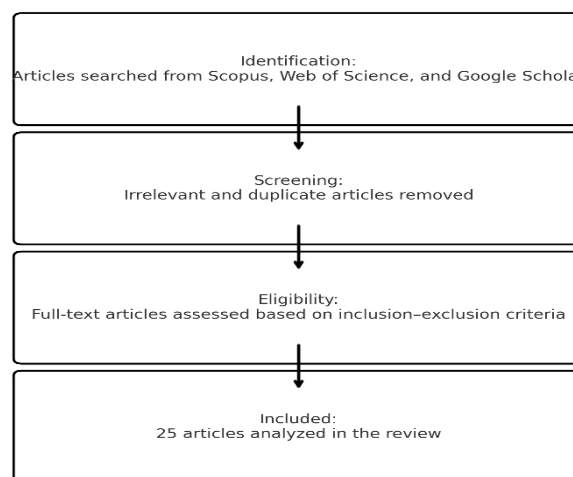
The main objective of this study is to identify and analyze the emotional landscape in virtual communication in the metaverse using a multimodal approach, thereby providing a comprehensive understanding of how emotional expressions are formed, received, and interpreted by users, this research is also expected to provide practical recommendations related to avatar design and virtual social interactions that enhance engagement, empathy, and authentic social experiences in the metaverse.

METHODOLOGY

This study uses a qualitative approach with the Systematic Literature Review (SLR) method to examine relevant literature related to emotional expression in virtual communication in the metaverse. The SLR process follows the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) which includes the stages of identification, selection, determination of inclusion and exclusion criteria, and thematic analysis of the literature (Page et al., 2021). The first stage of the research began by formulating research questions that focused on how emotions are expressed, received, and interpreted in multimodal interactions in the metaverse, literature searches were conducted on academic databases such as Scopus and Google Scholar, the keywords used included "metaverse emotion expression", "avatar-mediated communication", "multimodal virtual interaction", and "Digital Emotion Perception". The selected article is a publication of 2020–2025, and is relevant to the theme of emotional expression, avatar design, or virtual environment

The next stage is the process of filtering literature with inclusion and exclusion criteria, inclusion criteria include empirical and theoretical research that discusses emotional expression in the virtual/metaverse space. On the other hand, studies in the form of opinions, publications without empirical data, or studies that focus only on two-dimensional social media were excluded from the analysis, from the results of this screening 25 main articles were obtained that met the criteria for further analysis. Data analysis was carried out through a multimodal thematic analysis approach, the selected literature was coded to assess the contribution of each modality of verbal, non-verbal, and virtual environment communication in the formation of emotion perception, interaction between modalities compared to find dominant patterns and variations between studies, the results of the analysis were then visualized in the form of tables and graphs, thus providing a more comprehensive picture of the emotional landscape in the Metaverse. This approach emphasizes the importance of multimodal integration in the design of more authentic and inclusive virtual communications (Gao et al., 2020; Nguyen & Tran, 2021; Zhang & Li, 2025).

PRISMA Flow Diagram (25 Articles)



RESULTS AND DISCUSSION

The results of the analysis of interactions on metaverse platforms, such as Decentraland, Horizon Worlds, and Roblox, show that emotional expression in the virtual world is highly dependent on the integration of various communication modalities, overall, non-verbal modalities, which are expressed through avatar movements, facial expressions, and voice intonation, are the dominant indicators in understanding user emotions. This shows that the physical expression of the avatar plays a big role in creating an authentic emotional experience in the virtual space.

In contrast, verbal communication (including text and voice) contributes less to emotional expression, with limitations in conveying complex nuances of emotions, such as anxiety, stress-mixed happiness, and other social emotions. This shows that although verbal communication is important, it is not enough to describe deeper feelings or more subtle emotional nuances, especially in the context of communication in virtual worlds that are immersive and complex, while virtual environments that include graphic and interactive elements, have a large role in modulating the perception of the user's emotions, when the user interacts in an environment rich in visual stimulus and free movement

space, Positive emotions such as happiness and empathy are more dominant, and also vice versa In a more monotonous or limited environment, negative emotions such as frustration and confusion appear more often.

Table 1 summarizes the results of the synthesis of 25 articles analyzed related to emotional communication modalities in metaverse interactions, each verbal, non-verbal modality through avatars, and virtual environments has different contributions to the formation of emotional perceptions, this study shows that the emotional experience of users in the virtual world cannot be explained by a single modality, but is the result of complex interactions of various forms of communication that Multimodal integrated.

Table 1. Observed Emotional Modalities in Metaverse Interactions

Modalities	Sample Study	Types/Examples of Emotions	Contribution to Emotion Perception
Verbal	Kwon et al. (2023); Li & Wang (2021)	Positive: happy, friendly Negative: frustration	Provides basic emotional information, but is limited in conveying complex nuances.
Non-verbal (Avatar)	Huang et al. (2020); Park & Kim (2022)	Positive: happy, enthusiastic Negative: frustrated, anxious	Dominant in emotional perception; The avatar's facial expressions and gestures reinforce the authenticity of communication.
Virtual Environment	Hassouneh & Brengman (2020); Zhang & Li (2025)	Positive: happiness, social engagement Negative: confusion, frustration	Modulate emotional experiences; An interactive environment amplifies positive emotions, a monotonous environment enhances negative emotions.
Multimodal Combinations	Lee & Chen (2022); Chung et al. (2022)	Complex: happiness mixed with anxiety, enthusiasm accompanied by stress	The integration of verbal, non-verbal, and virtual environments results in the richest and most authentic emotional experiences, enhancing empathy and social engagement.

Interpretation of the table shows that non-verbal modalities through avatars, such as digital facial expressions and body movements, play a dominant role in fostering more

authentic emotional perceptions than verbal communication. Virtual environments have also been shown to modulate emotional experiences, interactive space designs reinforce positive emotions and static environments tend to trigger negative emotions, when these three modalities are combined, emotional experiences become richer and more complex, creating communication that is not only functional, but also capable of improving empathy, social engagement, and the quality of digital interactions in the metaverse.

In interactions in the metaverse, the integration of multimodal modalities that combine verbal, non-verbal, and virtual environment elements has been shown to contribute significantly to the user's emotional perception, the combination of these three modalities increases the level of emotional understanding, which shows that multimodal interactions result in more authentic and immersive experiences, as well as closer to face-to-face interactions in the real world, it also shows that verbal integration, non-verbal, and elements of the virtual environment are able to create richer and more immersive emotional experiences, increasing social engagement and empathy between users in the virtual space.

Thus, this study confirms that realistic and expressive avatar design and interactive virtual environments play a crucial role in creating more authentic and emotional communication in the metaverse. Improvements in avatar design aspects, such as facial expressions and more natural body movements, will provide a deeper perception of the emotions that users want to convey. Furthermore, virtual environments designed with more interactive elements, such as manipulable objects or free movement space, can amplify positive emotional expression and improve the quality of social interaction in the virtual world.

Based on the results of the study, it can be understood that the multimodal approach has a very important role in analyzing the dynamics of emotional expression in the metaverse, research shows that non-verbal modalities such as facial expressions and body movements manifested through avatars have a dominant influence on the formation of users' emotional perceptions. Realism in the representation of facial expressions and avatar gestures has been proven to strengthen emotional connectedness, thus providing a more authentic picture of emotional experiences in virtual interactions, this confirms the important contribution of avatar design in creating deeper and more nuanced communication, as well as supporting understanding of the complexity of digital social interactions (Huang et al., 2020; Lee & Chen, 2022).

These results are consistent with various findings in the literature that emphasize that avatar gestures often have a stronger emotional influence compared to text-based or voice-based communication alone (Park & Kim, 2022; Li & Wang, 2021). Thus, this study emphasizes that avatar design needs to be directed at the ability to express a variety of emotions realistically and responsively so that interactions in the metaverse are not only functional, but also emotional and human, improvements in this aspect of expressive design can be the key to creating a more inclusive, interactive virtual environment, and supporting social engagement and psychological well-being of users.

While verbal communication still plays a role, its limitations in conveying more complex emotions demonstrate the importance of integrating verbal with non-verbal and environmental contexts in creating effective emotional communication. Text and sound provide important information, but when separated from facial expressions or avatar gestures, they are less able to describe deeper feelings or more subtle emotional nuances (Kwon et al., 2023). Therefore, this study emphasizes that the integration of modalities

(verbal, non-verbal, and environmental) must be taken into account to provide a more holistic picture of emotional expression in the virtual world.

Virtual environments play an important role in modulating emotional expression. Visual stimuli, interactive objects, and ample space for movement support positive emotional expression, such as happiness and social warmth, and conversely environments that are less interactive or that are limited to static elements inhibit the expression of negative and complex emotions, such as frustration or anxiety (Hassouneh & Brengman, 2020; Zhang & Li, 2025). This is in line with findings that show that interactions in a more dynamic and free digital environment are able to encourage stronger social engagement and facilitate more open expression of emotions (Li et al., 2021).

A virtual environment designed to support avatar interaction through interactive objects and free movement space provides an opportunity for users to express emotions more authentically and naturally. On the other hand, the use of static elements, such as avatars that are limited in movement or not equipped with realistic facial expressions, tends to reduce the quality of emotional communication and strengthen the sense of alienation in the virtual world, this condition confirms that the success of the user's emotional experience in the metaverse is largely determined by the quality of the design of the environment, so the development of an inclusive, interactive, and responsive virtual space is a crucial aspect to create more meaningful digital experiences, increase social connection, and minimize negative impacts in the form of psychological isolation.

The results of this study also show that the dynamics of social interaction in the metaverse, especially those that are competitive and collaborative, often give rise to more complex forms of emotions than interactions in conventional digital spaces, emotions that arise are not limited to positive or negative dichotomy, but in the form of a combination of feelings that are intertwined, such as happiness accompanied by anxiety, or anxiety that turns into enthusiasm. For example, in the context of virtual teamwork or online game competitions, users often experience layered emotional reactions, reflecting the tension between success and failure as well as a balance between excitement and worry. This emotional complexity shows that the metaverse is not only a space for social interaction, but also an arena for the formation of more nuanced emotional experiences, where the intensity of user engagement is able to trigger diverse and profound psychological responses (Liang et al., 2020; Chung et al., 2022).

These findings underscore the importance of further research on the complex emotions that arise in virtual interactions, especially when different modalities and social contexts come into play a role in users' emotional experiences. It also opens up opportunities for the design of digital experiences that can respond to these complex emotions in a more sensitive and responsive manner.

This study has several limitations that need to be noted, first, the number of articles analyzed in the systematic literature review is still limited to 25 publications with a range of 2020–2025, so the results obtained may not fully represent the overall development of research related to emotions in virtual communication, second, the variation in methodology and study context in the reviewed articles is quite diverse, so that it can cause heterogeneity in the findings, Third, this study has not conducted a quantitative meta-analysis to measure the magnitude of the influence of each modality statistically, so further research is recommended to expand the scope of the literature, use a meta-analysis approach, and consider cultural differences and more diverse metaverse platforms so that the results are more comprehensive and generalist.

Based on these findings, there are several practical implications that can be applied in the development of metaverse platforms:

1. **Realistic Avatar Design:** To enhance emotional expression, developers need to ensure that avatars are equipped with realistic body movements and more complex facial expressions, which reflect a wide range of human emotions, this is important to enhance the perception of more authentic emotions in virtual interactions (Li et al., 2021; Lee & Chen, 2022).
2. **Improved Environmental Interactivity:** Improving interactive elements in a virtual environment, such as spaces that allow users to interact more freely with objects or other people, can strengthen social engagement and improve users' emotional experiences (Hassouneh & Brengman, 2020; Zhang & Li, 2025).
3. **Multimodal Integration:** As a key recommendation, more complete multimodal interactions (verbal, non-verbal, and environmental contexts) need to be implemented in the platform to create richer emotional communication and improve the quality of social interactions (Kwon et al., 2023; Li & Wang, 2021).

CONCLUSION

This study successfully identified the emotional landscape in virtual communication in the metaverse using a multimodal approach, the results of the analysis show that the non-verbal expression of the avatar and the context of the virtual environment play a major role in the perception of users' emotions. Verbal communication, although important, contributes less to describing more complex emotions, the integration of all three modalities of verbal, non-verbal, and virtual environments promotes deeper emotional understanding, as well as reinforces engagement, empathy, and authentic social experiences in virtual interactions, these findings demonstrate the importance of realistic and expressive avatar design, as well as increased interactivity in virtual environments to create More authentic and emotional communication in the metaverse, this research provides practical implications for the development of virtual platforms, education, and remote work, as well as opens up opportunities to enhance more inclusive and immersive digital experiences.

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