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## MODERN TRENDS IN INTELLIGENT CHATBOT DIGITAL VISUAL IMAGE

***Purpose***. *Study the digital visual image of intelligent chatbots as a sample, analyze the design trends of the digital image of chatbots and direct the design practice to improve user interaction.*

***Methodology.*** *In the study, the method of combining literature review and empirical research is adopted. Through the analysis of existing research literature and the collection and analysis of existing design cases, the trend of digital visual image design style of intelligent chatbots is discussed.*

***Results.*** *Design options for digital visual images of chatbots were analyzed, and their comparative classification was created. Based on the study of the directions of evolution of the design of the digital image of the intelligent chatbot, the main types of stylistic solutions have been determined – from traditional to abstract/anthropomorphic.*

***Scientific novelty.*** *The research aims to explore the latest trends and innovative design ideas in digital image design to meet the needs of users and the challenges of technological progress, create unique and attractive images of intelligent chatbots for users, and realize a new human-computer interaction experience.*

***Practical significance.*** *The results provide guidance and suggestions for innovative design of digital visuals for chatbots aimed at creating more attractive, friendly and effective digital images, as well as increasing the practical value of the application and user satisfaction of chatbots.*

***Keywords:*** *design; digital image; human-computer interaction; visual design; intelligent chatbot.*

**Introduction.** In recent years, the rapid development of artificial intelligence (AI) and natural language processing (NLP) technologies has led to the widespread use of intelligent chatbots. Designed to interact with users via text or voice, these chatbots have become integral to a variety of industries including customer service, healthcare, and education. As chatbots continue to grow, there is a growing awareness of the importance of their visual presence – the digital avatar. The digital visual image of a chatbot is its visual avatar, representing its personality and facilitating human-machine interaction. Digital visual identity design plays a vital role in shaping the user's perception, attitude, and experience during an interaction. The purpose of this study is to deeply study the field of the digital visual image design of intelligent chatbots, explore the latest style trends and innovative design ideas of digital image design, and improve the effectiveness and user acceptance of chatbot technology. Ultimately, this research helps advance the design of intelligent chatbots and their practical applications in various fields.

**Analysis of previous research.** The use of chatbots has gained significant attention in recent years, with researchers exploring various aspects related to user perception and design considerations [1]. Mohit Jain et al. [2] conducted a study investigating users' interactions with chatbots on the Facebook Messenger platform, highlighting the need for further investigation into user perception and factors that contribute to a positive attitude towards this emerging technology.

The authors [3] approached chatbot design from a social relationship perspective, specifically targeting younger consumers. Their study utilized a factorial design to examine the effects of visual cues (avatar presence vs. absence) and interaction styles (social-oriented vs. task-oriented) on social presence and its impact on millennials' perceived enjoyment, trust, and attitude towards chatbots. To evaluate the effectiveness of chatbots in specific contexts, Höhn and Bongard-Blanchy

proposed a heuristic evaluation framework for COVID-19 chatbots [4]. Based on Nielsen's heuristics, they adapted the framework to 了 suit the conversational interface context, facilitating the evaluation of chatbot performance.

Choi et al. developed ProtoChat, a prototype system that supports iterative conversation design [5]. This system allows designers to prototype conversations, test them with the crowd, and analyze the crowdsourced conversation data, enabling an iterative design process. Considering the impact of sensory experiences on user interaction, Lee explored the integration of olfactory senses in the design of smart devices to create emotional experiences [6]. By incorporating the olfactory sense, designers can enhance the user-device relationship. Khurana et al. implemented two chatbots, ChatrEx-VINC and ChatrEx-VST, for complex spreadsheet tasks [7]. Their comparative observational study demonstrated that both chatbots improved users' understanding of breakdown reasons and enhanced perceptions of usefulness, transparency, and trust.

The authors [8] investigated the use of chatbots to enhance hazard awareness in the construction industry using an artificial intelligence-based eye-tracking tool. Their research focused on the unique challenges posed by chatbot development and the importance of studying human-AI interaction and its impact on user experience. Silva and Canedo aimed to uncover chatbot conversational practices and their impact on users, with the goal of developing a web guide to support designers in creating effective chatbot conversations [9]. Additionally, scientists [10] assessed the usability and credibility of a web-based chatbot called Vira among young adults and health workers in the United States. Their study focused on evaluating the effectiveness of the chatbot, which was developed by the Johns Hopkins Bloomberg School of Public Health and IBM Research using natural language processing

technology. These studies, along with influential work by Durak, contribute to the understanding of chatbot design, user perception, and the impact of chatbots on various industries and user experiences [11]. Further research in this area is essential to advance the field of human-AI interaction and improve the design and implementation of chatbot technologies.

The research and design of intelligent chatbots cover different aspects of chatbot design and applications. The technical terms involved in the above research include social relationship perspective, visual cues, task orientation, social orientation, heuristic evaluation, prototyping systems, sensory design, artificial intelligence, eye tracking, natural language processing, etc. [12]. These technical terms are all key concepts and tools related to chatbot design and development. Cicco explores the impact of the anthropomorphic design of digital avatars on the user experience of chatbots. Using a factorial design approach, the study examines the impact of visual cues (presence or absence of a digital presence) and interaction style (social-oriented versus task-oriented) on social presence and how this enhances millennials ' perceived enjoyment, trust in chatbots, and attitude [3]. Cicco only explored the impact of the anthropomorphic design of digital avatars on millennials, but did not study other types of digital avatars. Also, the study only used one chatbot platform (Facebook Messenger) and did not explore whether the effect was the same on other platforms. This paper [13] mainly studies the digital visual image of intelligent chatbots on different platforms, summarizes the style trends of design, and provides useful guidance and suggestions for designers when designing innovative practices, at the same time improves user satisfaction, user acceptance, and the actuality of chatbots.

**Statement of the problem.** Design trend forecasting analysis is an oriented research activity, which can see the market dynamics, and at the same time find the design

development direction and obtain new innovative design opportunities. However, the exploration of design style trends in the field of visual image design of intelligent chatbots is not perfect. Therefore, this study takes the digital visual image of intelligent chatbots as the research object and summarizes the design style trend of digital images of chatbots through the collection and analysis of existing design cases. , guiding design practices to improve their user experience and acceptance.

**The results of the research and their discussion.** With the rapid development of machine learning, artificial intelligence, natural language processing, and other technologies in the computer field, various forms of chatbots have emerged [4]. Machine learning provides a new information retrieval method and development framework for the development of chatbots, and gradually realizes intelligent and personalized functions. There are two main types of intelligent chatbots, one is physical chatbots; the other is system-embedded conversational software, such as OpenAI's ChatGPT, Amazon's Echo and Alexa, Apple's Siri, Microsoft's Cortana, and China Momentum Zhengsheng's Xiaomi's Xiao Ai, Huawei's Xiaoyi, and a series of chatbot applications developed by large service platform providers.

In recent years, to bring people a better user experience, the visual digital image design style of intelligent chatbots has changed from mechanization to anthropomorphism, and more and more attention has been paid to interactive design. For example, digital avatars can communicate more vividly and intuitively with users through animation effects, sound and tactile feedback, and enhance users' sense of participation and experience. The early digital image design of intelligent chatbots tended to be more mechanical and machine-like, emphasizing its technical characteristics. However, with the further development of human-computer interaction, designers began to incorporate more interactive elements into digital images. Take Apple's Siri as an example. When Siri appeared in 2011, it was a simple

microphone shape. It was composed of two-dimensional rectangular shapes with a relatively single-color composition, which was very similar to Apple's design concept at that time. In 2013, Apple updated Siri's digital visual identity. The shape of the updated Siri has changed from a simple microphone icon to a changing wavy stripe, and the color has changed to a combination of red, green, and blue gradients. This change makes Siri more technological than the simple icon shape, and it is more in line with the connotation of artificial intelligence. In 2016, the visual image of Siri evolved from the transformation of lines to the change of surfaces, and the red, green, and blue gradient color blocks can change with the sound. This change not only makes the visual sense more refined, but also makes the display more cool and improves the user's trust (Fig. 1).

In addition, with the continuous advancement of technology, the functions of intelligent chatbots are becoming more and more powerful, so the design of digital visual images also needs to take more into account the user's usage scenarios and needs [14]. At the same time, digital visual image design also needs to take into account factors such as the user's aesthetic taste and cultural background, to better meet the needs of users. Digital visual images not only start to have human appearance characteristics, but also show emotional expressions and body movements, making chatbots more human and easier to establish emotional connections with users. Digital visual images can have a more friendly and intimate appearance, and at the same time pay more attention to the expression of emotion and tone in the communication process, to better meet the needs of users [15].

The visual image design styles of intelligent chatbots can be divided into three categories: traditional images, abstract images, and anthropomorphic images. Traditional image: The digital image design of traditional intelligent chatbots is usually mechanical and indifferent, similar to the appearance of a chatbot or computer (Fig. 2). This design style

mainly emphasizes the functionality and practicality of the chatbot, rather than the emotional communication with the user. In the traditional design, the appearance of the chatbot may adopt tough lines and geometric shapes, showing a sense of technology and the future. Common elements include metal casings, mechanical structures, light indicators, etc. The purpose of this design style is to emphasize the intelligence and technicality of the chatbot, so that users can focus more on the chatbot's functions and tasks when interacting with the chatbot. The advantage of the traditional design lies in its simple and clear appearance and intuitive function display. This design style is suitable for many scenarios, such as customer service chatbots, self-service terminals, industrial chatbots, etc. Their appearance design usually matches the function and usage environment of the equipment to provide an efficient operating experience. However, conventional designs also have some limitations. Due to its mechanized and indifferent appearance, it may lack humanity and affinity, and it is difficult to establish an emotional connection and user identification. However, although there are certain limitations in emotional communication, the traditional design has certain advantages in providing a concise and clear operating experience and meeting the needs of specific scenarios.



**Fig. 1.** Design changes of Siri's digital visual image from 2011 to 2016
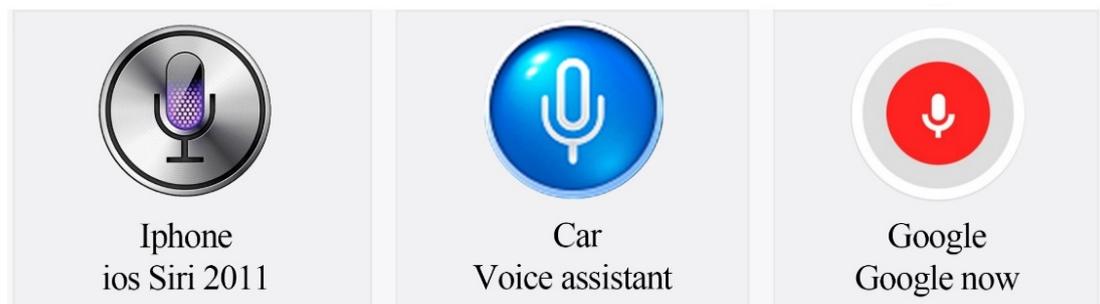


**Fig. 2.** Traditional images



**Fig. 3.** Abstract images

Abstract image: The digital visual image design of an abstract intelligent chatbot usually adopts some abstract graphics, symbols, or patterns, and adds some dynamic special effects to express the functions or characteristics of the chatbot while increasing the vividness and interest of the visual image (Fig. 3). This design style mainly emphasizes the simplicity and easy identification of digital visual images, making it easier for users to understand and use chatbots, and more willing to interact with digital images, thereby improving user participation and experience, and leaving a deep impression on users. The design style of abstract digital images emphasizes the functions or characteristics of digital visual images and pays more attention to the expression and communication of digital visual images, rather than the emotional communication with users [16]. At the same time, abstract digital visual images make also easier to carry out brand marketing, making it easier for users to remember brands and chatbots. Therefore, abstract digital images are suitable for those scenes that pay more attention to practicality and functionality.

Anthropomorphic image: The digital visual image design style of an anthropomorphic intelligent chat chatbot mainly emphasizes the emotional communication and interaction between the digital image and the user, making it easier for the user to have a sense of intimacy and trust (Fig. 4). In some cases, users may be more inclined to interact with an anthropomorphic chatbot because an anthropomorphic design can better meet human emotional needs and expectations for social interaction. This design style usually adopts human-like appearance and characteristics, such as facial expressions, body language, etc., to simulate the way humans communicate with each other. The design style of anthropomorphic digital visual images can make it easier for users to communicate and interact emotionally with digital images, thereby improving user satisfaction and loyalty. In addition, anthropomorphic digital images can also enhance brand image and brand recognition, making it easier for users to remember and follow the brand. However, the design style of the anthropomorphic digital image also has some disadvantages, such as relatively difficult design and relatively high cost. Therefore, when choosing a digital visual image design style, it is necessary to comprehensively consider various factors and choose the design style that is most suitable for your brand and users [17].

From the perspective of a time dimension, these three types of designs follow the evolution path of "traditional type – abstract type/anthropomorphic type" (Fig. 5). Combining the evolution path of design style types and the advantages and disadvantages of types, it can be seen that the design of the digital visual image of intelligent chatbots in the industry is paying more and more attention to the expression of brand personality, the concept of AI, and the humanities of technological products. Caring and emotional experience, which also reflects the transition process from traditional mechanical command design to modern artificial intelligence emotional design.

**Conclusions.** Intelligent chatbots have become an important part of the modern human-computer interaction field. They not only play a key role in business and personal life, but also provide strong support in education, health care, and other fields. In this rapidly developing field, the digital visual image design style of intelligent chatbots has undergone significant evolution, from traditional images to abstract and anthropomorphic images. This change has had a profound impact on the human-computer interaction experience. In the past, most chatbots were perceived as robotic and cold. Their appearance is usually abstract, focusing more on functionality and practicality. This traditional image emphasizes the technical characteristics of robots but has certain limitations in terms of emotional communication and user participation. It is often difficult for users to establish emotional connections and the interactive experience is relatively weak.
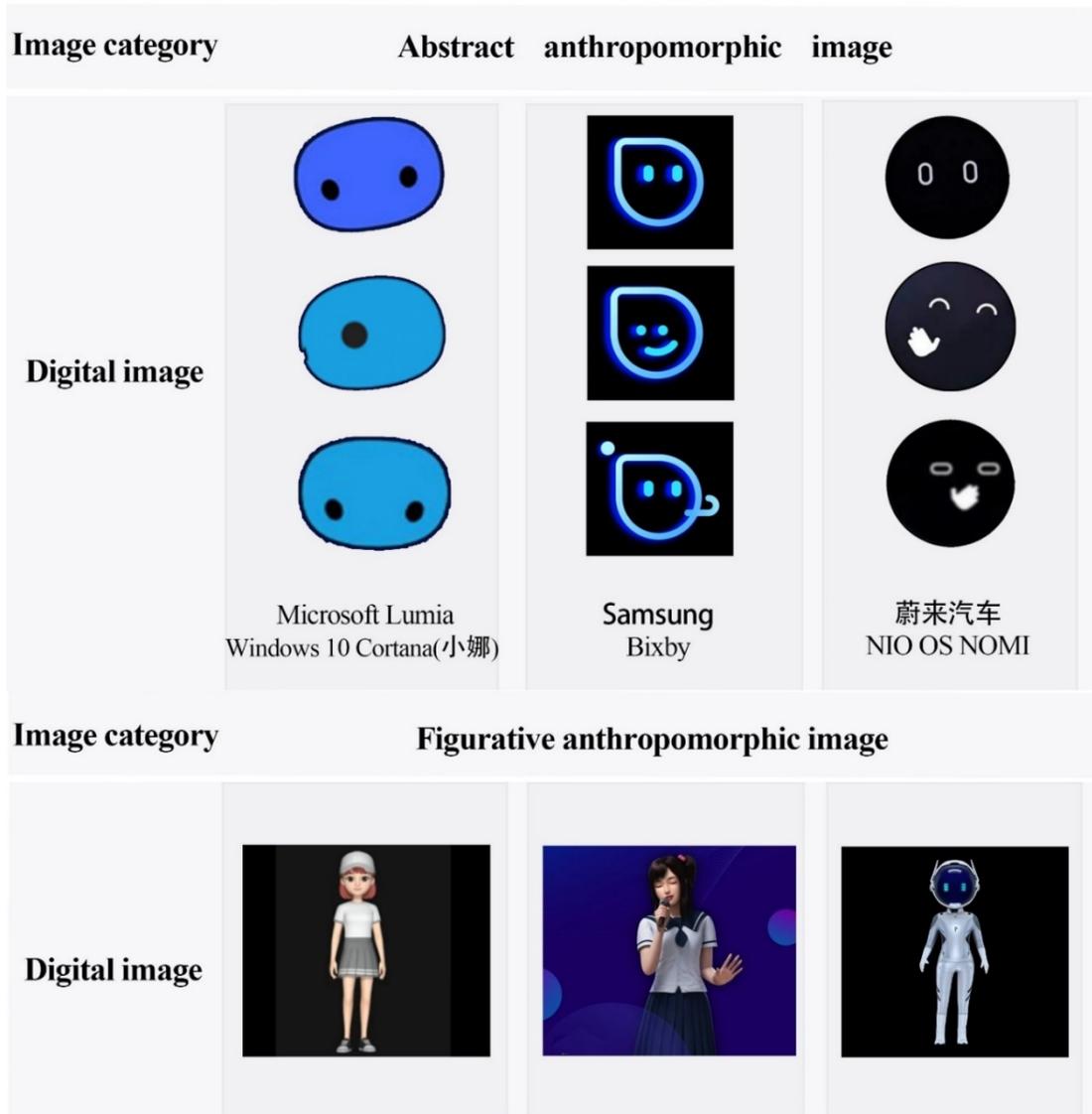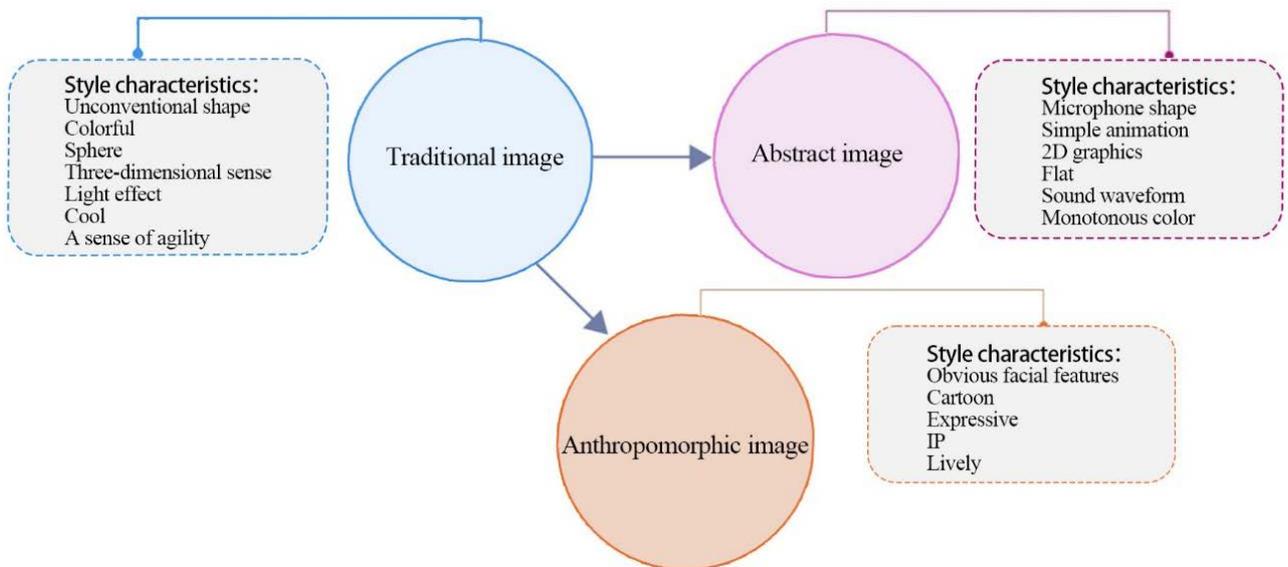
**Fig. 4.** Anthropomorphic images



**Fig. 5.** Trends and characteristics of digital visual image design for intelligent chatbots

However, with the continuous development of the field of human-computer interaction, the digital image design of intelligent chat robots has gradually shifted towards abstract and anthropomorphic images. A key reason for this trend is to improve user experience. By injecting more anthropomorphic design elements into digital images, designers are trying to shorten the distance between humans and machines and enhance the emotional connection with users. The design of the abstract image is more simple and easy to understand, making it easier for users to interact with the robot, thereby improving user engagement and user experience.

Significant progress has been made in the design of anthropomorphic figures. Now, the digital avatars of some chatbots not only have human appearance characteristics but also display emotional expressions and body movements, making the robots more human-like. This design style can make it easier for users to communicate and interact emotionally with digital images, thereby improving user satisfaction and loyalty. For example, some digital avatars not only have facial expressions but can also simulate human body language, making interactions more natural and interesting.

In general, the design style of the digital visual image of intelligent chat robots has changed from traditional images to abstract and anthropomorphic images, which represents the development trend in the field of human-computer interaction. This change aims to improve the user experience and make interactions more natural, approachable, and fun. In the future, with the further development of technology, we can expect that the digital image design of intelligent chat robots will continue to evolve, bringing more intelligent, efficient, and humanized services and experiences to users.

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## СУЧАСНІ ТЕНДЕНЦІЇ РОЗВИТКУ ЦИФРОВОГО ВІЗУАЛЬНОГО ЗОБРАЖЕННЯ ІНТЕЛЕКТУАЛЬНОГО ЧАТ-БОТУ

**Мета:** *вивчити цифрове візуальне зображення інтелектуального чат-боту як зразок, проаналізувати тенденції дизайну цифрового зображення чат-боту та скерувати практику проєктування на покращення взаємодії з користувачем.*

**Методологія.** *У дослідженні використано метод поєднання огляду літератури та емпіричного дослідження. Завдяки аналізу існуючої дослідницької літератури та збору і аналізу існуючих проєктних випадків обговорюються тенденції дизайну цифрових візуальних зображень інтелектуальних чат-ботів.*

**Результати.** *Проаналізовано варіанти дизайну цифрових візуальних зображень чат-ботів, створено їх порівняльну класифікацію. На основі вивчення напрямків еволюції дизайну цифрового зображення інтелектуального чат-боту визначено основні типи стильових рішень – від традиційного до абстрактного/антропоморфного.*

**Наукова новизна.** *Дослідження спрямоване на вивчення останніх тенденцій та інноваційних дизайнерських ідей у дизайні цифрових зображень, щоб задовольнити потреби користувачів і*

viклики технологічного прогресу, створити унікальні та привабливі зображення інтелектуальних чат-ботів для користувачів і реалізувати новий досвід взаємодії людини з комп'ютером.

**Практична значущість.** *Результати містять пропозиції щодо інноваційного дизайну цифрових візуальних зображень чат-ботів, направлені на створення більш привабливих, дружніх та ефективних цифрових зображень, а також на підвищення практичної цінності застосування та задоволеність користувачів чат-ботами.*

**Ключові слова:** *дизайн; цифрове зображення; взаємодія людина-комп'ютер; візуальний дизайн; інтелектуальний чат-бот.*

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