

Application Programming Based on Human-Computer Interaction and Software Modularity

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Abstract. In the 21st century, cutting-edge information technologies such as artificial intelligence, blockchain and big data have profoundly affected the way human society is organised, the form of interaction and even the social structure. With the miniaturisation, mobility, intelligence and embedding of machines, the relationship between humans and machines has undergone fundamental changes. Human-computer interaction has gradually become one of the most important forms of interaction in human production and life, and human daily life centred on human-computer interaction has also undergone great changes. Various applications have been introduced into the lives of human beings, and at present, it would be difficult for human beings to carry out their daily lives without these applications as a vehicle for the development of information technology. However, complicated applications do not really enhance the usage experience in many cases, redundant information also ignores the real needs of users in this paper, which will focus on human-computer interaction, from the four aspects of human-computer interaction (HCI) HCI modes, HCI interfaces, HCI devices, HCI modalities, HCI patterns to analyse then borrow the concept of software modularity to optimise the current applications, and put forward some suggestions for improvement. This will make the application more suitable for the user's experience and reduce the burden of programme managers.

Keywords: Human-computer interaction; Software modularity; Applications. Artificial Intelligence User Interface.

1. Introduction

As an advanced tool invented by human beings, computer has had a profound impact on people's work and life since its birth. As an interface for information exchange between humans and computers and a methodology for human-centred system development, human-computer interaction (HCI) plays a very important role in the development of both humans and computers. Extensive research on human-computer interaction has provided a description of human interaction intentions and corresponding physiological and psychological constraints, as well as related knowledge, and has developed interaction technologies to help people accomplish previously unachievable tasks.

Since the 1980s, human-computer interaction (HCI) technology in the 21st century has made tremendous progress in the past decades, which has been driven by a number of factors, including advances in computer technology, sensor technology, artificial intelligence, and user experience design. In the context of the smart era, as computer technology is increasingly widely integrated into all areas of human life, and emerging information technologies such as Internet of Things (IoT) technology, deep learning technology, natural language processing, big data, and virtual reality technology are developing rapidly, HCI is becoming more and more ubiquitous and ubiquitous, and most of the daily life of human beings relies on the applications for which it is the main body. The popularity of mobile Internet allows people to be online all the time; touch-screen interaction technology allows people of all ages to use computers without barriers; the rise of virtual reality allows people to immerse themselves in the digital world at any time; and the breakthroughs in artificial intelligence enable machines to better understand human intentions and meet human needs. However, HCI, as an emerging technology with multi-disciplinary intersection, has not gained synchronous achievements with the technological development of multi-disciplinary fields, but instead has fallen into a development bottleneck. The reason for this is that, on the one hand, the user-

centred main idea of HCI is neglected, and the real demands of users are ignored. On the other hand, there is no layering through reasonable modularity, which makes the application very redundant and increases the cost of developers as well as the machine itself. In this paper, we will outline the four aspects of human-computer interaction and the development status of each aspect, consider why applications have encountered difficulties, analyse them by means of modularity, and finally make some suggestions.

2. Related Works

In related works, the Figure 1 showed the four aspects of human-computer interaction, including interaction device, interaction interface, interaction mode and the interaction modality. And, Figure 2 showed the four processing line of interaction and interface, and which composing of command language, graphical user, network user and virtual reality. Finally, the Figure 3 showed main structure of interaction device.

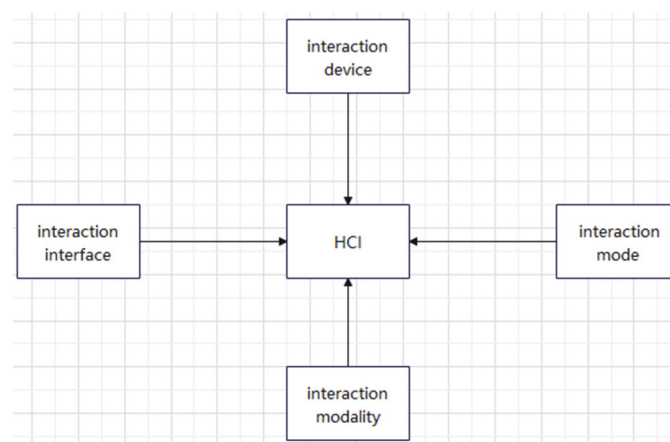


Fig. 1. Four aspects of HCI

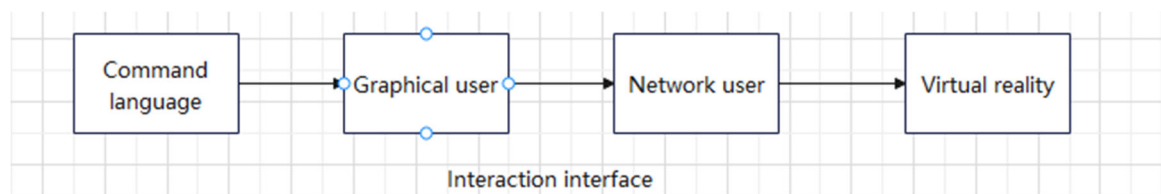


Fig. 2. Four processing line of interaction and interface

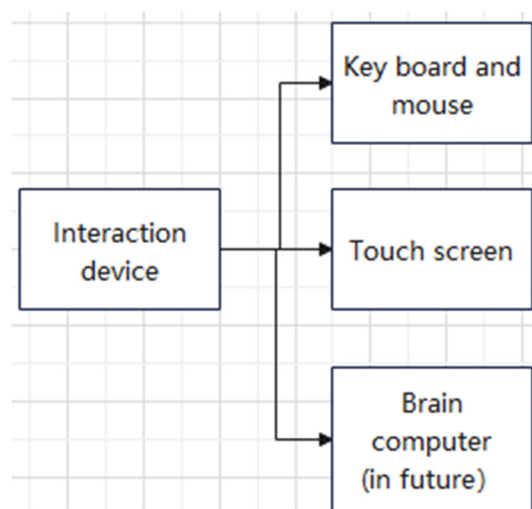


Fig. 3. Main structure of interaction device

Case description: Moving from normal human contact with non-AI computing systems to interaction with AI systems should be the primary focus of present HCI research [1]. Generally speaking, human-computer interaction has four aspects interaction interface, interaction device, interaction modality, and interaction mode [2]. Around today's an application, these four aspects of things continue to iterate, human-computer interaction interface presents by the command language, graphical user to the network user, and then to the development of virtual reality vein, despite the slow development of brain-computer interface technology field, the human-computer interaction interface relies on the physical carrier has begun to shift from the machine to human body trend. As for the interaction device, although there has been the brain-computer interface technology and other extensions mentioned above, the main body is still the keyboard and mouse as well as the touch screen. Touch screen greatly reduces the threshold of human-computer interaction, even a newborn baby can easily complete the first human-computer interaction in life by touching the screen. Fuelled by technology companies, various types of touch-screen terminals have filled our lives, shaping a new generation of human-computer interaction. It is also the carrier of most of the current applications. Modality originates from the field of linguistics and is a system of comparable and contrasting symbols [3]. For interaction modality, in 2023, it is already a multimodal and cross-modal era, text, audio, picture and video provide a variety of rich human-computer interaction experience. In the past year, the development of ai technology has enabled AI models with cross-modal generation capability, i.e., the ability to understand and generate another modal information after receiving a certain modal command from the user, and now AI drawing tools such as novelAI can intelligently generate an image based on textual commands. Finally, there is the interaction mode, from command response to intelligent response through AI and sensors, to the current natural language processing technology represented by chatgpt will continue to revolutionise the human-computer interaction mode. Apps have evolved to be very smart and easy to use in various fields. Human-computer interaction in visual news applications allows users to increase their autonomy when reading news software, transforming the way they read news, and intervening in human-computer interaction so that users are not purely recipients of news, but rather participants in the production of news, which is also more conducive to obtaining the information they want [4]. At present, the use of human-computer interaction technology to provide personalized medical services has been widely used in most medical institutions and has taken shape. The use of HCI to provide personalized care approaches, as the focus of each care approach may vary depending on the disease and outcome preferences, can be tailored to the specific disease and patient's outcome expectations through HCI and applied to healthcare facility procedures [5].

However, in the current situation, in the human-computer interaction of some applications, full of redundant information, and lack of content validity of the operation [6], in the human-computer interaction interface, the huge amount of modal information brought about by the program ui does not bring the user intuitive feelings, but due to the lack of layering and modularity, the user is not able to quickly obtain the information that they want, and may be due to the age or cognitive reasons, it is difficult to achieve the desired goals of the program, and it also creates a bad influence on the maintenance of the program developers as well as the feedback.

3. Discussion

With the development of ai technology, the application is gradually intelligent, more and more functions, but the user is more and more difficult to use, ui redundancy, complex interface, many key functions are hidden, for mobile phone users, bad interface will not only make the mobile phone users cannot experience any fun, but also make the mobile phone users because they cannot find some of the interactive elements that should be there, or poorly designed interface elements They are also confused and annoyed by the fact that they can't find certain interactive elements or poorly designed interface elements that should be there.

This problem has led to a lot of thinking. The reason for this is that apps are designed to add more functionality and content, while neglecting the user experience. From a dialectical-existential perspective, user conditions may be dehumanizing [7]. And user oppression has to be taken into account in the application design, includes sexism, racism, classism and ableism, but also special relationships related to human-computer interaction: userism. This is a potential problem, if we want to achieve a more appropriate user experience, to start from the user-centred concept. Reduce the meaningless behaviour in human-computer interaction, on the other hand, on the current Web in the web design and development of the status quo analysis, web pages of poor page layout and redundant content makes the user in the use of the web page cannot find the urgent need for information as well as functionality, for the developer, it will lead to the development of Web applications is not efficient, increasing the amount of late maintenance tasks [8]. From this point of view, if you do not start from the user-centred perspective, it will only lead to a very difficult situation for both users and openers. And this is the importance of modularity, on the basis of human-computer interaction, reasonable layering can be on the web page through the concise ui will be the most important function of the representation of the user's need for content through a more reasonable human-computer interaction and human-computer interaction modalities to be presented [9], so as to improve the user experience.

Suggestion: For the above problems, there have been physical cases of human-computer interface optimisation on such applications as mobile phone games to enhance customer experience. Factors such as mobile phone's button design, limited screen size and data processing capability limit the player's entertainment experience and interactivity freedom. So, it should break through the limitation of mobile phone hardware, take advantage of the fact that most of the users are low-end and middle-end mobile phones to develop game interfaces with mobile phone characteristics, and the interaction mode should be diversified and liberalised, develop towards multi-channel human-computer interaction mode, and focus on human-to-human interaction. The visibility, interactivity, and hierarchicality of mobile phone game interfaces have deepened the aesthetic feelings of the players and allowed the players to get a stronger aesthetic experience in order to enable users to obtain a more intuitive, healthy and comprehensive gaming experience [10]. In terms of human-computer interaction mode, optimise the input mode, through the study of different user habits, and some disability or special disease groups, adopt different interaction modes, for example, provide the hearing playback function, so that the visually impaired groups or when the user focuses on other things, can listen to get the important information on the application and complete the interaction through the more subtle voice input function. In terms of the interactive interface, the whole page of the application is layered by modularity, and the whole page is expanded from simple to complex through various small links to find a reasonable and effective layout of the application. At the same time with the artwork design, so that the user in the use of the user experience through the beautiful page to enhance the user experience, through the colour or picture to distinguish between the various important points. In this way, it can also save efficiency, thus giving the developer more time to polish the program, but also to facilitate his maintenance and upgrading, which is the importance of human-computer interaction and software modularity for the development of program design.

4. Conclusion

In the future, the development of HCI technologies will continue to be driven by innovation and evolution, which may involve more advanced sensors, more powerful artificial intelligence, smarter automation systems, and more intuitive user interface design through the concept of modularity. From the perspective of human-computer interaction, artificial intelligence brings breakthroughs in human-computer interaction. Traditional human-computer interaction technologies such as mouse, keyboard, and touch screen can hardly enable human and computer to achieve efficient and natural interaction as between human beings, while artificial intelligence technologies such as speech recognition, image analysis, gesture recognition, semantic understanding, and big data analysis can help computers better perceive human intentions and complete tasks that human beings can't accomplish from four aspects,

driving the development of human-computer interaction. From the perspective of human beings, the development of artificial intelligence is the development of computer technology, and the ultimate goal of computer technology development is to serve human beings. In order to serve human beings, artificial intelligence inevitably needs to study the characteristics of artificial intelligence, the characteristics of human beings, and the problems encountered in the process of interaction between human beings and artificial intelligence, which is precisely the problem studied by human-computer interaction. From the perspective of information technology development, the world today is no longer driven by a single technology. Human-computer interaction, as a typical multi-cross-cutting technology, will bring great improvement to the whole level of information technology in terms of research and development. Technologies such as the Internet of Things (IoT), Deep Learning, Natural Language Processing, Big Data, and Virtual Reality will truly transform the user experience when using applications. These advances will continue to change the way we interact with the digital world and create new opportunities and challenges.

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