

An interactive design solution based on AR technology for mobile phone addicted user

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Abstract. With the rapid development of wireless technology, mobile phones are becoming widespread at all levels in the society. Advancement in technology is leading to people's over-dependence on mobile phones and in many cases emergence of mobile phone addiction. Therefore, the purpose of this project is to explore an interactive way to relieve the excessive use of people's attention and addiction to mobile phones. The habits of using smartphones were investigated first. Based on the results of data analysis, the conceptual design of a new inter-active solution based on augmented reality (AR) technology was proposed. This design solution is an attempt to alleviate the addiction to the mobile phone using AR, artificial intelligence, and environmental computing technology.

Keywords: Mobile Phone Addiction, Smart Glasses, Image Recognition, Augmented Reality

1 Introduction

Mobile phone has accumulated an enormous number of users because of its portability, convenience, privacy, and easiness [1]. However, the over-dependence on smartphones has led to several psychological and physiological problems [2, 3]. Long-term use of smartphones can lead to mobile phone addiction and chronic neck muscle strain [4], which directly endanger the physical and mental health of users [5, 6].

Understanding the core of mobile phone addiction is the first step to address the above problem. Mobile phone addiction is intrinsically a kind of behavioral addiction [7]. The main manifestation of this phenomenon is fear of missing information. The convenience of transmitting information by smartphones causes the daily using of mobile phones to be uncontrolled [8]. Continued use of smartphones for a long time even produces negative emotions. This kind of negative emotion is a kind of diffuse anxiety, which is called fear of missing [9]. Fear of missing information is an important factor leading to mobile phone addiction [10]. The more frequently we use mobile phones, the more our attention are occupied by mobile phones, which forms a vicious

cycle [11]. Therefore, people are becoming increasingly impatient with their work because of attention-deficit and mobile phone addiction [12].

The effective solution to mobile phone addiction is to broaden the channels for people to access information, rather than dependent on mobile phones only [13]. To achieve this goal, this study designed a pair of smart glasses that can actively provide the information needed in the characteristic scene to users. The information is projected into the physical world by AR technology, so that people can interact with information in the real world. At the same time, the designed system is also equipped with a touch board, which is used as an information carrier when no physical (flat or curved) surface is detected. Users can interact with information accurately. This study explored the possibility of this kind of intelligent glasses for daily use. The new technology not only meets the user demand but also reduces the dependence on mobile phones. The developed system aims to provide better users experience when interacting with the system. Starting from the interaction form, this paper explores the design of glasses, which provides reference and experience for future research on the interaction form of mobile phone dependence.

2 User Research

To find out the situation and scenes for using mobile phones, this study utilizes the methods of observation, context mapping, and interview to conduct user research. Through the user research, the scenes and current problems were identified and the basic characteristic and persona were summarized.

2.1 Observation

First of all, a follow-up observation on a female employee and a male college student was conducted (Fig. 1). During the observation, some common problems were discovered which can reflect the mobile phone usage habits of the subjects. The subjects checked their mobile phones unconsciously even while studying and leisure activities. They even stop doing their main work. Based on the results of observation, their motivations for using mobile phones were asked. Referring to the research of Tran et al [14], the motivation of people to use mobile phones can be roughly divided into filling their spare time, alleviating social embarrassment, taking a break between works, and looking forward to information recovery and update. The above results of observation and investigation confirmed these motivations.

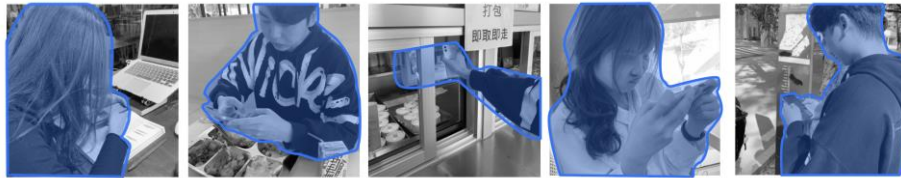


Fig. 1. Smartphone scenes

2.2 Context Mapping and Interview

To further understand user behavior, four students and three working staffs (There are two female and two male participants) were invited to participate in the context mapping and interview. The participants were asked to fill in the relevant forms on week-days and rest days to record the use of mobile phones by using an app called Off-Screen. Participants were required to record the usage time of mobile phone screen every day to obtain relevant data.

By analyzing the forms, results show that participants behaved most negatively in the scene 'look forward to the replies and notifications' and most positively in the scene 'rest after work' and 'kill the spare time'.

Based on the analysis, the interview was hosted to find out the feelings of participants in different scenes. The contents of the interview showed that most of the interviewees were expecting information updates and worried about missing information. Therefore, the interviewees have to pay more attention to smartphones, which distracts their attentions on work or study, thus resulting in anxiety and irritability.

2.3 Research Results

Participants spend about 40% of the time looking smartphone. Users' anxiety and curiosity about missing information exacerbate the problem. Based on the user research, the confusion (Fig. 3) and the expectation (Fig. 4) of users were summarized.

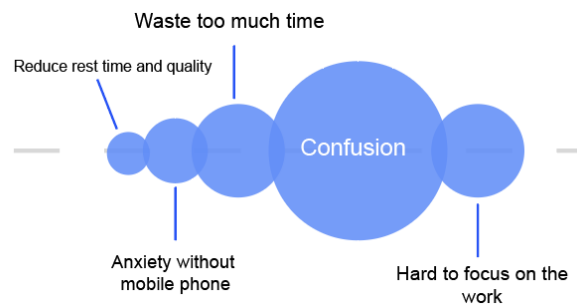


Fig. 3. The confusion of users

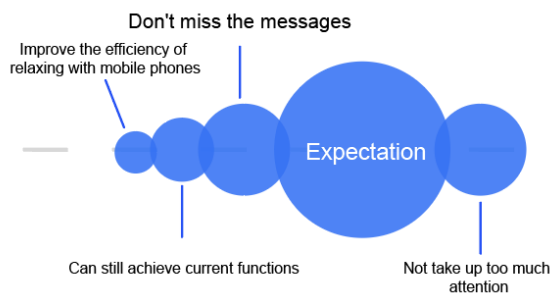


Fig. 4. The expectation of users

3 Design Process

Based on the research results, the design objectives were put forward. Firstly, the design should allow users to receive messages and notifications through multiple channels. Users need not allocate attention to mobile phones because of waiting for messages and message notifications. Secondly, the scheme can meet most of the entertainment needs of mobile phones, but with a corresponding time reminder mechanism. Finally, the design scheme actively provides different functions according to different scenes, to reduce the muscle damage caused by using mobile phones [4].

3.1 Concepts

People pay too much attention to smartphones because it is the only platform that connects everyone for most scenarios, leading users to ignore physical surroundings. If the information world could integrate with the physical surroundings, People will feel connected through interaction with the physical world directly without focusing on mobile screen only. Using the proposed interactive design solution, users can interact with information in the physical world. It will make people feel more connected (Fig. 5).



Fig. 5. Concept explanatory diagram

Because of the previous user research design insights, this study conducted brainstorming and proposed conceptual solutions. After the initial concept is determined, the specific design concept is further developed and explored (Fig. 6).

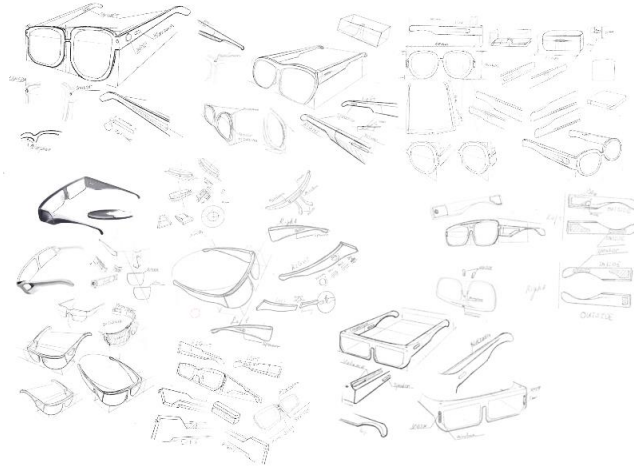


Fig. 6. Concept sketch

3.2 Hardware Design

The design concept of the hardware is a pair of intelligent glasses with a touch panel. The glasses are integrated with built-in acceleration sensors, an HD camera, and related electronic components. A high-definition camera is used to accurately judge the user's usage scene. It can also project messages and notifications into the physical world using augmented reality technology, ensuring that users do not miss any information. Moreover, the touchpad also was designed to provide a physical surface for the projected information. Users can also interact with the information more accurately through tapping on the pad (Fig. 7).

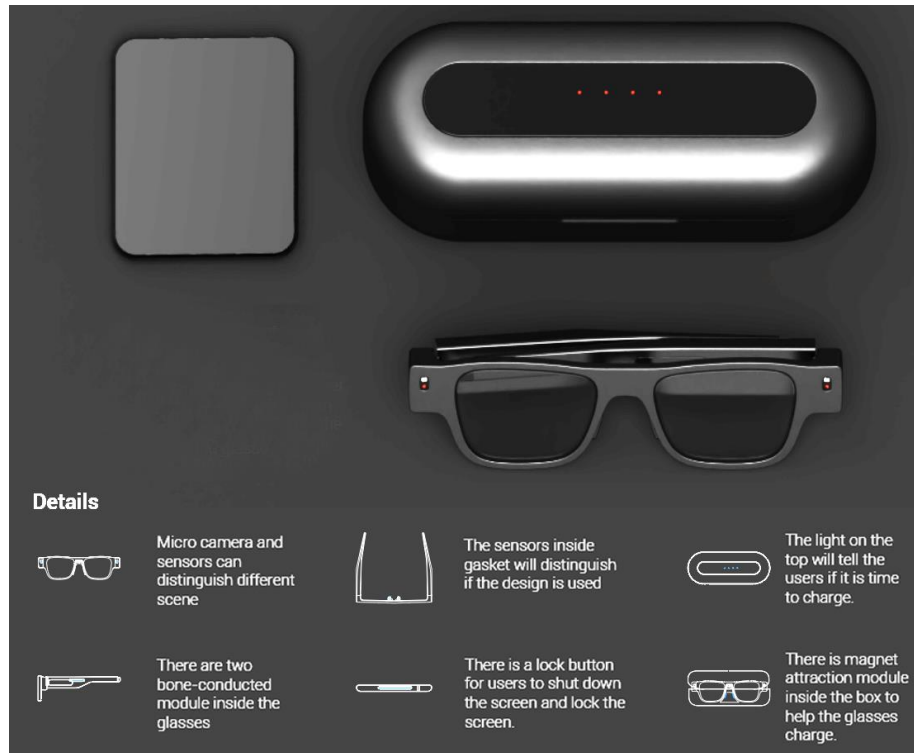


Fig. 7. The details of hardware design

3.3 Interaction Design

As the media of information interaction has changed, the original form of interaction on the mobile phone should also change. Therefore, this project designs the information interaction forms that may appear in the smart glasses. For better understanding, the following figures show the usage scenarios by storyboards (Fig. 8, Fig.9, Fig.10, Fig. 11).

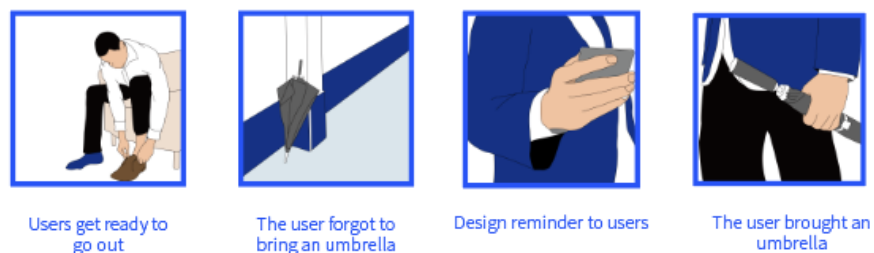


Fig. 8. Users get ready to leave for work.



Users use design to browse social media



No physical screen
weaken its
on attention

Fig. 9. Users go to the workplace.



Users focus on work



The design displays
unread messages on
the desktop



The user replies via a
virtual keyboard



User continue to
focus on his work

Fig. 10. Users arrive at the office and start working.



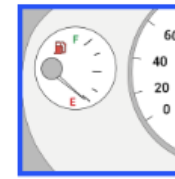
The design shows
navigation on the
windshield



Users respond to
messages via a voice
assistant



User has met a red
light, news out of the
windshield now



When the user's vehicle runs
out of gas, design and
display the route of the gas
station for his/her choice

Fig. 11. Users drive for hiking.

The relevant wireframes are drawn according to the different scenarios to clarify the logic of information interaction, as shown in Fig. 12.

WIREFRAME

For several typical scenarios, I designed the relevant graphical interface and the interaction during it.

Users arrive at the office and start working

Users arrive at the office and start working

Users can open the trackpad's virtual screen by pressing the lock screen button on the trackpad.

Users get ready to leave for work
When the user is ready to go out, if he/she forgets to bring necessary things (for example, he/she forgets to bring an umbrella in the rainy day), the design will remind him/her and display it on the trackpad.



Fig. 12. Wireframe of interaction design

According to the physical size of the projection medium, the user interface is designed (Fig. 13). The design scenario is shown in Fig. 14.

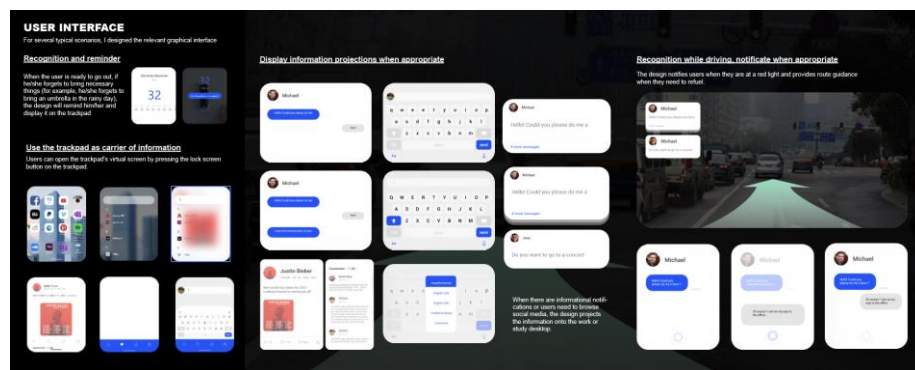


Fig. 13. Interface design



Fig. 14. Scenario

4 Conclusion

This study focuses on developing an interactive design solution based on AR technology that can relieve people's over-dependence on mobile phones. It should be noted that there are some limitations in this study. First, more user samples should be added. Secondly, due to the limitation of the equipment, the real effect of the new interactive mode could not be demonstrated very well. In further research, the experiment will be carried out in a more rigorous environment, and the irrelevant variables will be strictly controlled, to reduce the interference of environmental factors on the research and demonstrate a more realistic interactive experience.

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