

equals 367,334 (as shown in Figure 1.). However, every application (APP) is specified with a unique icon. It is obviously an impossible task to distinguish and even harder to remember numerous icons. Therefore, an auxiliary graphic audio system was proposed to clearly illustrate the meaning and functions of each icon at any time.

LITERATURE REVIEW

Existing studies confer advantages on auditory display, both in terms of efficacy in apprehending certain types of data, and efficiency in terms of user effort or time. Yet Human Computer Interaction (HCI) research supports that the addition of audio displays can reduce subjective workload. Brewster et al (2000) investigated the application of sound to enhance usability of mobile Personal Digital Assistant (PDA) devices.

As well as reducing workload, presentation of data in audio rather than graphical formats can promote comprehension of certain structures. Accounts from significant scientific events corroborate theoretical evidence that the auditory system is capable of discerning data structures that are impervious to graphical analysis (Eldridge, 2005). According to Brewster and Crease (1999), icons and earcons deployed in mobile computing device menus have been shown to have positive effects in shortening performance times and decreasing errors.

According to Cohen, Giangola and Balogh (2004), an auditory interface enables a device to interact with the user purely through sound - typically speech

input from the user, and speech plus non-speech output from the system. Non-speech output (often referred to as non-verbal audio or NVA) may include earcons (auditory icons, or sounds designed to communicate a specific meaning), background music, and environmental or other background sounds. Moreover, presbyopia is the decreasing ability of the lens to focus with increasing age. People are seen a steady decline in amplitude of accommodation from the early forties. Generally, by 45 years, most people begin to notice problems associated with presbyopia (Ross et al., 1996).

Norman (1998) pointed out that bad Interface problems are usually to lack visibility and lack of easy to appropriate conceptual model. Auditory interface in which speech plus non-speech output from the system is utilized, may play an important role in graphical user interface (GUI) in which graphical icons and visual indicators are not clearly of visibility or perceptible to the user.

Previous application of audio output includes 'menu voice navigation' and 'selective confirmation voice'. The former would read all the items on the screen, while the latter only read the selected item. Keyboard and mouse systems were used for switching on the audio output. With the growing use of touchscreen displays, the interface of switching on the audio output needs to be redesigned.

METHOD

An experiment was carried out to verify the effectiveness and feasibility of the auditory interface.



Figure 2. The graphic audio switch was aligned with basic function iconic keys at the bottom of touchscreen.

A follow up interview was taken right after the experiment to collect correspondents' opinions including subjective satisfaction. Finally, a positive result with detail analysis is anticipated.

EXPERIMENTAL INTERFACE DESIGN

A graphic audio switch was adapted and aligned with basic function iconic keys at the bottom of touchscreen. User can initiate audio output by dragging the audio switch to the icon where he/she would like to listen to the audio instructions (as shown in Figure 2.).

By dragging the graphic audio switch to and overlap a specific icon, a user may initiate basic voice information of the icon. In the same time, the red frame will appear on this target icon. Farther detail instructions will be prompted if the user 'long press' the overlapped audio switch. Audio output can be terminated by hardware 'return' key which is usually available in touchscreen mobile phone or by dragging the graphic audio switch back to its original location.

Beside the above-mentioned graphic audio switch, 12 icons of various applications were arranged in the screen.

RESPONDENTS

The experiment was set 15 respondents; including novice and experienced user groups, as well users with presbyopia. Novice users were defined as users without any experience of using a touchscreen phone; while experienced users must own a touchscreen phone and use it regularly.

PROCEDURE

- The purpose of experiment is to verify the effectiveness and feasibility of the auditory interface and to examine the subjective satisfaction of respondents. Respondents were tested and interviewed. After the test, they answered two questions as below: Is the graphic audio switch easy to use? Answer it from 1-5 levels, please.
- Would you like to use the graphic audio switch frequently? Answer it from 1-5 levels, please.

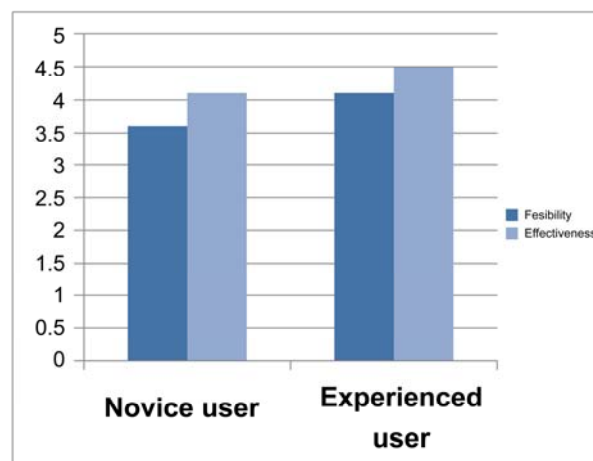


Figure 3. statistics comparison of feasibility and effectiveness of the additional audio system for novice and experience users.

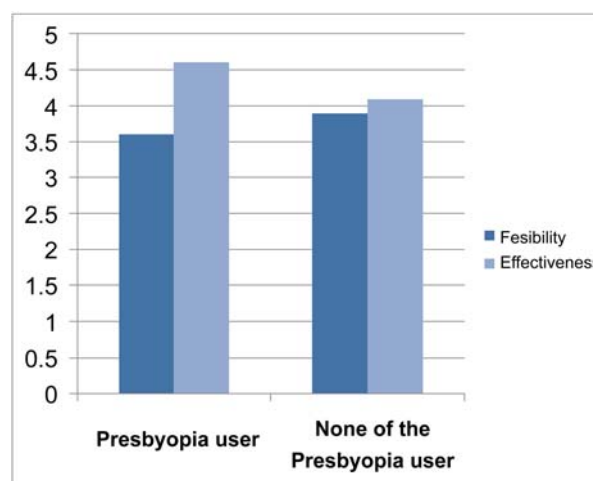


Figure 4. statistics comparison of feasibility and effectiveness of the additional audio system for presbyopia and none of the presbyopia users.

CONCLUSION

The statistics result was shown that the feasibility and effectiveness of the additional audio system is high obviously. (as shown in Figure 3.). It indicates that the graphic audio switch is easy to use, even novice user. And it is effective to use, even experienced users.

Moreover, the statistics result also was shown that the effectiveness of the additional audio system is high obviously for presbyopia users. (as shown in Figure 4.). It indicates that the graphic audio switch is great help for presbyopia user.

Finally, most respondents gave high evaluation of feasibility and effectiveness of the graphic audio switch of the additional audio system.

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