

Evaluation of Some User Interfaces for Elderly Persons

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Abstract: We have already proposed a new concept of ‘universal multimedia access’ intended to narrow the digital divide by providing appropriate multimedia expressions according to users’ (mental and physical) abilities, computer facilities, and network environments. Our previous work has evaluated some types of multimedia user interfaces only for younger persons who can utilize keyword search functions. In this paper, we describe several multimedia contents particularly for elderly persons’ aid and evaluate them based on a questionnaire survey.

Keywords: Multimedia, User Interface, Digital Divide.

1 INTRODUCTION

Recently, immense multimedia information has come to be exchanged on the Internet, where 3DCG, video, image, sound, and text are involved in various circumstances with terminal devices, networks and users different in their competences and performances. This fact may easily lead to ‘digital divide’ so called unless any special support is given to the weaker.

The universal design concept is proposed to support handicapped people in their social activities [1]. In the computer science field, the universal web [2] has been proposed to evolve this concept. However, this does not support to switch the contents, media or its quality of service (QoS) function to work the devices and network environments in their full performances. On the other hand, many studies about QoS function proposed to optimize video quality for priorities on users’ requests [3]. These studies focused on performances of devices and network environments but neither users’ abilities nor contents. Of course, there were also several studies on ‘universal multimedia access (UMA)’ but they could not narrow the digital divide because they concerned ‘content switching’ only [4].

Considering this fact, we have already proposed a new concept of UMA and its switching functions [5] intended to narrow the digital divide by providing appropriate multimedia expressions according to users’ (mental and physical) abilities, computer facilities and network environments. In this paper, we introduce some multimedia contents for user switching function and evaluate a questionnaire survey conducted for elderly persons.

2 UNIVERSAL MULTIMEDIA ACCESS

The digital divide is caused by the differences in users’ personal competences, computer facilities and network environments with such detailed items as follows.

(1) Personal competence: Physical abilities for seeing, hearing and manipulating; linguistic literacy; computer skill and cultural background,

(2) Computer facility: Processing power, resolution, color quality, sound quality and battery life,

(3) Network environment: Bandwidth availability, specification and transfer mode.

Therefore, multimedia information is necessarily accompanied by switching user interface, media and QoS parameters reflecting these differences. Here, we present a new approach to UMA for elderly people with handicap in working their devices and network environments in full performances based on such a concept as shown in Fig.1.

3 SWITCHING FUNCTIONS

UMA is to selectively provide three kinds of switching function, namely, user interface switching (UIS), media switching (MS) and QoS switching (QS). Fig.2 shows these switching functions working as follows:

(SF1) UIS: Switch to user interfaces (UI) appropriate for users’ competences and display devices,

(SF2) MS: Switch to media appropriate for users’ competences, performances of terminal devices and networks,

(SF3) QS: Control media qualities appropriate for users’ competences and terminal devices.

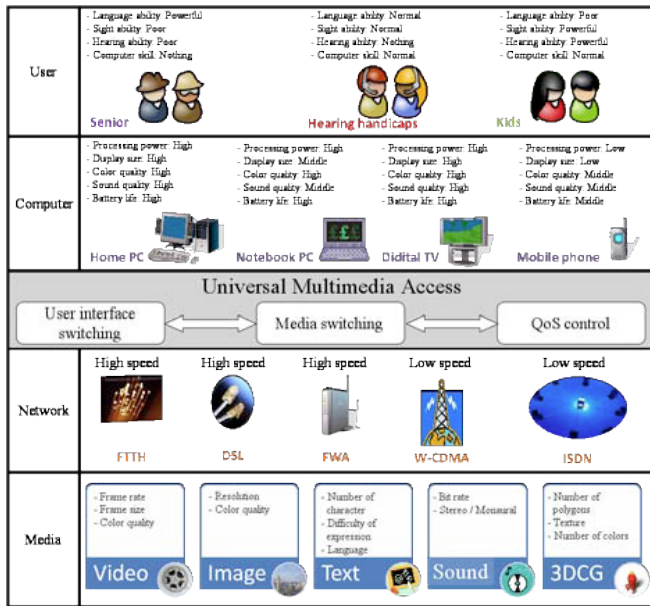


Fig. 1. UMA.

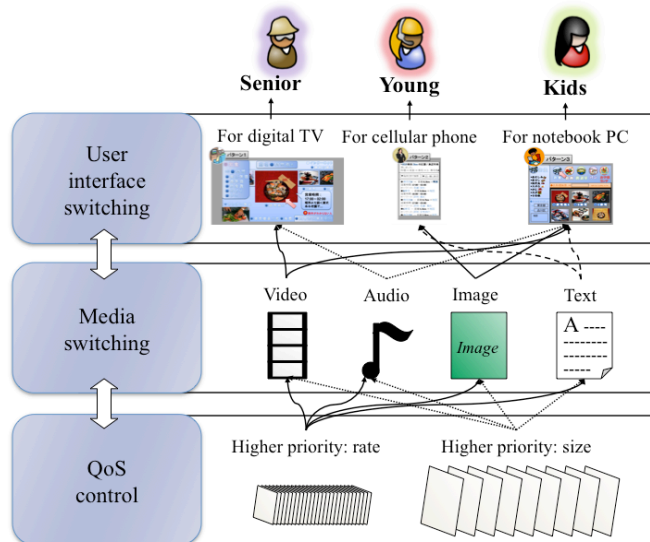


Fig. 2. Switching functions

These functions are applied in the ascending order (from SF1 to SF3) at beginning to play multimedia information or in the descending order at playing.

4 USER INTERFACE SWITCHING

UI provides users with appropriate operations and media according to their computer skill and computer facilities.

Computer skill is graded in such a way as follows.

(G0) No Knowledge about Computer: Unable to operate any computer functions.

(G1) Computer Beginner: Able to start up an application software such as Web browser and play media.

(G2) General Web User: Able to operate general Web pages and select to play a media.

(G3) Internet Expert: Able to use efficiently interactive online applications such as a search engine.

On the other hand, computer facilities are rated from several viewpoints and classified into 4 levels (None, Low, Middle, High) to setup media.

UI is provided differently according to computer skills and facilities. Table.1 shows 12 types of UI expressed in a matrix.

Computer beginners are supposed to select Broadcast Operation (BO) so as to play media according to the program without complicated operations. The user can get information just like watching TV because it is not necessary to operate any application software fundamentally. Choice Operation (CO) is intended for general Web users so as to select media only. But it takes user much time to select one from a lot of media. Search Operation (SO) is supposed to support Internet experts by providing a keyword search function.

Low power terminals are supported to play AA and text with only low graphics power and narrow bandwidth of network. Middle power terminals are to display contents such as combinations of still image and text. High power terminals play video requiring not only high power CPU but also high power Graphic device.

A layout is used to put media on UI and to specify the display region, display size and number of media for resolutions of the terminal device and the media. These relations enable a layout to specify the display position according to the display size and the number of media.

In order to introduce UIS, we focused on CO because willing users are supposed to perform this operation driven by necessity. On the other hand, they will not use any operation without CO. From this point of view, CO is applied to UIS switching from a current UI to desired one and controlling types of UI with buttons just like TV remote control.

Table 1. User interface according to user's operation and types of media

| Operation | Media | | | |
|-----------|--|--|---|--|
| | AA (Ascii Art) | Text | Image&Text | Video |
| Broadcast | - No operation - Displaying a AA according to the program | - No operation - Displaying a text according to the program | - No operation - Displaying images and text according to the program | - No operation - Playing a video according to the program |
| Choice | - Selection - Displaying a AA according to the program | - Selection - Displaying a text according to the program | - Selection - Displaying selected images and text | - Selection - Playing a selected video |
| Search | - Keyword search - Displaying a AA according to the program | - Keyword search - Displaying a text according to the program | - Keyword search - Playing searched images and text | - Keyword search - Playing a searched video |

5 IMPLEMENTATION

Our ideas were implemented as Flash applications running on a web browser as shown in Fig.3. These applications introduce the sightseeing area called the 'Keishouchi (=Splendid scenery)' contents providing the 12 UIs mentioned above. These UIs can be switched to a desired one using 'software remote controller (SRC)' as shown in Fig.4. SRC is supposed for general Web users and over so as to select a UI with simple button operation because other users would not like complicated operations.

6 EVALUATION

In order for evaluation, the web-based questionnaire survey system has been used to correct for the results of questionnaire sheets and to support following functions:

- (ES1) Make a new questionnaire,
- (ES2) Perform a questionnaire survey,
- (ES3) Output the results of survey.

The system published contents [8] as shown in Fig.5 and was constructed on the following 4 types of software:

- (FW1) Web server: apache 2.2.14 [10],
- (FW2) Web Survey System: LimeSurvey 1.90 [11],
- (FW3) Script language: PHP 5.3.1 [12],
- (FW4) Database: MySQL 5.1.41 [13].

A questionnaire survey has been carried out for 5 elderly persons (over 70 years old) using the questionnaire sheet as shown in Fig.6. In the survey, the graduate student instructs them to operate the UI and fill out to the sheet. For this reason, none of them can do any computer operation. The results are shown in Fig.7. From the evaluation, we find that they can only use BO in order not to operate a general PC, but CO is preferred to BO using a tablet PC. Also, the information can be understood easily by video content regardless of its operation. But both of text and ascii art content are more difficult than other contents.

7 CONCLUSION

In this paper, we discussed the UI appropriate for low computer skills and facilities. Especially, we evaluated the 12 types of UIs for elderly persons. From the evaluation, elderly persons can only use BO in order not to operate a general PC, but CO is preferred to BO on a tablet PC. Currently, we are evaluating SRC and its UI for more persons. In near future, we will construct some types of content for evaluating UIS and other switching functions for UMA.

| Operation | AA | Text | Image & Text | Video |
|-----------|----|------|--------------|-------|
| Broadcast | | | | |
| Choice | | | | |
| Search | | | | |

Fig. 3. 'Keishouchi' contents

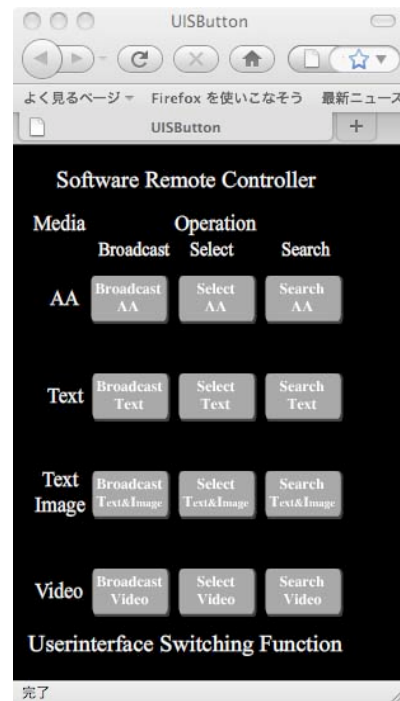


Fig. 4. SRC.

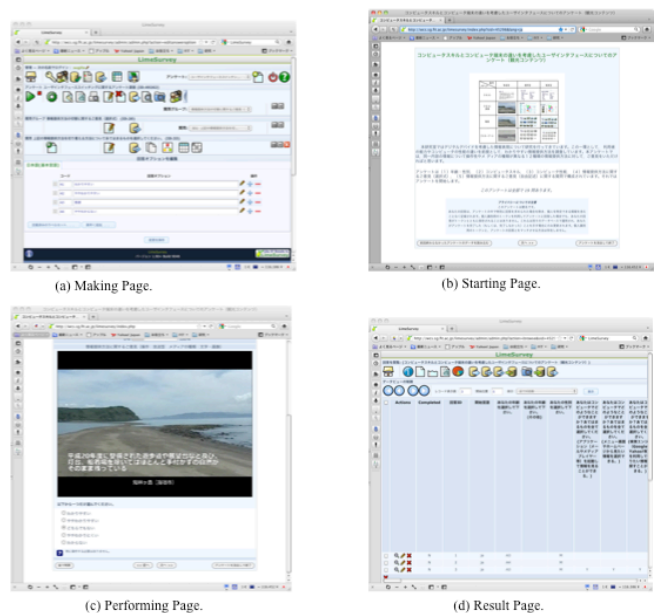


Fig. 5. The evaluation system

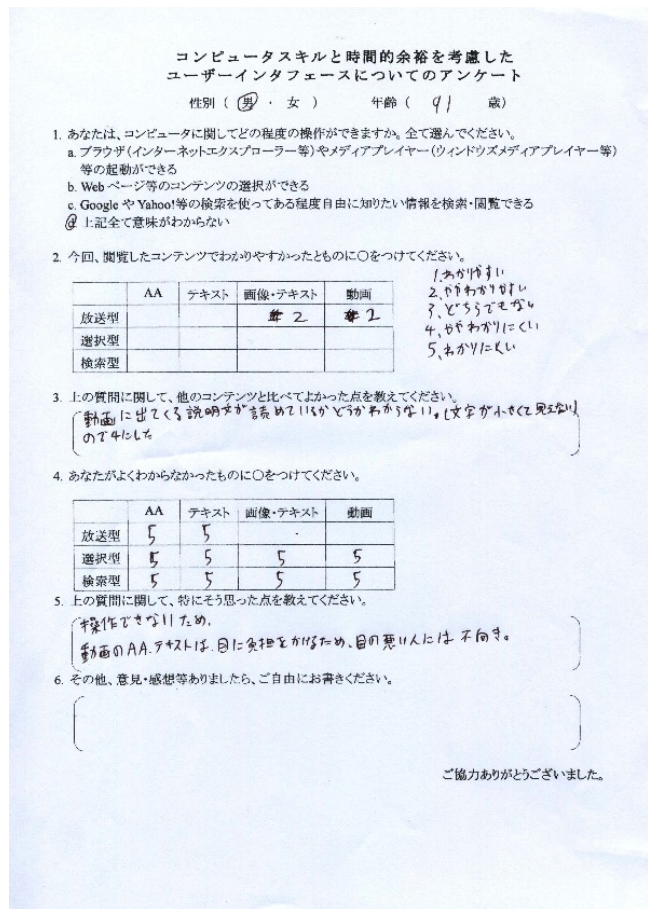


Fig. 6. The questionnaire sheet

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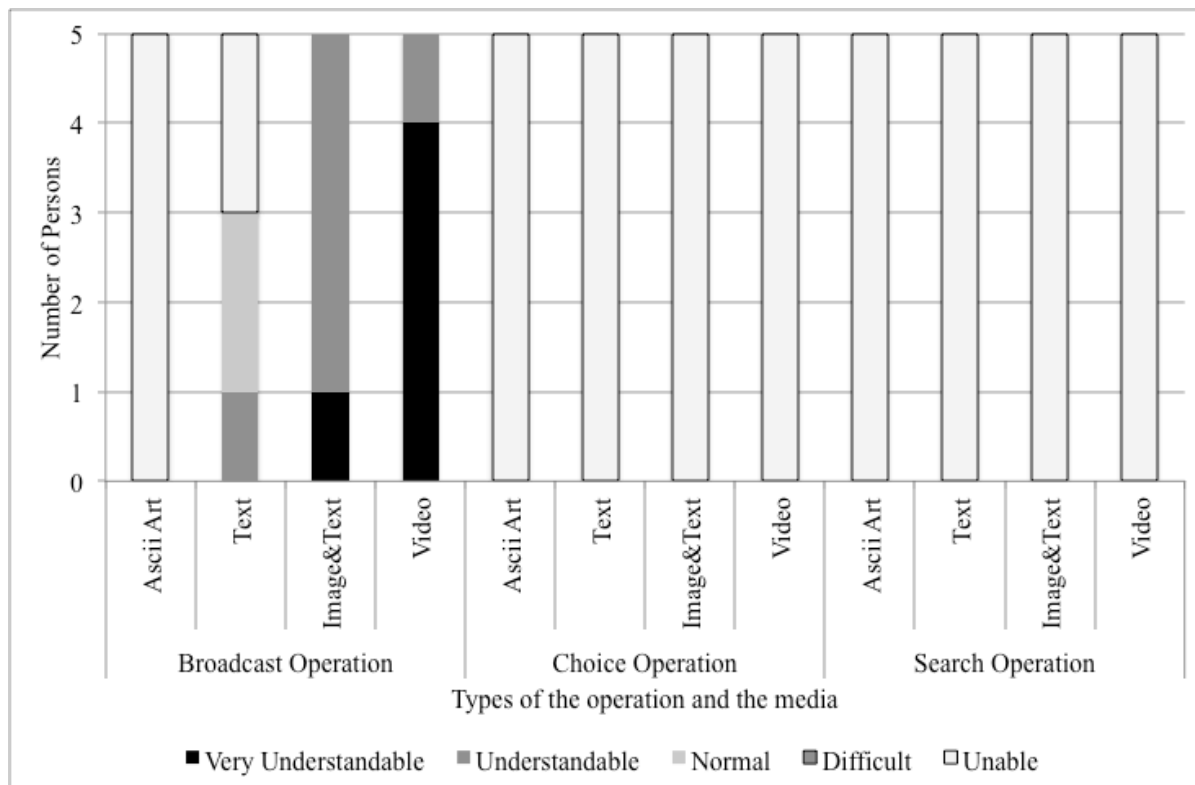


Fig. 7. The result of questionnaire survey