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Dental Interview System with a Native-language Interpreting Engine

Miki Ojima, Hiroo Tamagawa, Naoji Hayashi, Satoshi Shizukuishi

Department of Preventive Dentistry, Osaka University Faculty of Dentistry, Osaka, Japan

Abstract

We developed a Dental Interview System with a Native- language Interpreting Engine (DISNIE) on the Internet. DISNIE uses simple natural sentences without dental terminology and interprets these sentences in five languages such as Japanese, English, Korean, Chinese and French, respectively.DISNIE is a good tool not only for patients who are able to read, write and speak only their mother languages but also for the staff at a dental hospital because of its accessibility via the Internet.

Keywords

WWW; Interview; Dentistry; Interpretation

Introduction

In this study, we report a World Wide Web (WWW)-based multilingual interview system for dentistry.

Recently, many foreign students and workers have come to Japan so that the number of patients who are not able to read, write or speak Japanese fluently has increased in our dental hospital.

Increase in foreigners treated at our hospital has caused a communication problem between patients and dental staff. To avoid communication problems, some patients do not seek treatment in the early stages and the status of their disease is worse when they finally consult a medical institution.

However, advances in computer technology have provided access to better and more affordable personal computers [1,2]. Our dental interview system with a Native-language Interpreting Engine (DISNIE) attempts to solve communication problems in a dental hospital.

Foreign patients mainly consist of overseas students and their family members from Korea, China and other Asian countries. Overseas students can usually read, write and speak English very well and they can communicate with our hospital staff. However, their family members have difficulties in expressing their complaints and disease history in Japanese. Furthermore, the staff in our hospital do not have enough experience to communicate with foreign patients in their native language except for English. Generally, people can express and understand feelings of disease better in their mother language than in foreign language.

DISNIE can be used not only in a dental clinic but also at home via the Internet with a WWW browser. DISNIE has functions capable of interpreting disease status and other six typical situations in a dental clinic to and from five languages such as Japanese, English, Korean, Chinese and French.

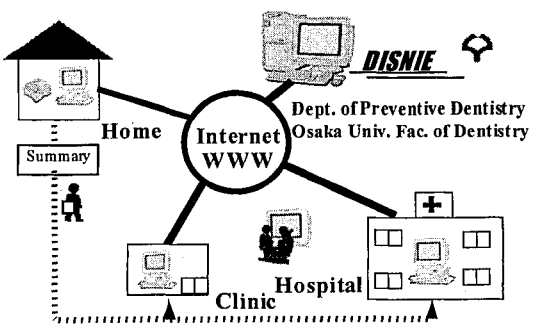

Figure 1 - Basic concept of DISNIE

Materials and Methods

Basic concept of DISNIE

Figure 1 shows the basic concept of DISNIE. DISNIE aids these foreign patients in expressing their medical and dental history in their mother language at home or in a clinic by simply pushing buttons or checking boxes on the computer display. Patients get a summary of their dental problems in a printed material interpreted in the native language of the dental staff.

DISNIE can be used bidirectionally. One function is as a tool that can translate complaints of the patients to the dental staff and the other is as a tool for explanation from dental staff to patients.

Staff in a Japanese hospital can use DISNIE in Japanese characters when they need to explain the status of a disease, treatment plan, the treatment itself, medication, cautions after treatment, expenses and the next appointment. If the dental staff are Korean, they can use DISNIE with Korean characters.

To facilitate easy access to DISNIE, it is placed on the Internet. If a patient has personal computer connected to the Internet, he/

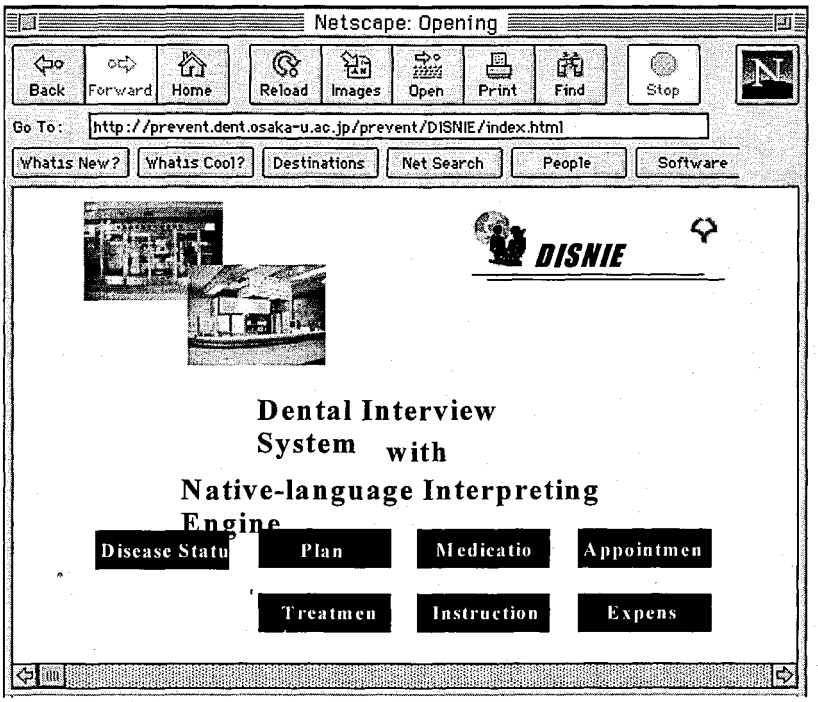

Figure 2 - Home page of DISNIE

she can access our system at home so that he/she can summarizes his/her complaints by simply pushing buttons before he/she comes to our hospital.

System description

Figure 2 shows the home page of DISNIE.

DISNIE is located on the World Wide Web at http:// prevent.dent.osaka-u.ac.jp/prevent/DISNIE/ index.html.

The Web server hardware is a SUN SPARC station IPX work station with 16 MB of random access memory and direct connection to the Internet by an Ethernet interface card. The server software is NCSA httpd, version 1.3, and it runs under a SunOS 4.1.3, operating system. The Web server executes a common gateway interface (CGI) program written in Perl,version 4.036.

The minimal requirements for use of the DISNIE are access to the Internet (by direct connection, Point to Point Protocol), the ability to run Transmission Control Protocol/Internet Protocol (TCP/IP), and a Web browser. Because of its special features, Netscape, version 3.0 or later, is recommended as the Web browser.

Languages on our system are Japanese, English, Korean, Chinese and French.

Results

Contents of our system

Table 1 shows the contents of DISNIE. Our interview tree contains seven parts consisting of disease status, treatment plan, treatment itself, medication, caution after treatments, expenses and appointments. These are selected using buttons on the screen. Every button reflects situations in a dental hospital. The first button for the disease situation is mainly for patients. The other six situations buttons are for dental staff.

Table 1 - Contents of DISNIE

Disease Status	chief complaint : tooth pain, decayed tooth, gums, oral cleaning, jaw, falling of anamnesis : general anamneis, history of the present present condition : tooth pain (spontaneous, cold water, occlusal) , gums (bleeding, pus discharge, mobilization, swelling), jaw (clicking difficulties on opening mouth), denture (breakage, inadaption)
Plan Treatment	filling, taking out nerve, extraction, anesthesia, x-ray,
Medication Instruction	how to take medicine, antibiotics, daily care for dentures, preventive care against periodontal disease, after extraction
Appointment Expense	date of next appointment how to pay doctor's bills, insurance, today's fees, approximate bills in total

The user can select the most suitable situation using the button on the WWW browser.

User interface

Fig. 3 shows a sample user interface of DISNIE.

First, the user needs to choose the situation with these buttons. Then, the user can select the languages they need to interpret from and to.

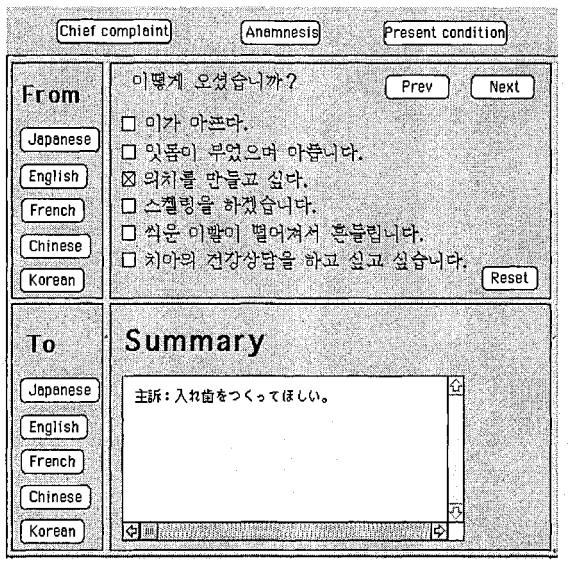

Figure 3 - User interface of DISNIE

The upper part of the screen shows interview items of seven situations that the patients want to express when they are in a dental hospital. After selecting the interview items on every page, the user can push the language button in the lower part of the screen to show interpreted results. The lower part of the screen can be changed when the user changes their language selection.

DISNIE has a hypertext structure and is written in hypertext markup language (HTML) so that any personal computer with a WWW browser can display the separate parts described above. DISNIE is a so-called platform free system.

To avoid software problems that will occur when the suitable font does not exist, two files are prepared to show the characters.

One is written in an HTML file with text file format and the other is an HTML file with gif (general image file) image file format.

Discussion

The popularity of the Internet is increasing all over the world and many WWW browsers have been developed. Newer browsers can handle many languages without any confusing presetting of the preference files.

However, we sometimes found that DISNIE users could not display foreign fonts, especially the Chinese font seton their personal computers because they do not know how to install a Chinese font set on their personal computer.

The most technically difficult problem was font availability in plat form free software. Some WWW browser such as Netscape communicator have the ability to display a fonts set for Western, Japanese, Central European, Traditional Chinese, Simplified Chinese, Korean, Cyrillic, Greek and Turkish. However, not all users have the font sets needed to run our system effectively.

To solve this problem, we prepared image files that treat the characters as images because an image file can be displayed without creating garbage on-screen even if the character code does not fit DISNIE.

When we compare our network-based interview system to a paper based system, the summarizing functions have an advantage.

DISNIE can be reached via the Internet so that users of the network could prepare a summary of their dental disease before they consult the hospital. However, the availability in the clinic is poor when the clinic have only one terminal for both the patient and staff.

Our system is the next stage of the interactive patient system of Marshall University [3] and is one of a concrete example of telepreventive dentistry. Telepreventive dentistry is the application of telecommunications technology to dental public health and preventive dentistry would enhance our ability to transmit information and improve human health.

We are also going to use this system as a computer assisted instruction (CAI) tool for dentistry. After reading the pages of DISNIE, students can learn how to explain disease status in dentistry to patients with simple natural language even though they have only a small amount of experiences in translating dental terminology to commonly used plain words.

Conclusion

Our dental interview system with the Native-language Interpreting Engine (DISNIE) on the Internet seems to be a useful tool for making a communication between patients from foreign countries and hospital staff.

Acknowledgments

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Address for correspondence

Miki Ojima, 1-8 Yamadaoka, Suita, Osaka 565, Japan.
e-mail : ojima@dent.osaka-u.ac.jp