Practical Use of Optical Cards In Medical Care

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Abstract

This paper reports excellent results with respect to application of optical cards in medical care, based on improvements in the technology for encoding optical cards and devices used to increase read-write speed, and also reports the issuance of the first Japanese standards for the data format of optical cards.

1. Introduction

In order to obtain background medical information, it would seem useful for patients to always carry a credit card-size card bearing their medical data, preferably an optical card which has large information storage capacity. This paper describes the status of application of optical cards in medicine as a result of the authors's work.

2. Design Considerations

There are problems related to the development of an optical card system for medical use. We shall consider two main areas: read-write speed and data reliability.

2.1. Read-write speed

In a busy outpatient clinic, it is important that only a few seconds elapse before data are displayed on the screen. At present, read-write speed is about 160 kbit per second and slower than a floppy disk.

2.2. Data reliability

Data reliability is considered necessary to achieve wide use of this type of card.

3. System Description

3.1. Hardware

(1) Main system

An NEC PC-9801 microcomputer with a 2 MB RAM-disk is standard and connected to the read-write device.

(2) Optical card

The optical card was produced by Dai Nippon Printing Company under a royalty-bearing manufacturing license from Drexler Technology Corporation. Its capacity is 4 MB.

(3) Application software

Application to medical use was developed by our cooperative study group using the standard data format recently issued by the cooperative research group of the Japanese Ministry of Education, Science and Culture [1]. We developed the software using an MS-DOS- based C language.

4. Status Reports

4.1. Read-write speed

In order to improve the problem of read-write speed,

reading of the optical card data was performed in two stages, the first being numeric and string information and the second, image information. Initially, as soon as the optical card was inserted into the read-write device, general information such as card-related information, patient-related information and the patient's portrait, was read directly and observed immediately on a display screen. However, the other numeric and string data were read at a speed of 160 kbit per second and stored on the RAM disk during the conversation between the physician and the patient. The data read were edited and were then capable of being promptly displayed by selecting items at will. Thus, the physician is able to obtain patient data without being conscious of any irritating delay. Because the capacity of image data is large and requires a great deal of time for reading, these data are only read when necessary. In the future, speed is expected to become even faster, despite the large volume of image data and the limitations imposed by the to-and-fro movement of the read-write device. However, we processed numeric and string data stored for ten years so that it could be used in practice, and did not feel that it was too slow.

4.2. Data reliability

Some research has been done on the application of optical cards to medical use [2,3], however, one of the problems which prevents the widespread use of optical cards appears to lack of data reliability due to the quality of the card material. There were problems as a result of mistakes in reading and writing the data on the card, and so we devised a writing process which ensures proper reading and writing of the data.

4.3. Data format

1) General information

Items of general information are as follows:

Card-related information including the program version for recording, card number, card issue date, card issue organization, zip code, address and telephone number.

Patient-related information including the patient's name, sex, birth date, home address zip code, home address, home address telephone number, work name, work zip code, work address, work telephone number and occupation. The portrait also is included.

2) Chart information

Items of chart information are as follows;

Medical organization information including code number, name, zip code, address, telephone number, patient ID number.

History information including drug side effects, allergy, transfusion etc.

Visiting information including visiting date, medical organization name, visiting clinic, doctor's name.

Laboratory information is categorized as follows: biochemical, hematological, immunological data and normal value for each test.

Image information including X-ray picture, endoscopic picture and ECG.

Clinical information including diagnosis, drugs, injection, surgical operation and comments.

4.4. Application in practice

1) Operation of the system is achieved by using a mouse. There are 11 kinds of icons on the screen. A multi-window is also open. In the first stage of operation, card-related information, patient-related information, health insurance information and portrait are displayed within about 5 seconds.

2) Other data are automatically read and developed on the RAM disk in order to obtain the quick presentation of selected items.

3) String information provides clinical information such as diagnosis and other comments. Numeric information displays the data from laboratory and physical examinations. These data are obtained by clicking the icon with the mouse and are shown as time-course tables and graphs.

4) Image information displays X-ray, fundus and endoscopic pictures, and ECGs, which are recorded using a floppy camera. The data capacity for each is about 157 kbyte.

5) Calendar information provides information as a function of time and contains the string, numeric and image data.

6) The data input procedure consists of recording the date, clinical and laboratory data and visit information, which includes information concerning the medical organization and physician's name. First, this data is recorded on the RAM disk.

7) Implementation of data on the card is performed upon

exiting from the process.

8) In the initial trial involving about 120 outpatients, use of this application software was very convenient and beneficial over a period of about 6 months.

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Reference

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