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(Table 1).

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.   (Table 2).

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PHP

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(SQL, Structured query language)

(Fig. 1).

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gateway interface)

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CGI (common

Table 1. Features that Should be Implemented in the Radiology Reports Searching System

Functionality	The system should provide appropriate results with keywords and conditions given by user
Accessibility	Users can access the system in allowed place only with web browser
Security	The system should prevent unauthorized person accessing the database
Others	Preexisting HIS (hospital information system) should not be affected by the system

Table 2. Records that Included in Database

Study-related records	Study name, study code, date of examination, clinical department, clinician's name
Patient-related records	Patient's name, age, sex, clinical diagnosis
Report-related records	Radiologist's name, date of read, content of report

(Fig. 2).

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MEDLINE   OVID (NY, U.S.A.)   ,

(Fig. 2).   30

, EXCEL

(Fig. 3).

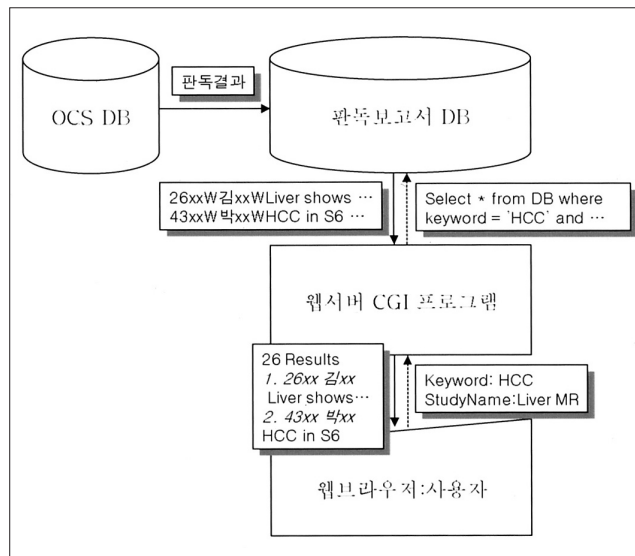(Unix)   (FreeBSD)

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Fig. 1. Schematic drawing of the structure of radiology reports searching system. The program fetches updated radiology reports from OCS (ordering communication system) server daily and stores them into database of this system. Users connect to this system using web browser and can input keywords with various conditions. Then CGI (common gateway interface) program converts users' requests into SQL (structured query language) codes and searches database using that SQL codes. Finally, CGI program reformat the found results into user friendly form and display them on users' web browser.
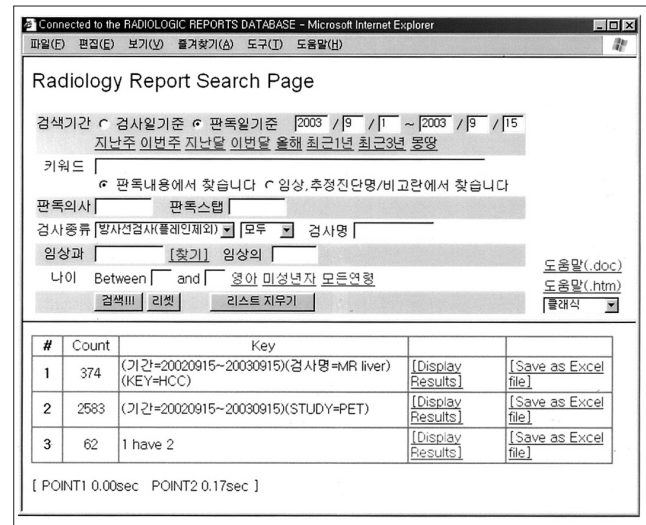

Fig. 2. An example of searching radiology reports. Some keywords and conditions were provided in upper frame of web browser. After pressing 'search' button, the numbers of found cases are displayed in lower frame of the web browser. In this case, 374 cases that contains the word 'HCC' are found from the radiology reports of liver MRI studies in recent 1 year and are stored as 'result #1'. Then, 2583 cases of PET studies are found and are stored as 'result #2'. Finally, new set of 'result #3', which contains the cases of patients that have both Liver MRI study (contains 'HCC' in their reports) and PET study, are generated by combining previous two results.

CGI
(common gateway interface)   PHP
(http://www.php.net)   .

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sd.org)   ,   49   ,
MySQL (MySQL, Uppsala,   )   3.7GB (gigabyte)   .
.   1   ,
(Apache Web serv-   1
er, http://httpd.apache.org)   .

.

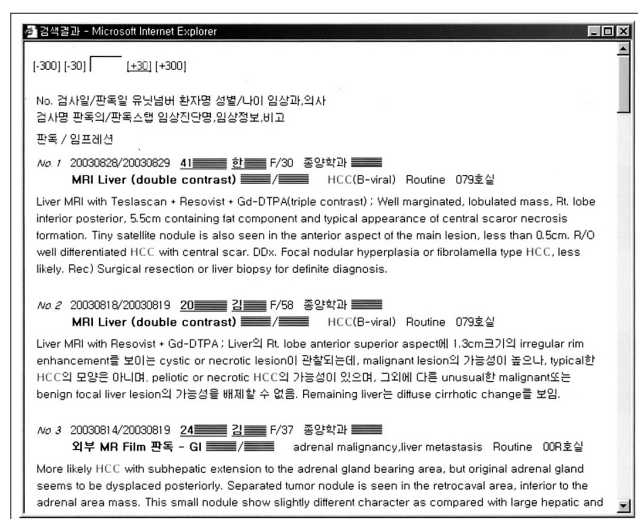2002   8

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Table 3   .

Fig. 3. An example of search results. A new display popped up by following the 'display results' link in Fig. 2. Thirty cases are displayed in each page. The found results can be downloaded into client's PC as Excel file by clicking 'Save as Excel file'.

Table 3. Examples of Application of Radiology Reports Searching System

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Collecting cases for conferences, papers or teaching for residents or students
- Reports of intravenous pyelography that contains the word "duplication"
- Reports of thoracic computed tomography that contains the phrase "pancoast tumor"

Keeping the reports read by each radiologists
- Reports of musculoskeletal ultrasonographies performed by radiologist   .

Statistics of reports classified by radiologists and study modailities.
- Reports of brain CT taken in fourth quarter 2003.

Correlation with radiology reports and pathology reports.
- All patients that are diagnosed as "signet ring cell carcinoma" from stomach biopsy and performed both pre-operative CT scan and whole body PET scan.
- "Non-diagnostic" cases of fine-needle aspiration biopsy of the thyroid, performed by radiologist   .

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(Table 3). .

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(free text entry)

(Simple full- text search)

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(simple text
search) ,

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(Structured report entry) .

(Graphical User Interface)

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(7- 9).

(Natural language processing)

(10- 13).

1. Gould DM, Morgan RH. Professional and administrative indexing system. *Am J Roentgenol Radium Ther Nucl Med* 1955;74:98-115
2. Stiennon OA. Punch-card sorting for radiological reports. *Radiology* 1953;60:708-713
3. , , , , , .
   . 1990;26:811-820
4. Sievert MC, McKinin EJ, Johnson ED, Mitchell JA. Retrieval from full-text medical literature: the dream & the reality. *Proc Annu Symp Comput Appl Med Care* 1991:348-352
5. Hersh WR, Greenes RA. Information retrieval in medicine: state of the art. *MD Comput* 1990;7:302-311
6. Hripcsak G, Friedman C, Alderson PO, DuMouchel W, Johnson SB, Clayton PD. Unlocking clinical data from narrative reports: a study of natural language processing. *Ann Intern Med* 1995;122: 681-688
7. , , .
   : . 2001; 20:187-192
8. Kahn CE Jr, Wang K, Bell DS. Structured entry of radiology reports using World Wide Web technology. *Radiographics* 1996;16: 683-691
9. Sinha U, Dai B, Johnson DB, Taira R, Dionisio J, Tashima G, et al. Interactive software for generation and visualization of structured findings in radiology reports. *AJR Am J Roentgenol* 2000;175:609-612
10. Friedman C, Alderson PO, Austin JH, Cimino JJ, Johnson SB. A general natural-language text processor for clinical radiology. *J Am Med Inform Assoc* 1994;1:161-174
11. Sager N, Lyman M, Nhan NT, Tick LJ. Medical language processing: applications to patient data representation and automatic encoding. *Methods Inf Med* 1995;34:140-146
12. Taira RK, Soderland SG, Jakobovits RM. Automatic structuring of radiology free-text reports. *Radiographics* 2001;21:237-245
13. Spyns P. Natural language processing in medicine: an overview. *Methods Inf Med* 1996;35:285-301

A Simple Text Searching System for Radiology Reports Based on World Wide Web Technology[1]

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Purpose: The authors have developed a system that searches for radiologic reports, and we have evaluated the utility of this system for clinical application, research and medical education.

Materials and Methods: The system retrieves radiologic reports from the OCS (ordering communication system) server and stores them in a separate computer. A CGI (common gateway interface) program was written to search the database with variable keywords given by the user. The system satisfied the requirements of functionality, accessibility and security.

Results: Users could search for radiologic reports with variable keywords using the web browser, and the user could refine the results using combinations of these keywords. The system has been running successfully for 2 years, and radiologists have used this system for searching or collecting cases, keeping reports and gathering statistics.

Conclusion: The simple text searching system has been developed in a short time period with only small costs and a bit of hard effort, and this system is practical for clinical use, research and medical education.

Index words : Computers
Computers, diagnostic aid
Information management
Radiology reporting systems

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