Department of Computational Diagnostic Radiology and Preventive Medicine

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Introduction and Organization
The Department of Computational Diagnostic Radiology and Preventive Medicine (CDRPM) was established in May 2005. It is under the supervision of the Department of Radiology.

The aim of our research project is as follows: (1) to create a large database of health screening clinical data including medical images, (2) to develop methods to analyze large volumes of medical images and to search for algorithms to detect subtle abnormal findings in these images, and (3) to evaluate the clinical usefulness of such image processing methods and to apply the system in clinical settings.

The department comprises two project associate professors and three project research associates, along with a medical staff of approximately 40 employees in the health-screening center.

Clinical Activities
CDRPM is responsible for the clinical activities in the CDRPM Health Screening Center. In this health screening center, the following diagnostic imaging modalities are installed to facilitate high level of diagnostic accuracy: positron emission computed tomography/X-ray computed tomography (PET/CT) (Figure 1), 3-tesla magnetic resonance imaging (3T-MRI) systems, ultrasound imaging systems, and digital mammography.

Clinical Activities
At present, CDRPM does not accept students.
However, CDRPM participates in the education of students and residents in the Department of Radiology. CDRPM endeavors to help students whose research themes include image analysis such as computer-assisted detection, or epidemiologic studies employing health-screening data.

**Research Activities**

1) Health screening database

We have developed a unique health screening information system in order to facilitate daily management of the health screening activities and to input health screening data. This information system is still under constant revision. The medical images acquired in the health screenings are stored in the hospital picture archiving and communication system (PACS) for clinical use (Figure 2). Medical images used solely for research purposes are stored in an independent PACS installed inside the CDRPM department.

![Figure 2. Health screening information system and PACS viewer](image)

2) Image processing software development

We have structured an integrated software developing system to facilitate the production of image processing software. The system is divided into the clinical part and the research part, with the data in the latter being anonymized. The clinical part consists of case entry for software development, and clinical application of the developed software. The research part consists of an interface to obtain images of the representative cases to develop the software, and an interface to test the developed software with the accumulated cases (Figure 3).

![Figure 3. Lung nodule detection scheme](image)

3) Clinical evaluation, application of software, and epidemiological studies

Research based on the health-screening database are carried out in collaboration with other researchers of various specialties. Images are analyzed using the developed software (Figure 4).

![Figure 4. Aneurysm detection in MR angiography](image)
Publications of year 2011


Gonoi W, Akahane M, Akai H, Hagiwara K, Kiryu S, Hayashi N, Ohtomo K. Retroportal main pancreatic