

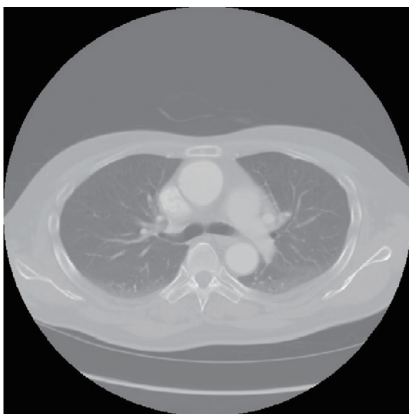
Naoyuki AIKAWA (Professor, Department of Applied Electronics, Faculty of Industrial Science and Technology, Tokyo University of Science)

## Purpose of Research

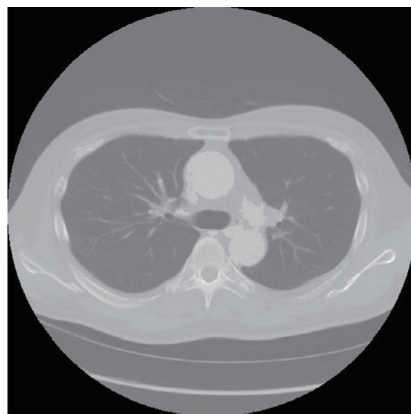
To develop a “medical front-end processor” in order to provide an interface that enables definite early detection of pathological lesions while reducing the burden on doctors and laboratory technicians. More specifically, we have been working to develop efficient analytical methods and presentation methods for high-dimensional image information, as well as a display and input device that incorporate the method and the means to construct a highly visual interface that uses shapes and designs to engage with feelings and senses.

## Summary of Research

Use of the contrast adjustment method for the target site using conversion functions, the region extraction method using Gabor filters and morphological filters, the clustering method, or other methods enables efficient medical diagnostic imaging and image analyses.



Original image with  
contrast agent



Processed image  
without contrast agent

### Points

- Efficient recognition using multidimensional information
- Image analysis, extraction, and recognition using mathematical methods
- Lower burdens on the patients and doctors

## Comparison with Conventional or Competitive Technologies

Conventional methods had issues such as low contrast of the extracted target site and indefinable edges, leading to low accuracy extraction, which consequently made them difficult to use in medical diagnostic imaging. However, by employing this technology, the extraction accuracy will be higher and the efficiency of medical diagnostic imaging and image analyses will be increased.

## Expected Applications

- Vascular extraction without using a contrast agent
- Efficient detection of abnormal sites such as cancer cells
- Support in diagnoses
- Measurement and sorting of blood cells

## Challenges in Implementation

- Development of a human-centered device (tablet device) without a high-end CPU
- Extraction of small blood vessels
- Integration of a learning function to increase detection accuracy

## What We Expect from Companies

We are looking for companies to collaborate with in the development of input/output devices and presentation methods.

## Future Developments

- 2016 Improved the vascular extraction accuracy
- 2017 Develop a human-centered device
- 2018 Enable detection of abnormal sites such as cancers and thrombus

- Awards: Incentive award of the technical committee of the Institute of Electrical Engineers of Japan (3/7/2013), etc.
- Intellectual Property:  
Japanese Patent No. 5618129 “Medical image display control device and program”  
Japanese Unexamined Patent Application Publication No. 2013-103080 “Medical image processing device, method, and program”  
Japanese Patent Application No. 2014-252388 “Target detection device and program”