Department of Media Information Engineering,
National Institute of Technology, Okinawa College

Research Title:

# Malware Detection on Windows OS



| Name | IHA Yasushi | E-mail | yasuc@okinawa-ct.ac.jp |
|---|---|---|---|
| Status | Professor | | |
| Affiliations | Information Processing Society of Japan | | |



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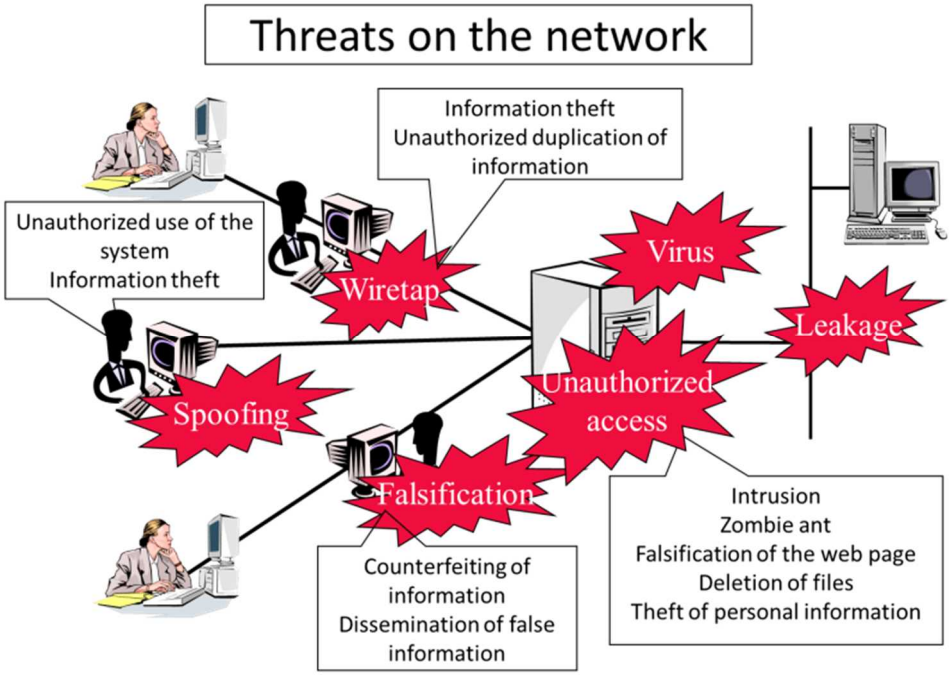
|---|---|
| Keywords | Information Security, Malware Detection, WAF, SVM |
| Technical Support Skills | ・ Building a Windows Bastion Host<br>・ Configuring the Firewall and IDS |

## Research Contents

・Malware Detection on Windows OS
・Web Application Firewall
・Digital Forensics




## Available Facilities and Equipment

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| NEC Express5800 (Windows Server 2003) | |
| Juniper Firewall SSG-5-SB | |
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National Institute of Technology, Okinawa College
Department of Media Information Engineering

# Studies on an Augmented Automatic Choosing Control for Nonlinear System



| | | | |
|---|---|---|---|
| Name | NAWATA Toshinori | E-mail | nawata@okinawa-ct.ac.jp |
| Status | Professor | | |
| Affiliations | Institute of Electrical Engineers of Japan, Institute of Electronics,Information and Communication Engineers, Institute of Systems, Control and Information Engineering | | |





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| Keywords | Nonlinear control, Section wise linearization, Genetic algorithm |



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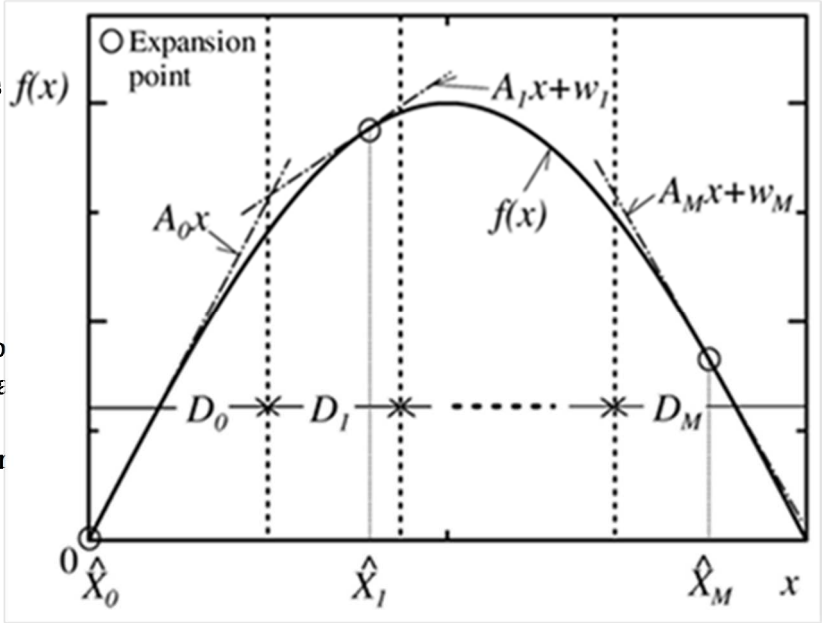
| Technical Support Skills | ・Theory of nonlinear control<br>・Applications of genetic algorithm |

## Research Contents

A genetic algorithm (GA) is one of evolutionary computing algorithms in engineering sciences. The GA has been used to solve such complicated tasks as nonlinear global optimization problems. The purpose of this research is to present a nonlinear feedback control called Augmented automatic choosing control (AACC), which is designed by making good use of the GA.

Assume that a system is given by a nonlinear differential equation. Choose a separative variable, which makes up nonlinearity of the given system. The domain of the variable is divided into some subdomains. On each subdomain, the system equation is linearized by Taylor expansion around a suitable point so that a constant term is included in it. This constant term is treated as a coefficient of a stable zero dynamics. The given nonlinear system approximately makes up a set of augmented linear systems, to which the optimal linear control theory is applied in order to get the linear quadratic (LQ) controls. These LQ controls are smoothly united by sigmoid type weighted gradient optimization automatic choosing functions to synthesize a single nonlinear feedback controller.

This controller is a structure-specified type which has some parameters, such as the number of divisions of the domain, regions of the subdomains, points of the Taylor expansion, gradients of the automatic choosing functions, and so on. These parameters must be selected optimally to be just the controller's fit. Since they lead to a nonlinear optimizatio problem, we are able to solve it suboptima and successfully by using the GA, which is one of evolutionary computing algorith in engineering sciences.




## Available Facilities and Equipment

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Department of Media Information Engineering
National Institute of Technology, Okinawa College

# Analysis of Traffic and Pedestrian flow

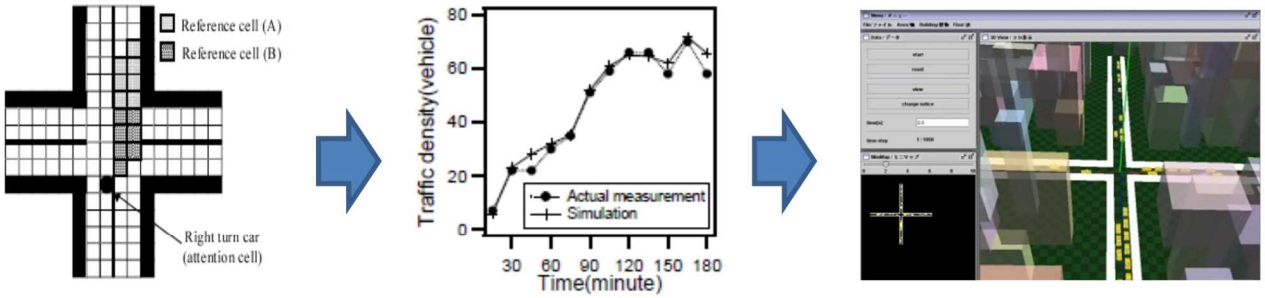


| | | | |
|---|---|---|---|
| Name | Tatsuhiro Tamaki | E-mail | t.tamaki@okinawa-ct.ac.jp |
| Status | Associate Professor | | |
| Affiliations | Information Processing Society of Japan<br>Mathematical Modeling and Problem Solving | | |
| Keywords | Traffic flow, Physical simulation, Optimization Calculation | | |
| Technical Support Skills | ・Analysis of Traffic flow<br>・Vehicular Rad Network Design | | |



## Research Contents

- Traffic flow simulation using Cellular automaton
- Analysis of Crowd Behavior
- Smooth Particle Hydrodynamics using GPGPU




**1. Modeling**
Design traffic flow model
※Modeling of XPT

**2. Analysis**
Comparing results to
Actual value

**3. Visualization**
Showing results animation
using Java3D

## Available Facilities and Equipment

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|---|---|
| Linux machine with the GPGPU | |
| Radar(Speed) Gun | |
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Department of Media Information Engineering,
Okinawa National College of Technology

Research Title:

# Analysis of Complex Systems by Multi-Agent Systems



| | | | |
|---|---|---|---|
| Name | SATO Takashi | E-mail | stakashi@okinawa-ct.ac.jp |
| Status | Associate Professor (Ph.D. in Knowledge Science) | | |
| Affiliations | The Japanese Society for Artificial Intelligence, Japan Association for Evolutionary Economics<br>The Japanese Society for Evolutionary Computation, Japanese Neural Network Society | | |



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|---|---|
| Keywords | Complex Systems, Artificial Life, Evolutionary Linguistics, Evolutionary Computation, Multi-Agent Systems, Neural Networks, Reinforcement Learning |
| Technical Support Skills | ・Construction and analysis methods of multi-agent systems<br>・Techniques of evolutionary computation approach<br>・Analysis methods of complex systems |

## Research Contents

Constructive study on complex systems such as life, cognition, language, society and economics, which develop autonomously / evolve

The purpose of my research is to clarify and understand the following things:

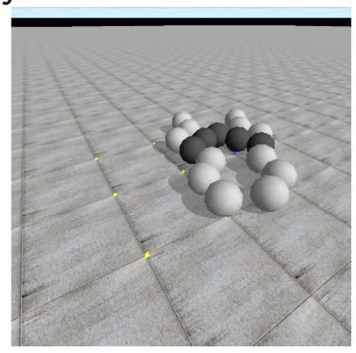
- Universal natures of the complex systems by using constructive approach in which an objective system is to be understood by constructing the system and operating it.
- Dynamics of complex emergent phenomena by using a multi-agent system which consists of dynamic cognitive agents with internal dynamics.

### Complex Systems

This is a system in which the local rules regulate the behaviors of the system's composing elements and the global rules emerge by the interactions among the elements, where both rules change by the whole context

#### Artificial Life

Study on the analysis and synthesis of life-like behaviors by artificial systems



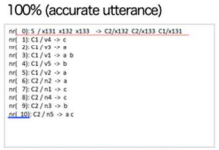
Research example: evolutionary acquisition of locomotion strategy and bodily structure

#### Evolutionary Linguistics

Study on the origin and evolution of language

Research example: the role of ambiguity between symbol and meaning on grammar formation by iterated learning model

Obtained grammar structures at last generation




Acquired grammars with the highest compositionality.

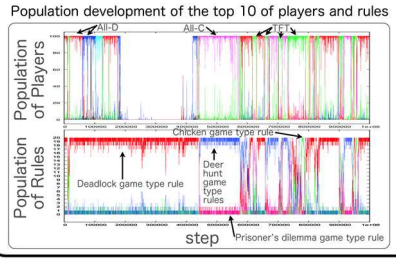
The numbers of rules are increased to express many kinds of things

#### Evolutionary Computation

Computational technique for realizing objective specification and performance by evolving a system like life

Research example: evolutionary selection of equitable rules on a game in which strategies of players and the rules coevolve

Population development of the top 10 of players and rules




## Available Facilities and Equipment

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|---|---|
| A computing server with 24 Xeon cores, 6 Tesla P100 (16GB) GPUs & 24TB*2 RAIDs for Deep Learning simulation (TYAN) | Two computing servers with 72 cores for scientific computation and with 28 cores for advanced computation (Apple) |
| 3 sets of advanced computing servers with 12 cores (Apple) | Two humanoid robots (Softbank / ALDEBARAN) |

# Embedded System, Project Management



| | | | |
|---|---|---|---|
| Name | Taisaku SUZUKI | E-mail | suzuki.t@okinawa-ct.ac.jp |
| Status | Associate Professor | | |
| Affiliations | Information Processing Society of Japan<br>Project Mangement Association of Japan | | |



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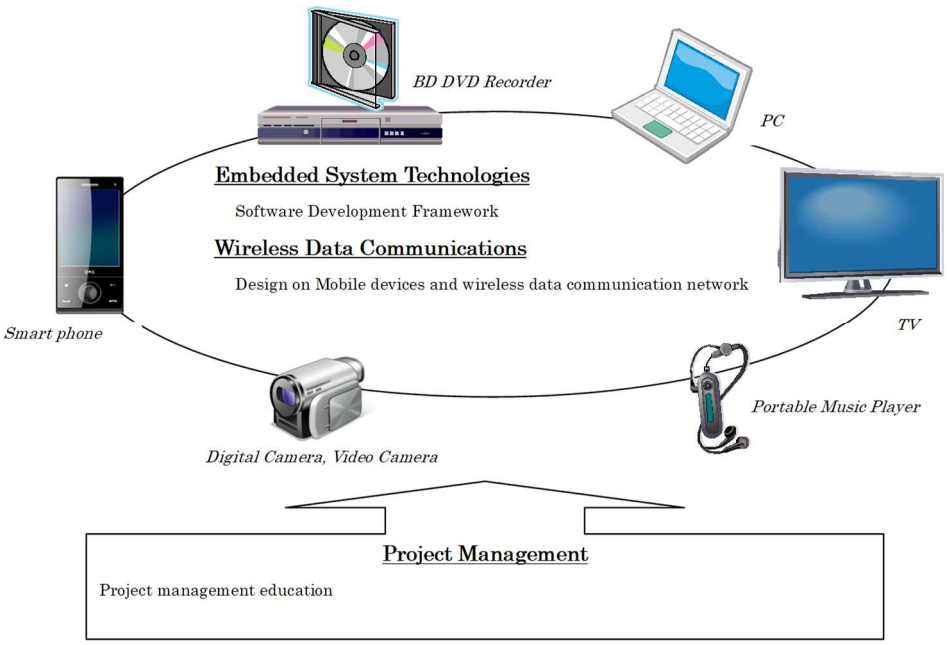
|---|---|
| Keywords | Embedded System, Embedded Software, Project Management |
| Technical Support Skills | ・ Design on embedded system software<br>・ Wireless Data Communications<br>・ Project management |

## Research Contents

・Embedded System Technologies
・Wireless Data Communications
・Project Management




## Available Facilities and Equipment

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# (1)Application of media contents to community design (2) educational welfare


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|---|---|---|---|
| Name | Atsushi Nishimura | E-mail | nisimura@okinawa-ct.ac.jp |
| Status | Associate Professor, BA(Musicology) Dr.(Home Economics) | | |
| Affiliations | Soundscape Association of Japan (a board member)<br>Japanese Association of Certified Social Worker | | |



| | |
|---|---|
| Keywords | Soundscape Design, Participation of Residents, Educational Welfare, Philanthropy |


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|---|---|
| Technical Support Skills | ● Application of media contents to community design.<br>● Soundscape design.<br>● Production of media contents. |

## Research Contents

- participation and initiative of local residents in soundscape design
- description of sonic environment as soundscape
- educational welfare

Publication (only in English)


1. A. Nishimura and K. Hiramatsu, The significance of local participation and local initiative in soundscape design, World Forum for Acoustic Ecology 2010, Koli, Finland.
2. A. Nishimura and K. Hiramatsu, The significance of participation and initiative of local residents in soundscape design, The 38th International Congress and Exposition on Noise Control Engineering (INTER-NOISE 2009), Ottawa, Canada.
3. A. Nishimura and K. Hiramatsu, The Recording and Editing Techniques of Soundmonograph, The 36th International Congress and Exposition on Noise Control Engineering (INTER-NOISE 2007), Istanbul, Turkey.
4. A. Nishimura and K. Hiramatsu, The Technical Aspects of Soundscape Museum, World Forum for Acoustic Ecology 2006, Hirosaki, Japan.
5. A. Nishimura, A Tiny Field for Soundscape Design, Soundscape (Wordl Forum for Acoustic Ecology), Vol.6 No.2, p21-24, (2006)


## Available Facilities and Equipment

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| Audio/Visual Equipment of the media production studio | |
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| Name | Mbaitiga Zacharie | E-mail | zacharie@okinawa-ct.ac.jp |
|---|---|---|---|
| Status | Associate Professor | | |
| Affiliations | IEEE Computer Society, IEEJ, Computer Society TCCLS | | |



| Keywords | Robot Control Engineering, Production Management System, UAV, Image Processing |
|---|---|
| Technical Support Skills | ・Industry production management system<br>・Industrial robot development<br>・UAVs development for diverse purposes. |

## Research Contents

① Development of Industrial production management system based on the need of each company
② The system include order entry, estimation cost according to the company production process.

The following is the example of what we have developed for one company

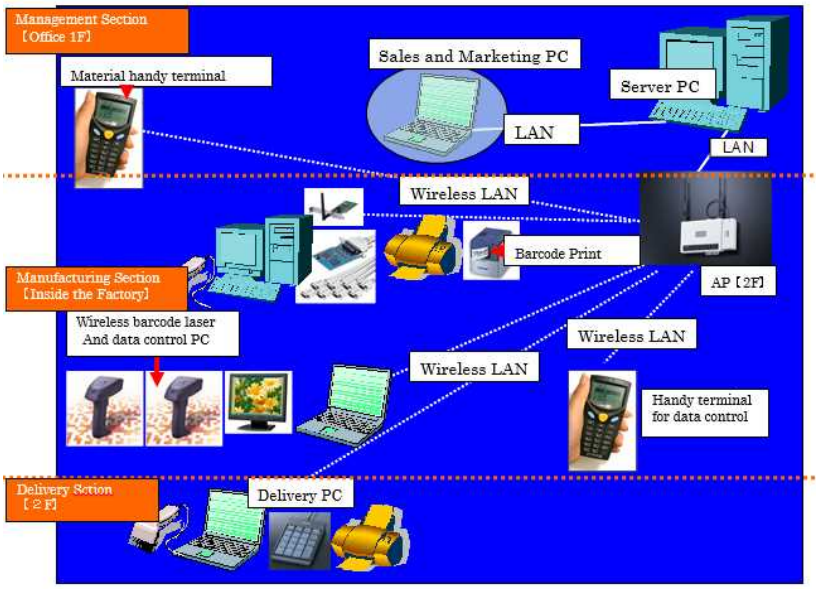


Fig.1 Production Management System

③ We can provide the software skill for UAVs and Robot based on the Company demand

Fig.2 Diverse purposes drone development


Fig.3 Robot Development

## Available Facilities and Equipment

| Equipment will depend on the consultation content | |
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Department of Media Information Engineering,
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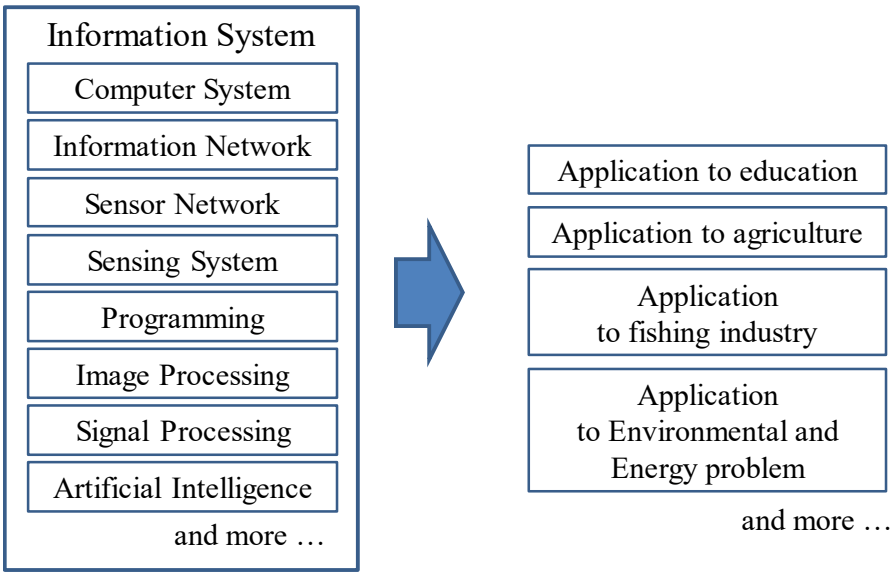
# Information System, and this application


| | | | |
|---|---|---|---|
| Name | Kinjo, Atsushi | E-mail | akinjo@okinawa-ct.ac.jp |
| Status | Assistant Professor （Ph.D. in Engineering） | | |
| Affiliations | Information Processing Society of Japan, Marine Acoustics Society of Japan<br>The institute of electronics information and communication engineers | | |
| Keywords | Information System, Information Network, Marine Acoustics | | |
| Technical Support Skills | ・Information System Architect<br>・Information Network Architect | | |


## Research Contents




## Available Facilities and Equipment

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National Institute of Technology, Okinawa College,
Department of Media Information Engineering

# Computer-Aided Diagnosis by Image Analysis



| | | | |
|---|---|---|---|
| Name | Eisaku TOHMA | E-mail | tohma@okinawa-ct.ac.jp |
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| Affiliations | The Institute of Electronics, Information and Communication Engineers (IEICE) | | |



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|---|---|
| Keywords | Image Processing, Image Analysis, Soft Computing |
| Technical Support Skills | ・Image Processing Technique |

## Research Contents

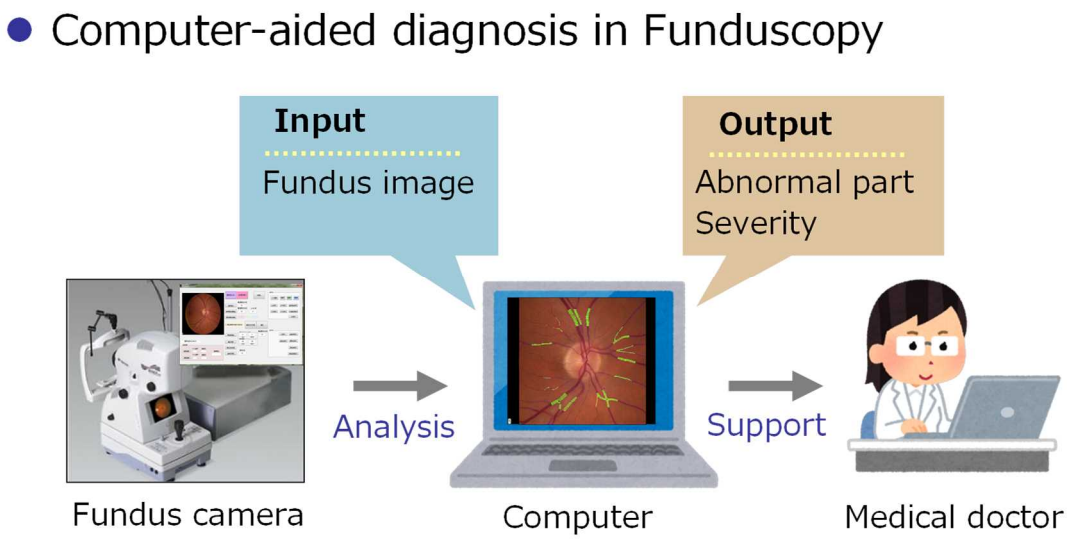
### ■ Retinal Fundus Image Analysis for Diagnosis of Arteriosclerosis

Cardiovasular disease and cerebrovasular disease are now the main causes of death worldwide. With an increased longevity, the number of people suffering from the common age-related brain diseases is increased. A lot of attention is attracted to the techniques to probe those diseases.

The association of retinal microvascular abnormalities with cardiovascular and/or diseases has often been suggested by the past investigations. The eye fundus examination can be a screening test for a prevention of those diseases.

Automatic analysis of a retinal is necessary in the implementation of a screening system to support medical doctors. In addition, computerized analysis of retinal fundus images can reduce the medical doctors' workload and improve diagnostic efficiency.

I am doing research on image analysis for diagnosis focusing on the fundus image.




## Available Facilities and Equipment

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