2.2.8 Laboratory : Laboratory of Wood Processing

Member :	Professor	Okumura, Shogo, Dr. Agric. Sci.
	Associate Professor	Fujii, Yoshihisa, Dr. Agric. Sci.
	Assistant Professor	Sawada, Yutaka, M. Agric. Sci.
	Assistant Professor	Yanase, Yoshiyuki, M. Agric. Sci.
	Doctor's program	2
	Undergraduate	1
	Researcher	1

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Fundamental problems in wood machining

The main subjects are concerned with solution of cutting mechanism of wood and wood based materials and of phenomena in wood cutting, by thermographic measurement and analysis of tool-chip-work system in wood cutting. For the evaluation of the surface roughness of wood, the novel filtering method and 2D and 3D roughness parameters that coincide with tactile sensation are proposed. Influence of machine surface finishing on the performance of painted surface is also studied.

b) Improvements of woodworking machines and cutting tools and automatization of machining process.

For the improvements of accuracy, efficiency and safety of the wood cutting and grinding, following subjects are studied: analysis of deformation and vibration of tool using FEM, analysis of stress generated on the tool, and prediction of concentration of airborne dust in the woodworking chamber using computer simulation and the optimization of a condition of dust collection. An algorithm of pattern recognition of the processing sound to simulate the auditory sense of the skilled worker and its master process is developed. It is also applied to the control of the grinding machine of band saw tooth to realize fully automatic control using artificial intelligence technique. Another subjects are pattern recognition of the transient signals from wood using wavelet analysis, simulation of distribution of temperature and stress during drying wood, and simulation of roll pressing of wood using FEM as an application of CAE to the woodworking process.

c) Scanning of wood and wood based materials

The subjects on this field are use of acoustic emission (AE) for prediction of checks and for solution of mechanism of AE generation during the drying of wood, thermographic detection of starved joints of wood and the grain direction and recognition of blue stained wood with image analysis and pattern recognition technique. Movement of free water in wood tissues under drying is also evaluated by a micro-focus X-ray CT system. Fundamental researches for the analysis of biology of wood-destroy insects and practical application for detection of termite attack using AE monitoring are studied, including developments of portable AE detector, new AE sensor using PVDF film, waveguides, and AE monitoring system for wooden house. Detection of metabolic gas components from termite colony such as H2, CH4 and CO2 are also studied. Development of physical barrier using crushed cement-stabilized sludge for termite attack. Fact-findings of the damages by termite and other wood-destroy insects in the houses and cultural properties, and research of damage using AE monitoring. Detection of cavity and deterioration points in the material using radar and millimeter wave for the non-destructive inspection of decay and damage by wood-destroy insects in the wooden house

A-2.Publications and presentations

a) Publications

Original Papers

- N. Yamada, Y. Fujii and S. Okumura: Estimation of drying stress in a longitudinally hollowed boxed-heart lumber using finite element method, J. of the Society of Materials Science, Japan, 58(4), 286-291, 2009
- Y. Yanase, K. Uetani, Y. Fujii and S. Okumura: Moisture and desorption properties of pelletized Zeolite and its efficiency as a physical barrier against termites, J. of the Society of Materials Science, Japan, (58) 4, 304-309, 2009
- A. Tsuchiya, Y. Fujiwara and S. Okumura: Cutting performance and wear charachteristcs of chromium nitride coated tools II. Mokuzai Gakkaishi, 56(1), 1, 1-8, 2010

Reports

- Y. Fujii: Recent problems and future prospect on diagnosing technology of biodegradation in wooden historical buildings. Insect & Fungus Damage to Cultural Properties, No.57, 3-8, 2009
- Y. Fujii：Nondestructive diagnose of wood and wooden buildings using millimeter wave, Inspection Engineering, 14(12), 37-43, 2009

- Y. Fujii: Improvement of working conditions in sawmills, Wood Industry, 64(11), 525-527, 2009

- Y.Fujii, Y.Fujiwara, M.Harada, R. Kigawa, Y. Komina and W. Kawanobe : Evaluation of insect attack in wooden historic buildings using drill resistance method: Part 2 A case study on Sambutsu-do of Rinnohji, Science for Conservation, No.49, 183-190, 2010

- M. Harada, R. Kigawa, Y. Komine, Y. Fujii, Y. Fujiwara and W. Kawanobe : Survey of records of restoration in relation with damage by wood-boring insects at Rinnohji Temple in Nikko, Science for Conservation, No.49, 165-172, 2010

- Y. Komine, M. Harada, M. Nomura, R. Kigawa, K. Yamano, Y. Fujii, Y. Fujiwara and W. Kawanobe : Survey of Wood-boring anobiids at Rinhohji Temple in Nikko, Science for Conservation, No.49, 173-182, 2010

Patents

- Apparatus and method for estimation of wood moisture content. Patent-Claim 2009-087280

b) Conference and seminar papers presented

- 25th Annual Meeting of Japan Wood Preseravation Association（Tokyo,2009.5.21）
- 26th Annual Meeting of Japan Society for Scietific Studies on Cultural Properties （Nagoya, 009.7.11-12）
- The 2009 International Symposium on Conservation of Cultural Heritage in East Asia （Peking, 2009.10.17-19)
- 53th Conference of Union of Matrials Technology, Science Council of Japan (Kyoto, 2009.10.21）
- 21th Annual Meeting of The Japanese Society of Environmental Entomology and Zoology (Mino, 2 009.11.14-15)
- 60th Annual Meeting of Japan Wood Research Society (Miyazaki, 2010.3.17-19）

A-3.Off-campus activities

Membership in academic societies

- Okumura, Shogo : Wood Technological Association of Japan (councilor, director of Kansai Branch), The Japan Wood Research Society (Director, Vice-Presidnet)
- Fujii, Yoshihisa : Wood Technological Association of Japan (Kansai branch, organizing committee), Wood Preserving Association (Director, Committee chair of wood degradation

inspector), Japan termite Control Association (Committee chair of dry-wood termite committee)

- Sawada, Yutaka : Wood Technological Association of Japan (Kansai branch, organizing committee), Japan Society of Materials Science (Editorial committee) , Japan Society of Materials Science (Organizing committee, Co-chair for finance)
- Yanase, Yoshiyukii, : Japan Society of Materials Science (Organizing committee, Co-chair for finance of department of wooden materials), Wood Preserving Association（Committee of Dry-wood termite)

Membership in Science Council of Japan, etc.

- Yanase Yoshiyuki : Wood Preserving Association（Committee of organization of annual meeting)

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Grant-in-Aid for Scientific Research (B) : Fujii Yoshihisa : Nondestructive testing of wood and wood based materials using millimeter wave imaging

2.Other Research Grants

- Grant of JST, Research for seads development 2009：Fujii Yoshihisa：Introduction of surface roughness parameter and visual roughness from shadow image of wooden finished surface
- Grant of Kyoto Chamber of Commerce and Industry：Fujii Yoshihisa：Development of VOC free Kyoto-type town house made of local and natural materials
- Grant of Research Institute for Sustainable Humanosphere, Kyoto University, Exploratory research on Humanosphere 2009：Yoshiyuki Yanase：Visualization of termite attack in wood by western drywood termite Incisitermes minor using microfocus X-ray CT system and evaluation of residual strengt

A-4.International cooperation and overseas activities

International meetings(country,roles)

- Okumra、Shogo：International Wood Machining Seminar (Advisory committee)

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level： Outline of Agricultural Scienece II(Okumura),Pocket Sminar for

New Students(Fujii), Forest and Biomaterials Science III (Okumura), Basic Forest and Biomaterials Science III (Fujii), Wood Processing I (Okumura), Wood Processing II (Fujii), Laboratory Course in Physics of Forest and Biomaterials (Fujii, Sawada, Yanase), Laboratory Course in Wood Processing (Fujii, Sawada, Yanase), Seminar for Forest Products Engineering (Okumura, Fujii), Reading of Foreign Literature II (Okumura)

- Graduate level: Wood Processing II (Fujii), Seminar in Wood Processing (Okumura, Fujii), Laboratory Course in Wood Processing (Okumura, Fujii, Sawada, Yanase)

B-2.Off-campus teaching etc.

Part-time lecturer

- Fujii Yoshihisa: Graduate School of Agricultural and Life Science, Tokyo University （Special Lecture on Wood Processing for Course of Wooden Architecture

Open lectures, etc.

- Fujii Yoshihisa: Seminar on Forest Products Technology, Toyama Prefecture (Lecturer)
- Fujii Yoshihisa: Seminar for Professional Engineers (Forest department), Japan Forest Technology Assoc. (Lecturer)
- Fujii Yoshihisa: Seminar on practices of conservation of national properties 2009, Agency for Cultural Affairs(Lecturer)
- Fujii Yoshihisa: Seminar on wood technology 2009, Hyogo Prefecture (Lecturer)
- Ynanase Yoshiyuki: Seminar on Bio-deterioration 2009, The working group on Bio-deterioration, the Japan Wood Research Society(Lecturer)

B-3.Overseas teaching

International students

- International students : Doctral 1 (Gahna)

Lectures and seminars

- Okumura Shogo

Mini lecture: Wood Machining and Nondestructive Testing of Wood(Lecturer) : Center of Mechanical Engineering, University of Coimbra(Portugal)

C.Other Remarks

- Fujii Yoshihisa：National Research Institute for Cultural Properties, Tokyo（Visiting Researcher）, Association of Architecture Research (Visiting Researcher), Committee on promotion of utilization of wood from national forest to housing 2009(Committee), Research committee on ling-life wooden house 2009 (Committee), Council on Forest Technology Research, Nara Prefecture 2009 (Committee)