Chair Biomaterials Technology

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	5
	Researcher	1

A. Research Activities (2010.4-2011.3)

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(including book-reviews)

- Tsuchiya, A., Y. Fujiwara and S. Okumura: Cutting performance and wear characteristics of chromium nitride coated Tools III. Edge wear of finger joint cutters and its effect on joint strength. Mokuzai Gakkaishi 56(4); 243-250, 2010

- Takuro MORI, Akihiro KOUSOKU, Yoshiyuki YANASE and Kohei KOMATSU. Relationships between Strength Properties and Density or Ultrasonic Velocity of Timber Attacked by Termite. J. of the Society of Materials Science, 59(4), 297-302, 2010

- Yoshihisa FUJII, Yuko FUJIWARA, Tatsuru SUDA, Yoshiyuki SUZUKI, Asahiko KIUNA, Junta SUGIYAMA, Yukio KOMINE, Rika KIGAWA and Wataru KAWANOBE: Survey on bio-degradation in Amida-do Hall in Higashi-Honganji Science for Consevation, 50、173-184, 2011

- Yoshihisa FUJII, Yuko FUJIWARA, Rika KIGAWA, Makoto HARASHIMA, Asahiko KIUNA, Junta SUGIYAMA, Noriko HAYAKAWA and Wataru KAWANOBE: Survey on bio-degradation in Torii-gate in Itsukushima-Jinja Science for Consevation 50、1573-172, 2011

- Yoshihisa FUJII, Yuko FUJIWARA, Rika KIGAWA, Wataru KAWANOBE, Norimichi NAGAISHI and Keiji NAKAJIMA: Nondestructive Detection of Inner Cavity of Wooden Pole Using Gamma-ray Science for Consevation, 50、185-190, 2011

Reports,others

- Yoshiyuki Yanase: Recent developments on inspection technology of dry-wood termites Jyutaku-to-Mokuzai, 390, 18-23, 2010

- Shunichi Yanagida, Yuko Fujiwara, Yoshihisa Fujii: Developments of argorithm for surface roughness evaluation and color adjustment using digital image analysis, Kensagijyutu, 15(10), 8-13, 2010

- Tadao Nagatsuma, Hiroyoshi Togo, Akishi Mochizuki, Naoya Kukutsu, Yosihhia Fujii: Application of millimeter waves to inspection of buildings, Keisokugijyutu, 38(12), 21-25, 2010

- Yoshihisa Fujii: Present status on dry-wood termites in Japan, Wood Indsutry, 65(11),554,2010

Patents

- 2009-087280 Apparatus and method for evaluation of wood moisture content, Hiroyoshi Togo, Akishi Mochizuki, Naoya Kukutsu, Yosihhia Fujii, Soichi Tanaka, Yuko Fujiwara, Shogo Okumura

- 2009-262164 Apparatus and method for imaging of wood, Hiroyoshi Togo, Akishi Mochizuki, Naoya Kukutsu, Yosihhia Fujii, Soichi Tanaka, Yuko Fujiwara, Shogo Okumura

b) Conference and seminar papers presented

- 26th Annual Meeting of Japan Wood Preseravation Association（Tokyo,2009.5.25）

- 61st Annual Meeting of Japan Wood Research Society (Kyoto, 2010.3.18-20）

- 30th European Conference on Acoustic Emission Testing (EWGAE 2010) (Vienna, 2010.9.8–10)

- 22th Annual Meeting of The Japanese Society of Environmental Entomology and Zoology (Hikone, 2010.11.23-24)

- 30th European Conference on Acoustic Emission Testing (EWGAE 2010) (Vienna, 2010.9.8–10)

- 32th Annual Meeting of The Japan Society for the Conservation of Cultural Property (Gifu, 2010.6.12-13)

- 27th Annula Meeting of Japan Society for Scientific Studies on Cultural Properties (Suita, 2010.6.26-27)

- 35th International Coference on Infrared, Millimeter and Terahertz Waves (Roma, 2010.9.6-10)

- World Conference on Timber Engineering 2010 （Riva del Garda, 2010.6.21-24)

- Annual Meeting of Society of Inddor Environment Japan 2010 (Yokohama, 2010.12.9-10）

A-3.Off-campus activities 1

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, Yoshiyuki : 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)

A-3.Off-campus activities 2

Research grants

Categories

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

- Okumura, Shogo : Formation mechanism of Type II chips during slow-speed, orthogonal and longitudinal cutting of wood :

2.Other Research Grants

- Research Grants of Housing Research Foundation 2010 : Yoshiyuki Yanase : Research for damage by drywood termite to wooden constructions in Japan

A-4.International cooperations and overseas activities 1

International meetings(country,roles)

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

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

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

B-2.Off-campus teaching etc.

Part-time lecturer

- Yoshihisa Fujii: Kyoto Prefectural University, Machinary for forestry and wood industry

Open lectures, etc.

- Yoshihisa Fujii: Seminar for "Sumairu-net" Reserch group on healthy life and house 2010.7.3

- Yoshiyuki Yanase: "Seminar on renewal of traditional wooden buildings" Nara Center of Employment and Human Resources Development Organization Japan 2010.9.11

B-3.Overseas teaching 1

International students

- International students : Doctral 1 (Gahna)

B-3.Overseas teaching 2

Lectures and seminars

- Yoshiyuki Yanase

Non-destructive Evaluation of Termite Attack in Wood and Wooden Constructions Using Acoustic Emission (AE) Monitoring and Ceramic Gas Sensors(Lecturer) : The Islamic University of Indonesia(Indonesia)

C.Other Remarks

- Okumura, Shogo：Technical Development Adviser, Hyogo Prefecture

- 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 2010(Committee), Research committee on ling-life wooden house 2010 (Committee), Council on Forest Technology Research, Nara Prefecture 2010 (Committee), Committee on development of inspection device for wooden houses for maintenance 2010(Committee）