OP017

Improvement of the CT Reconstruction Technique Using Portable Soft X-ray Apparatus

Chul-Ki KIM[1], Sang-Joon LEE[2], Kwang-Mo KIM[2], Hyun-Bae KIM[1] and Jun-Jae LEE[3]
1) Department of Forest Sciences, Seoul
College of Agriculture and Life Sciences, Seoul National University
2) Department of Forest Resources Utilization, Seoul
Korea Forest Research Institute
3) Department of Forest Sciences, Research Institute for Agriculture and Life Science, Seoul
College of Agriculture and Life Sciences, Seoul National University
aries8924@hanmail.net

Structural members of Korean traditional building were usually made by wood. And the style of that is post-beam architecture which is exposed to exterior environment. So it is very important to detect decay and deterioration of wood because wood play an important role in structural stability. Non-destructive evaluation is an effective method to evaluate internal state of wood. Among the methods, X-ray technique is an effective way to evaluate wood which has a large diameter. Moreover, CT (Computed Tomography) reconstruction technique using X-ray is very useful to display an internal state of wood. But it is not easy to apply at the site. First, X-ray could be harm to users or researchers when they use X-ray at the site. Secondly, medical machines of X-ray CT cannot be used in field. Lastly, medical machines are not economical.

Our studies had been done to develop CT reconstruction technique to show internal state of wooden members by using a lesser number of soft X-ray radiographs. Add to former research results, this study has an object to improve accuracy of the CT image through analysis a single radiograph. X-ray tube was CP 120B (ICM, Belgium). In test, tube voltage and current of which was 45 kVp, 1.5 mA, respectively. Digital detector is NX 06 (RF co., Ltd, Japan) which is CCD (Charge Coupled Device) type. A radiograph was gained while digital detector was exposed to X-ray for one second. The test specimen, which one side badly decayed, was a rafter which had been sought from dissolved historical structure. BP (Back-Projection) method was used to make CT image using 180 radiographs.

To improve accuracy of the CT image, a single radiograph was investigated. It could be confirmed that actual centre of X-ray radiation was different to physical centre between X-ray tube and detector. And the density of specimen was more overestimated as a part of specimen apart from centre of detector. In addition to these, the diameter of specimen or the length of deterioration was also overestimated. These problems could come from using commercial X-ray apparatus which was made for not CT image but X-ray examination and disregarding the shape of X-ray radiation. Therefore, a single radiograph was analysed to find actual centre of X-ray radiation by a contour line of intensity of radiation using MATLAB program. And CT image was restructured after considering shape and intensity of X-ray radiation according to distance of centre of detector. If the intensity of actual centre of X-ray radiation is I, the intensity of X-ray radiation will be (a^2/(a^2+b^2))×I. Where, a is the shortest distance from centre of X-ray radiation to detector and b is a circle radius around point a in detector. It could be found that accuracy of CT image was improved when the pixel of CT image had been analysed.

So, it will be applied to evaluate decay of deterioration of historical wooden structure member or standing tree in the site through development of device after from this study.

Keywords: Non-destructive Evaluation; X-ray; CT Reconstruction; Internal State of Wood

OP018

Validation of a X-Ray densitometry method for the determination of *Eucalyptus grandis* and *Eucalyptus urophylla* radial density profile

Allan Motta COUTO, Paulo Fernando TRUGILHO, Alfredo NAPOLI
Federal University of Lavras, Lavras – Department of Wood Science and Technology
allan_floresta@yahoo.com.br

The X-ray densitometry is considered one of the main non-destructive techniques for the analysis of wood due to the high precision and practicality. The method has been applied in determining the density of the wood, and the density variation is a result of the anatomical structure and chemical composition of the same. This technique is still used in the identification of growth rings and determine the pattern of radial variation of density.

This work aimed to ascertain the reliability of the information obtained by the x-ray densitometry technique in determining radial density profile on clones from *Eucalyptus sp.*. To this, it were used two and three clones of Eucalyptus grandis and of *Eucalyptus urophylla*, respectively, with 53 months of age. For radial profile of density determination, withdrew a sample, from each individual, was withdrawn perpendicularly to the axis, passing through the medulla at 1.30 m above the ground. The remainder of the radial sample was sectioned into small specimens with two millimeters of thickness, approximately, for determination of density by hydrostatic method.

Analysis of the data obtained showed that the pattern of radial variation of density obtained by the technique in challenge is very similar to the standard achieved by the determination of density by hydrostatic method, inferring so that the technique is reliable for this kind of analysis.

Keywords: Variation, clones, density.

OP0019

The Usage of Gamma Ray Attenuation Method for *Eucalyptus* Wood Density Evaluation at Past Ages

Fawaz Ali JAMMAL FILHO, Adriano Wagner BALLARIN,
Marcos Antonio de REZENDE
São Paulo State University "Júlio de Mesquita Filho", Botucatu - São Paulo - Brasil
College of Agricultural Sciences – Department of Rural Energy
jammal.fca@fca.unesp.br

The main objectives of the development of clonal eucalyptus forests are rapid growth and productivity. Considering the great diversity of species, the genus Eucalyptus has the potential to attend different segments of wood industry. One of the principal parameters for wood quality evaluation is the basic density, especially when considering industrial and energy purposes. This property has relatively simple determination and is well correlate to several other wood properties.

The objective of this study was to determine basic density of wood on the ages of 2, 4 and 6 years of the physiological development of Eucalyptus spp. 6 years old trees using densitometric radial profiles obtained using the method of gamma ray attenuation and, addi-

2012 IUFRO CONFERENCE DIVISION 5 FOREST PRODUCTS

INTERNATIONAL UNION OF FOREST RESEARCH ORGANIZATIONS

8 › 13 JULY'12 - ESTORIL CONGRESS CENTRE, LISBON, PORTUGAL

FINAL PROGRAM, PROCEEDINGS AND ABSTRACTS BOOK

www.iufro2012.org

ORGANIZING ENTITIES

IUFRO

Hinc patriam sustinet
Instituto Superior de Agronomia
Universidade Técnica de Lisboa

Centro de Estudos Florestais (CEF)

DIVISION 5 - FOREST PRODUCTS

Coordinator
Andrew Wong, Malaysia

Deputies:
Jamie Barbour, United States
Dave Cown, New Zealand
Pekka Saranpää, Finland

INTERNATIONAL ORGANISING COMMITTEE

Conference Chair
Pekka Saranpää (Finland)

Conference Co-Chair
Jamie Barbour (USA)

Scientific Committee
Andrew Wong (Malaysia)
Dave Cown (New Zealand)
Helena Pereira (Portugal)
Jamie Barbour (USA)
Jerry Winandy (USA)

LOCAL ORGANISING COMMITTEE

Chair
Helena Pereira
Vice-rector of the Technical University of Lisbon, full professor of ISA (School of Agronomy), president secretary of the Forest Research Centre/ Centro de Estudos Florestais (CEF).

Jorge Gominho,CEF, ISA
Isabel Miranda, CEF, ISA
Sofia Knapic, CEF, ISA
Francisca Lima, AIFF (Competitiveness and technology center for forest industries)
Pedro Cardoso, THE (local PCO)

Congress Agency and PCO Organizing Committee Support

THE – The House of Events
Office contact +351 22 8348940
Contact at Conference Centre +351 21 464 6204

Technical Board
Francisca Lima, AIFF
Jorge Gominho, CEF, ISA
Sofia Knapic, ISA
Luis Leal, ALTRI
Susana Silva, Cortiçeira Amorim
Susana Carneiro, Centro Pinus
José Manuel Nordeste, RAIZ

BEST POSTER AWARDS

The Scientific Committee wishes to encourage scientists to display outstanding posters during the IUFRO Division 5 conference.

An Awarding Body will evaluate all the posters exhibited during the poster sessions, based upon the following selection criteria:

1. Presentation: layout (attractiveness, legibility, creativity)
2. Content: innovative ideas and value of subject matter
3. Presenter's ability to convey the message

The awards will be presented at the Conference dinner, on July 11 and consist of a certificate and a gift sponsored by 3DCork – www.3dcork.com

ACKNOWLEDGMENTS

GOLD SPONSOR

grupo Portucel Soporcel

PREMIUM SPONSORS

altri

SONAE INDUSTRIA

FSC

BEST POSTER AWARDS SPONSOR

3D CORK intelligent nature

CO-SPONSOR

estoril CENTRO DE CONGRESSOS

PARTNERS

anefa Associação Nacional de Empresas Florestais, Agrícolas e do Ambiente

GREEN PARTNERS

Criar Bosques Um projecto Quercus

Pegada Ecológica

SAP/YSP PROGRAM SPONSOR

FOREST SERVICE USDA

MEDIA PARTNERS

GREENSAVERS

planetazul o portal de ambiente e sustentabilidade

SCIENTIFIC COLLABORATORS

IRG

iawa

INTERNATIONAL WOOD CULTURE SOCIETY IWCS

Society of Wood Science and Technology SWST

INTERNATIONAL ACADEMY OF WOOD SCIENCE IAWS

OFFICIAL AIRLINE COMPANY

TAP PORTUGAL | A STAR ALLIANCE MEMBER