

Team report from Universities of Helsinki and Joensuu

Forest Mensuration and Planning 2004-2008

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RESOURCE MANAGEMENT



JOENSUUN
YLIOPISTO

General

- ◆ At the University of Helsinki, Forest mensuration and management along with forest and wood technology belong to the Department of Forest Resource Management in the Faculty of Agriculture and Forestry
- ◆ At the University of Joensuu, Forest mensuration and forest planning is one of five specialization possibilities in the Faculty of Forest Sciences

Staff

- ◆ Helsinki:
 - professors
 - ◆ Annika Kangas (acting professor Lauri Mehtätalo), forest mensuration & management
 - ◆ Pauline Stenberg, forest mensuration
 - ◆ Markus Holopainen, GIS
 - lecturers

Staff

- ◆ Joensuu:
 - professors:
 - ◆ Matti Maltamo, forest mensuration
 - ◆ Timo Tokola, forest information systems
 - ◆ Timo Pukkala (acting professor Mikko Kurttila), forest planning
 - senior assistants
 - ◆ forest mensuration and forest planning

Focus on research

◆ Helsinki:

- *New generation planning systems*
- *Physical models in remote sensing*
- *Value of information in decision making*
- *Inventory methods for rare phenomena*
- *Combining aerial information and laser scanning data*

Focus on research

◆ Joensuu:

- *ALS based forest inventory by tree species*
- *Ecological applications of ALS*
- *Forestry related Geomatics*
- *Computational methods of Forest Remote Sensing*
- *Forest simulator software development*
- *Including risk and uncertainties in forest planning calculations (fire risk, erroneous inventory data)*
- *Spatial planning techniques and the use of raster cells in planning calculations*
- *Developing multiple-use models for forest planning calculations*

Researchers

- ◆ Helsinki:
 - post-docs
 - ◆ Ilkka Korpela, method development for 3D remote sensing for forest inventory
 - ◆ Miina Rautiainen, remote sensing of vegetation
 - graduate students
 - ◆ Minna Rätty, methods in general model localization
 - ◆ Antti Mäkinen, data mining
 - ◆ Olli Leino, inventory of sparse populations
 - ◆ Mikko Vastaranta, use of ALS and TLS measurements in wood supply chain
 - ◆ (about 10 elsewhere)

Researchers

◆ Joensuu:

- post-docs

- ◆ Arto Haara, high resolution remote sensing

- graduate students

- ◆ Petteri Packalén, ALS and digital aerial photographs in species specific forest inventory
- ◆ Jussi Peuhkurinen, ALS and digital aerial photographs in pre-harvest inventory
- ◆ Lauri Korhonen, forest canopy cover
- ◆ Susanna Sironen, non-parametric growth modelling
- ◆ Annukka Pesonen, inventory of sparse populations
- ◆ Mikko Vehmas, ALS based forest structural characteristics

Researchers

- ◆ Jari Vauhkonen, estimating central tree characteristics from ALS data. An approach based on computational geometry.
- ◆ Eveliina Kotamaa, ALS based biomass, spatial pattern and cost plus loss calculations
- ◆ Maria Pasadolos, optimising forest stand management in Galicia
- ◆ Nurul Islam, forest planning under uncertain inventory data
- ◆ Anne Seppänen, development of new generation forest simulator for operative management planning
- ◆ Sanna Härkönen, employing process-based models to forest planning for estimating forest production and bioenergy in different climatic conditions in Finland

Some research projects

- ◆ Helsinki:
 - SIMO – SIMulation and Optimisation for next generation forest planning system, Tokola & Kangas
 - Remote sensing of vegetation using spectrally invariant parameters, Stenberg
 - Coniferous forest structure from satellite images, Stenberg
 - Optical remote sensing of northern European forest structure, Rautiainen
 - Value of information in environmental decision making, Kangas

Some research projects

- Improving forest supply chain by means of advanced laser measurements , Holopainen
- Bottleneck and a black hole in forest remote sensing - Accurate estimation of tree species and young forests with the aid of laser scanning and optical multichannel material, Korpela
- Data mining methods in analysing the forest data and analysing the quality of forest planning, Tokola
- Mapping rare forest characteristics using remote sensing material and field data, Kangas (Helsinki and Joensuu together)

Some research projects

◆ Joensuu:

- The use of airborne laser scanning and aerial photographs in the inventory of timber assortments by tree species (Forestlaser2), Maltamo
- New Technologies to Optimize the Wood Information Basis for Forest Industries - Developing an Integrated Resource Information System (WW-IRIS), Maltamo (Finnish part)
- Leaf-off laser data in forest inventory, Maltamo

Some research projects

- Applying forest planning and environmental informatics to develop bioenergy economics, Tokola
- High Resolution Remote Sensing Potential to Measure Single Trees and Site quality, Tokola
- The effects of erroneous inventory data on forest owner's economy and decision making at forest stand and holding level, Kurttila & Islam

Passed doctoral thesis (during 2004-2008)

◆ Helsinki:

- Tuominen, Sakari: Estimation of local forest attributes by utilizing two-phase sampling and auxiliary data
- Miettinen Jukka: Burnt area mapping in insular Southeast Asia using medium resolution satellite imagery
- Rasinmäki Jussi: Management of multi-scale forest resource data over time

Passed doctoral thesis

- Pekkarinen, Anssi: Image segmentation in multi-source forest inventory
- Katila, Matti: Controlling the estimation errors in the Finnish multisource National Forest Inventory
- Korpela, Ilkka: Individual tree measurements by means of digital aerial photogrammetry

Passed doctoral thesis (during 2004-2008)

◆ Joensuu:

- Mehtätalo, Lauri: Predicting stand characteristics using limited measurements
- Trasobares, Antoni: Modelling and management of uneven-aged pine forests in Catalonia, North-East Spain
- Anttila, Perttu: Assessment of manual and automated methods for updating stand-level forest inventories
- Haara, Arto: The uncertainty of forest management planning data in Finnish non-industrial private forestry
- González Olabarria, José Ramón: Integrating fire risk into forest planning.

Passed doctoral thesis

- Mikkilä, Mirja: The many faces of responsibility: Acceptability of the global pulp and paper industry in various societies.
- Tikkanen, Jukka: Co-operation in forest planning processes for non-industrial private forestry
- Niskanen, Yrjö: Effect of forest plans on forest utilization decisions
- Hyvönen, Pekka: The updating of forest resource data for management planning for privately owned forests in Finland
- Heinonen, Tero: Developing spatial optimization in forest planning
- Schelhaas, Mart-Jan: Impacts of natural disturbances on the development of European forest resources: application of model approaches from tree and stand levels to large-scale scenarios

Publications

◆ During 2004-2008:

- Helsinki: about 85 refereed publications
- Joensuu: about 110
- Of which about 20% are combined

◆ Examples:

- "3D Treetop Positioning by Multiple Image Matching of Aerial Images in a 3D Search Volume Bounded by LIDAR Surface Models" Korpela, I. *Photogrammetrie, Fernerkundung, Geoinformation : 2007 : 1, pp. 35-44* "Hansa Luftbild Award"
- Packalén, P. & Maltamo, M. 2008. The estimation of species-specific diameter distributions using airborne laser scanning and aerial photographs. *Can. J. For. Res.* 38: 1750-1760

Publications

- International books
 - ◆ Decision Support for Forest Management. Managing Forest Ecosystems , Vol. 16
Kangas, Annika, Kangas, Jyrki, Kurttila, Mikko
2008, 224 p.
 - ◆ Designing Green Landscapes. Managing Forest Ecosystems , Vol. 15. Gadow, Klaus von; Pukkala, Timo (Eds.). 2008, 290 p.
 - ◆ Forest Inventory. Methodology and Applications. Managing Forest Ecosystems , Vol. 10
Kangas, Annika; Maltamo, Matti (Eds.). 2007, 362 p.

