PRECISION FORESTRY IN EU MOUNTAIN AREAS

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The SLOPE project

Integrated processing and control systems for sustainable forest production in mountain areas

- FP7-NMP-2013-SME-7
- 10 partners
- 3 years
- Precision forestry
- Forest digital model
- Intelligent machines development

Bruxelles 29/01/2016
The workflow concept

1. Remotely sensed data (satellite and UAV)
2. Ground based data (laser-scanner)
3. 3D forest model generation
4. Planning of cable crane lines
5. Trees marking (traditional and with RFID tags)
6. Forest operations
7. ERP
8. Final users

Final users:
- Online auction;
- Stocks optimization;
- Full traceability.

ERP:
- Integration of forest and harvesting databases;
- Management of logistics;
- Assortment orders as requested by the market

Forest operations:
- Felling and hauling
- Processing, timber sorting (assortments) and tagging

Planning of cable crane lines:
- Management of operations

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Aerial sensors

07/2013

RGB data

10/2012

NIR data

Large scale satellite images

Highly detailed UAV images
Terrestrial Laser Scanning TLS survey

AUTOSTEM software (Treemetrics)
• Automated tree detection
• Branches removal
• 3D tree shape (each 10cm)
# Generation of bucking instructions

<table>
<thead>
<tr>
<th>LOG Weight</th>
<th>LOG1 100</th>
<th>LOG2 10</th>
<th>LOG3 50</th>
<th>LOG4 0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assortment 1 Value (m3) 1*0.3</td>
<td>2*0.15</td>
<td>-</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assortment 2 Value (m3) 1*0.3</td>
<td>-</td>
<td>1*0.2</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Diagram showing bucking instructions for Assortment 1 and Assortment 2]
NIR and RGB Visualization
Tree forest model visualization

- Trees position and height inferred from DSM and image processing
Cable Crane placement

- Multiple pylon placement (with height)
- Cable follows a catenary function
- Harvesting area visualization (width = 2 x height of the cable from the terrain on each side)
Intelligent forest machines

- Interact with database and ERP
- Measure loads and volumes
- Full traceability
- Receive (cutting) instructions
- Real time connectivity

- Quality assessment per single log (knots, chemical and physical characteristics)

Cable yarder carriage

Processor head
- NIR
- Hyperspectral
- RFID
- Stress wave
- Branch index
Impact on Innovation Challenges

- Logistics optimization
- Timber value maximization
- Early characterization of feedstock (physical, chemical)

**CHALLENGE 2**

- Online auctions
- Stock optimization
- Complete traceability

- Integration of forest and harvest database
- Long term planning (stands, roads, operations)
- Analysis of historic data

**CHALLENGES**

1. Managing impacts related to climate change
2. Supporting Wood and Biomass Mobilization
3. Supporting the Provision of Ecosystem Services
4. Improving Sustainable Forest Management Approaches and Tools

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Thank You!

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Project web site: www.slopeproject.eu
Committee of the Regions

How important are these technology developments?

A new Eu forest strategy: for forest and forest based sector (2014/C 126/02)

21. agrees on the need to acknowledge that the EU does not depend exclusively on its own production and that its consumption has an impact on forests worldwide. As well as ensuring the sustainable forest management of all of the EU’s forests, the objectives should include both increasing the wooded area and increasing the productivity of European forests, at least in the case of forests whose main function, in the context of multifunctionality, is production;

23. recalls the situation of territories in which the process of forest regeneration is difficult due to the conditions of climate and soil. Special attention should be provided to regions where there is a difficult topography and, thus, a greater difficulty to introduce mechanization, as well as a climate most favorable to invasive species than to planted forestry species by providing measures to support private investment in the reconversion, conservation and development of the forest sector;

24. also considers that forest management should be strengthened in public forests where activities are not economically viable, either because of the quality of the products they offer or because of a lack of infrastructure, and investments must therefore be made in these forests in order to improve them and/or access to their resources;

25. considers that adopting the cascade principle for wood could be too restrictive, as not all regions have the infrastructure or companies providing the full range of options for processing and using wood. It would therefore be more realistic to promote the principle of efficient use of resources, as part of a comprehensive approach and under the guidance of local and regional authorities, with the aim of ensuring sustainable management of Europe’s forests;

27. welcomes and acknowledges the achievements of voluntary certification schemes and recommends that this be broadly underpinned by other measures, including financial instruments. Certification could serve as an instrument to help stem the flow of illegal timber and timber products;

28. points out that the measures to be adopted could result in a loss of competitiveness for local SMEs by increasing their production costs; therefore proposes that action be taken to support SMEs, for instance encouraging more consumption of forestry products produced locally and, as far as possible, avoiding policies that increase red tape and administrative costs. Special care should be taken when concluding bilateral agreements with third countries to take into account any possible repercussions for the economic and social wellbeing of forested regions in those countries;