

Title of the thesis: EVALUATION AND DEVELOPMENT OF SMART SOLUTIONS FOR WOOD TRACEABILITY AND SOURCING

By: Mirella ELIAS

Ensuring a complete, transparent, and verified wood traceability is essential for fighting illegal logging, legal compliance, and optimizing logistics across complex forest-based supply chains. Conventional wood measurement and tracking practices, such as manual log scaling using calipers or measuring tapes, paper-based transport documents, visual checking, and physical marking, remain labor-intensive, time-consuming, expensive, and susceptible to human error, bias and fraud. The PhD thesis presented by Mirella addresses these critical challenges in timber supply chain integrity by investigating and implementing digital solutions to enhance wood traceability and sourcing. Grounded in a comprehensive review of state-of-the-art technologies, the research targets persistent operational bottlenecks in timber transport, volume estimation, and verification.

To address these challenges, she structured the research around empirical field evaluations and advanced computational workflows:

1. She evaluates the accuracy, precision, and operational efficiency of a LiDAR-enabled smartphone app for real-time log volume estimation, comparing digital readings against traditional log volume estimates;
2. She assesses automated digital truckload measurement setups deployed at factory gates to streamline timber scaling, reduce measurement errors and, overall, increase the effectiveness of the supply chain;
3. She demonstrates the application of computer vision and image-matching feature detection algorithms to extract unique patterns, effectively establishing digital fingerprints for tracking truckloads and verifying wood origin.

The methodologies and findings compiled in her research make a substantial contribution to smart forestry, supply chain digitalization, and timber tracking systems. By successfully bridging field-level operations with digital innovation, the research offers actionable frameworks and tools for the forest-based sector.

I conclude that her work holds significant scientific value and practical merit. It aligns with modern principles of resource conservation and big data analytics in forestry, serving as a robust foundation for future technological developments in automated timber traceability.

Prof. dr. eng. Stelian Alexandru Borz

Scientific Supervisor

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