Virtual Forest - Towards Intelligent Forestry

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The need for modern learning environment

The possibilities of digitality and bioeconomy have been raised as leading themes of strategic planning by the Finnish government. Lapland University of Applied Sciences (LUAS) has put great efforts on both themes for years by effectively utilizing multidiciplinary knowledge and knowhow from different units of university and various networks. Smart use of natural resources is one of the strategic areas of emphasis in the university. The strategy is being implemented in the forestry study program as well as in the research team of natural resources. Development and utilization of digitality is taken care by the laboratory of software engineering, pLAB, which is an experienced creator of real-time integrated 3D-environments.

Constantly changing and diverse work of forestry engineers requires the forestry education to stay a step ahead and to respond to the upcoming challenges and possibilities of work life. The need for the visualized forest element has been recognized widely in the whole forest industry. That is why the Virtual Forest was innovated as a completely new learning tool for the forestry students. However, this virtual forest environment is not only a learning environment, but also a chance to turn the traditional forestry livelihood into modern direction: the Virtual Forest is the first application to combine spatial data with forest data and enabling forest growth (temporal aspect).

Game-based learning

The Virtual Forest was planned and executed by the experts of forestry and software engineering. It gives added value to the forestry teaching and is advancing the modernizing of teaching methods in Lapland University of Applied Sciences. Modern technologies enable learning environments that support the nontradional teaching, which emphasizes the active role of students as constructors of information and as developers of their own expertise. The role of teachers is turning towards the facilitator: creating learning possibilities and inspiring students to learning. However, teachers are still needed for creating the pedagogic framework, which defines the goals and reasoning for game-based learning.

Games are natural environments for the youngsters nowadays, which supports and justifies the utilization of game-based learning environments at schools. Virtuality also combines theory in practice and can help in understanding relations and entities. The abstract theory is changed into concrete object that can be experienced, tested and controlled by a student himself. In addition, games can act as motivators to learning: in virtual learning environments, it is safe to practice and even to make mistakes, solve problems and try again the alternative way. The practices implemented in game environments create internal operating models that guide to solve similar problems in different connections later in the future.

Digital tools in forestry

The forestry sector is one of the most significant industries in Finland. This requires a lot also from forestry education: supporting the competitiveness of forest industry by securing wood procurement and sustainable use of natural resources. New innovative tools based on newest technology are needed for teaching and modeling of forest planning and wood mobilization.

Digital tools have arrived to support fieldwork, since the effects of silviculture methods can be observed from visualization. The Virtual Forest enables the evaluation of different harvesting and regeneration methods as well as demonstration and comparison of alternative harvesting actions. Nowadays the forestry professionals have not only the economic point of view to consider; the ecological and social aspects are of significant importance as well. Digitality offers new tools for forestry planning to complement the traditional planning methods: a wider picture of the area in hand is gained without inspecting the area as fieldwork.

Combining game technology, GIS and temporal information

The Virtual Forest was created by utilizing of game technology. It combines different GIS data from different sources: the information originates to open sources and paid data. The selection of information enables the Virtual Forest to be used anywhere in Finland. The application for wood procurement was implemented by QGIS open-source geographic information system.

The Virtual Forest is a realistic model of a real forest with actual forest assets. Connection to SIMO forest calculation system enables growing the forest as well as observing and evaluating the effects of current silvicultural methods in the future. The future development of forests is a highly important feature when activating forest owners to manage their forest assets and when planning the utilization of forest areas with different groups of interest.

Virtuality to support decision-making

The challenges in Finnish forestry have to do with wood mobilization: people not understanding the effects that different silvicultural methods have in forest growth and landscape. Visualization changes information into structured, graphic form, which advances understanding: the users receive new resources to perceive information better than before. Graphic form of information also helps in making conclusions and, therefore, decisions. With the assistance of virtual applications, it is possible to actively manage forests, increase the acceptance of silvicultural actions and combine different goals of forest utilization. In the very near future, virtuality will become an outstanding tool for participatory planning in utilization of natural resources. Decisions are easier to make based on realistic 3D-environment than on pictures and verbal descriptions.

The goal is to get Virtual Forest to serve the Finnish forestry sector: to help in strengthening the competitiveness and speed up wood mobilization as well as modernization of this traditional livelihood. The importance of these cannot be emphasized enough especially now, when facing multiple new investments in Finnish forestry and energy industry. The boom of bioeconomy will help in replacing fossil fuels with energy from renewable natural resources. Virtuality is a new and welcome element in forestry sector for observing and comparing results and impacts of silvicultural actions. However, the educational utilization of Virtual Forest must not be underestimated; it is a perfect tool for basic and updating education of forestry as well as for education and guidance of forest professionals.