

Proposal full title: Holonic Integration of Cognition, Communication and Control for a Wood Patching Robot

Proposal acronym: **HOL-I-WOOD PR (284573)**

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Key words: Holonic Design, Agent Technology, Human Machine Interfaces, Augmented Reality, Visual Cognition, Non-linear Control, Robotics, Timber Industry; Machine Vision, Sensor Fusion, Real-time Imaging, Smart Cameras, TTEthernet, Time-triggered RT Communication

Proposal abstract

Repair and patching of resin galls and loose dead knots is a costly and disruptive process of inline production in timber industry. A large variety of plain as well as laminated wooden end-products demands for off-line human interaction and skilled handcrafting in order to add value and quality to the final products. The human workforce involved in these production tasks is hard to be replaced by a machine. Another request for human recognition and decision-making capabilities, occurring at a previous stage of the production line, is the detection and classification of significant artefacts in wooden surfaces.

The dimension of these plain or laminated wooden products ranges from a few centimetres up to several meters, thus requiring a related scalability of the fully automatised solution being researched for within this project. For that reason this project proposes a holonic concept that subsumes automated visual inspection and quality/artefact classification by a skilled robot visually guided and controlled by non-linear approaches that combine manipulation with energy saving in trajectory planning under real-time conditions – enabling the required scalability for a wide range of applications. The interaction of these holonic sub-systems is implemented in agent technology based on a real-time communication concept while fusing multi-sensoric data and information at different spatial positions of the production line.

The feasibility of inter-linking independent autonomous processes, i.e. agents for inspection, wood-processing, transport (conveying) to repair by a patching robot, is demonstrated by a pilot in a glue lam factory since shutter boards are a perfectly representative mid-size product. A mobile HMI concept makes interaction with the machine park easy to control, reliable and efficient, while at the same time increasing the safety for workers within a potentially dangerous working environment of a glue lam factories and saw mills.