Lightweight and flexible: developing industrial robots in timber construction

About this project

InRoHo

Lightweight and flexible: developing industrial robots in timber construction

Markets:

Material: Biocomposites, Wood, Others (Wood fibres), Laminates, Others (WVC (Wood Veneer Composite))

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

Technology Transfer Program Leichtbau

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Context

or the handling of workpieces. The supporting structures of these articulated robots are usually made of cast aluminium or steel. This design is heavy, energy-intensive to manufacture and is particularly worthwhile for large quantities with consistent geometries.

At the same time, there is a growing demand for robots whose dimensions and reach can be customised to specific applications. Rigid modular systems and long development times make this individualisation difficult.

Wood-based materials offer an alternative here: they are lighter, store CO# and can be flexibly processed using panel-based concepts and manufacturing processes based on computerised numerical control (CNC). This is where the researchers in the InRoHo project come in. They are investigating how load-bearing structures for industrial robots can be built from wood-based materials.

Purpose

The researchers want to develop an articulated-arm robot in a wooden design whose performance is equivalent to established metal structures. The focus is on a significant reduction in weight, a better carbon footprint and economical production, even in small series.

The project team is aiming for a modular lightweight timber construction, in which the load capacity, reach and geometry can be flexibly adapted to different applications. By substituting metal structural components and utilising renewable raw materials, the aim is to reduce greenhouse gas emissions in production and operation.

At the same time, the wood-based structure should improve movement and positioning accuracy thanks to its damping properties, thereby contributing to the productivity of automated systems.

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Procedure

The project team is initially developing a variably configurable modular system for robot elements made from panel-shaped wood materials. This forms the basis for lightweight designs that are manufactured using established CNC technology. Tests on components, connections and assemblies provide characteristic values for dynamic behaviour, fatigue strength and climate-related influences.

At the same time, the scientists are adapting the drivetrain and the control system to the changed system behaviour. In tests, they evaluate the positional accuracy, repeatability and motion stability of the overall system under laboratory and operating conditions. The results are incorporated into the design, calculation and control until a near-series prototype is available.

Finally, the researchers compare the ecological impact of the wooden construction method with conventional metal robots and derive basic principles for small series in industrial practice.

Funding duration:

Funding sign:	03LB3107	**Funding amount:**	EUR 838 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3107A - InRoHo in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Machines and plants	✓
Services & consulting	

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight material construction	✓
Functional integration	
Measuring and testing technology Component and part analysis	✓
Modelling and simulation Materials	✓
Plant construction & automation Robotics	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials Biocomposites, Wood	✓
Cellular materials (foam materials)	
Composites Laminates, Others (WVC (Wood Veneer Composite))	✓
Fibres Others (Wood fibres)	✓
Functional materials	
Metals	
Plastics	
Structural ceramics	
(Technical) textiles	