iLEAD

Lightweight Functional and Hybrid 3D-Printing for Medical Assistive Devices

Programm / Ausschreibung	COIN, Aufbau, COIN Aufbau 8. Ausschreibung	**Status**	laufend
Projektstart	01.04.2021	**Projektende**	31.03.2026
Zeitraum	2021 - 2026	**Projektlaufzeit**	60 Monate
Keywords	3D-printing, functionalization, digital design process, design optimization, user-centered design, medical assistance products		

Projektbeschreibung

Currently available medical assistance products (orthoses, rehabilitation equipment, etc.) are often laborious to manufacture (Functional Need FN1), the fabrication results in a considerable amount of waste (Social Need SN1), e.g. through casting molds, and so leads to expensive products (SN2). At the same time, products are optically not appealing (SN3), heavy (FN2) and lack individualization and functionalization. Similar to clothes with ready-made sizes, they often do not fit the respective user (FN3). Fit and function are not monitored (FN4), which can cause pain, infections and other injuries. This is where 3D-printing can offer a sustainable. 3D-printing is an essential technology to make today's manufacturing more resource-efficient, sustainable and flexible. However, 3D printing has not yet been able to exploit its potential for medical devices due to the following technological needs:

- (TN1) Material can only be stacked in layers.
- (TN2) Material combinations have not yet been investigated thoroughly.
- (TN3) Support structures are complex and cannot be released easily.
- (TN4) Functional components are not considered in the design and manufacturing process.

iLEAD starts here and examines the following areas (Goals):

- (G1) Multimaterial 3D-printing: material structure, compatibility analyses and print head design (addresses (FN1, SN1, TN2,3)).
- (G2) Lightweight lattice and simulation-based optimization (addresses (SN1,3, FN2, TN3)).
- (G3) 3D-printing strategies for 5-axis printing (addresses (FN2, TN1,3)).
- (G4) Intelligent functionalization of products (addresses (FN4, TN4)).
- (G5) Holistic participatory development process including users (addresses SN3, FN3,4).

By 3D-printing of endless fibre composites, load-bearing and adaptive structures can be integrated into medical assistance products (e.g. shafts for legs). Combination of different materials enables to adjust the stiffness of lightweight lattices and to integrate sensors at relevant points during production (e.g. individualized splints with monitoring of training state) for the first time. The developed technology enables products to be individualized, exhibit high mechanical strength, while at the same time being cost-efficient, material- and weight-saving. iLEAD aims to produce medical assistance products WITH AND FOR the users by continuous user-centered-design, involving future users and experts in the field of therapy. Thus, iLEAD

leads to an international leadership and pioneering position in 3D-printing technology with focus on medical assistance products.

Projektpartner

- FH Kärnten - gemeinnützige Gesellschaft mbH