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AUTOMATED DESIGN AND 3D PRINTING OF THERAPEUTIC WRIST HAND ORTHOSIS

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Individualized orthopedic supplies are currently produced mostly by manual means – using negative and positive casts of patients' limbs and manual work of orthotic technicians. This is neither quick nor cheap, and thus availability of specialized orthotics for people with special needs is low. Modern, digital process, based on 3D scanning, CAD and 3D printing, brings more possibilities, but is also difficult to perform correctly and requires highly qualified engineers. A possible solution is design automation – with use of intelligent CAD models it is possible to greatly reduce time and level of skills needed from the designer of an individualized orthopedic device. The paper focuses on developing therapeutic hand orthosis for a 13-year old patient with a congenital paresis of his right arm, resulting in permanent wrist dislocation and problems with performing daily activities. The orthosis was built using the automated workflow of AutoMedPrint system, developed at Poznan University of Technology. Both arms were 3D scanned and the obtained data was merged to obtain a target corrected geometry of the hand. Then, the orthosis was automatically designed and adjusted to the special needs of the patient. It was then 3D printed using FDM process with a PLA materials and tested with the patient with positive results, enabling to improve the therapeutic process and increase patient's capabilities in grasping objects and obtaining correct wrist positions. The therapeutic process continues, several iterations of the orthosis were made to adjust to the process and also growth of the patient.