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Weight Reduction of the Body Weight Support of COWALK Using the Topology Optimization Method

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Abstract

Exoskeleton robots have been used for rehabilitation in medical industry. An exoskeleton robot named COWALK has been developed by Korea Institute of Science and Technology (KIST) for rehabilitation of the lower body. In structural design of an exoskeleton robot, weight reduced models have been required to improve efficiency of motors and to reduce material cost. In this study, we present a weight reduced body weight support (BWS) of the COWALK by using a topology optimization method. BWS of the COWALK is used to hang up patient's body for standing up and to help their walking. To assist patient's walking, BWS needs to withstand not only static load but also dynamic load so that higher safety factor as well as less weight is required.
Using the topology optimization scheme to minimize structural compliance, we propose 22.2% weight reduced design of the BWS. In addition, it presents 66.6% higher safety factor than initially designed BWS. In this study, three dimensional optimization scheme based on level set method was used [1]. The finite element analysis was conducted by using the commercial package COMSOL and the optimization process was programmed using Matlab.

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References

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