

Title (en)

CONTROL SYSTEM FOR A HAPTIC LOWER LIMB EXOSKELETON FOR REHABILITATION OR WALKING, WITH IMPROVED EQUILIBRIUM CONTROL, MAN-MACHINE INTERFACE

Title (de)

STEUERUNGSSYSTEM FÜR EIN HAPTISCHES EXOSKELETT DER UNTEREN EXTREMITÄTEN ZUR REHABILITATION ODER ZUM GEHEN MIT VERBESSERTER GLEICHGEWICHTSKONTROLLE, MENSCH-MASCHINE-SCHNITTSTELLE

Title (fr)

SYSTÈME DE COMMANDE D'EXOSQUELETTE À MEMBRE INFÉRIEUR HAPTIQUE POUR LA RÉÉDUCATION OU LA MARCHE, AVEC CONTRÔLE AMÉLIORÉ DE L'ÉQUILIBRE, INTERFACE HOMME-MACHINE

Publication

EP 3705105 A1 20200909 (EN)

Application

EP 19425014 A 20190308

Priority

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Abstract (en)

A haptic exoskeleton (1) coupled to the body of a patient (2) has actuator means (10) for actuating a number of joints (7, 8, 9); bioelectric sensors (14) acquiring bioelectric signals (S_{EMG}); and a control system (75). The system envisages: an outer postural control loop (48), to output an automatic posture control vector (\dot{x}_{sum}), defining a postural task of the exoskeleton; a patient-control module (91), to output a vector of bioelectric angular velocities (θ_p) based on the bioelectric signals (S_{EMG}) to allow the patient to interact with said joints (7, 8, 9); an inner joint-velocity control loop (49) to output a control signal (u_s) to be applied to the actuator means (10) to control a rotational movement of the joints (7, 8, 9), based on an input reference signal (θ_{ref}), being a combination of contributions of the automatic posture control vector (\dot{x}_{sum}) and of the vector of bioelectric angular velocities (θ_p). A control modulation module (78, 82, 84) modulates the contributions of the postural control loop, through the automatic posture control vector (\dot{x}_{sum}), and of the patient-control module, through the vector of bioelectric angular velocities (θ_p), for generation of the reference signal (θ_{ref}).

IPC 8 full level

A61H 3/00 (2006.01); **B25J 9/00** (2006.01); **A61H 1/02** (2006.01)

CPC (source: EP)

A61H 3/00 (2013.01); **A61H 1/0237** (2013.01); **A61H 2201/165** (2013.01); **A61H 2201/5061** (2013.01); **A61H 2201/5069** (2013.01); **A61H 2201/5071** (2013.01); **A61H 2201/5084** (2013.01); **A61H 2230/605** (2013.01)

Citation (applicant)

- EP 2238894 A1 20101013 - SYCO DI HEDVIG HABERL & C S A [IT]
- EP 2497610 A1 20120912 - SYCO DI HEDVIG HABERL & C S A S [IT]
- G. MENGA ET AL.: "Lower limb exoskeleton for rehabilitation with improved postural equilibrium", ROBOTICS, 2018
- YOUNGJIN CHOI; DOIK KIM; YONGHWAN OH; BUM-JAE YOU: "Posture/Walking Control for Humanoid Robot Based on Kinematic Resolution of CoM Jacobian With Embedded Motion", IEEE TRANSACTIONS ON ROBOTICS, vol. 23, no. 6, December 2007 (2007-12-01), pages 1285, XP011332702, DOI: doi:10.1109/TRO.2007.904907
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- Z. LI; M. HAYASHIBE; Q. ZHANG; D. GUIRAUD: "FES-Induced Muscular Torque Prediction with Evoked EMG Synthesized by NARX-Type Recurrent Neural Network", 2012 IEEE/RSJ INTERNATIONAL CONFERENCE ON INTELLIGENT ROBOTS AND SYSTEMS, 7 October 2012 (2012-10-07)

Citation (search report)

- [AD] EP 2238894 A1 20101013 - SYCO DI HEDVIG HABERL & C S A [IT]
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- [A] CN 106214427 A 20161214 - UNIV SHANGHAI JIAOTONG
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Designated contracting state (EPC)

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