Document details

Back to results | 1 of 1

Export Download Print E-mail Save to PDF Add to List More...

View at Publisher

IEEE Access Open Access
Volume 7, 2019, Article number 8382150, Pages 1355-1364

Clasp-knife model of muscle spasticity for simulation of robot-human interaction (Article)

Mat Rosly, H.[a], Sidek, S.N.[a], Ahmad Puzi, A.[a], Yusoff, H.M.[a], Daud, N.[b], Mat Rosly, M.[c]

[a]Department of Mechatronics, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, 53100, Malaysia
[b]Faculty of Allied International Health Sciences, Islamic University Malaysia, Kuantan, Pahang, 25200, Malaysia
[c]Department of Physiology, Faculty of Medicine, University of Malaya, Kuala Lumpur, 50603, Malaysia

Abstract

View references (22)

The objective of this research was to replicate the muscle tone moment feedback of elbow upon passive mobilization and classify them based on modified ashworth scale criterion using a mathematical model. The proposed model enables the visualization of muscle tone pattern for robotic interaction simulation. A concurrent muscle tone model necessitates a jerk effect to fully replicate the catch and release effect, also known as, clasp-knife phenomenon of muscle tone feedback. However, the research of passive mobilization control interaction between robot and subject does not emulate such phenomenon. Thus, the model was improvised to replicate the clasp-knife phenomenon according to the robot's gross kinematics and dynamics. The model was designed based on the quantitative pattern of muscle tone feedback from subject with spasticity. The simulated model was then correlated to clinical measures using similar kinematic and dynamic input. The velocity dynamic input was splined to obtain the velocity trend without the jerk effect. The results obtained from the proposed model were relatively promising with an overall (n=9× 4) linear (Pearson) correlated average of -r=0.8348 for nine subjects with correlation significant at the 0.01 level (p< 0.01) and five of them presented a distinctive clasp-knife phenomenon with correlation average of -r=0.8631. © 2018 IEEE.

SciVal Topic Prominence

Topic: Muscle Spasticity | Stroke | limb spasticity

Prominence percentile: 93.690

Author keywords

biomedical engineering | mathematics | Modeling | motion analysis

Indexed keywords

Engineering controlled terms: Biomedical engineering | Electric resistance | Feedback | Kinematics | Mathematical models | Mathematical techniques | Models | Motion analysis | Muscle | Personnel training | Robots | ROM

Engineering uncontrolled terms: Catch and release | Clinical measure | Kinematics and dynamics | Modified Ashworth scale | Moment feedback | Robotic interaction | Simulated model | Simulation of robots

Engineering main heading: Human robot interaction

Metrics

0 Citations in Scopus

0 Field-Weighted Citation Impact

PlumX Metrics

Usage, Captures, Mentions, Social Media and Citations beyond Scopus.

Cited by 0 documents

Inform me when this document is cited in Scopus:

Set citation alert

Set citation feed

Related documents

Modified Ashworth Scale (MAS) integrated adaptive impedance control framework for upper extremity training platform

Sidek, S.N. , Rosly, H.M. , Yusof, H.M.
(2017) 2017 IEEE International Conference on Mechatronics and Automation, ICMA 2017

Design of a thumb module for the FINGER rehabilitation robot

Wolbrecht, E.T. , Morse, K.J. , Perry, J.C.
(2016) Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS

Model-based assistance-as-needed for robotic movement therapy after stroke

Taheri, H. , Reinkensmeyer, D.J. , Wolbrecht, E.T.
(2016) Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS

View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

Funding details

Funding sponsor	Funding number	Acronym
Kementerian Sains, Teknologi dan Inovasi	SF15-015-0065	MOSTI
International Islamic University Malaysia		IIUM
International Islamic University Malaysia	SF15-015-0065	IIUM
Ministry of Science, Technology and Space		

Funding text #1

This work was supported by the E-Science Grant through the Ministry of Science, Technology and Innovation, Malaysia, under Grant SF15-015-0065.

Funding text #2

The work presented was carried out in the Biomechatron-ics Research Laboratory of International Islamic University Malaysia. The author wishes to gratefully acknowledge the E-Science grant funding (SF15-015-0065) from the Ministry of Science, Technology and Innovation Malaysia. This research received ethical approval from IIUM Research Ethics Community (IREC) 659. Written informed consent was obtained from all the subjects for publication of this research.

ISSN: 21693536
Source Type: Journal
Original language: English
DOI: 10.1109/ACCESS.2018.2846595
Document Type: Article
Publisher: Institute of Electrical and Electronics Engineers Inc.

References (22)

View in search results format >

All | Export | Print | E-mail | Save to PDF | Create bibliography

1 Mehrholz, J., Pohl, M., Platz, T., Kugler, J., Elsner, B.
Electromechanical and robot-assisted arm training for improving activities of daily living, arm function, and arm muscle strength after stroke
(2015) *Cochrane Library*, 7 (11), p. CD006876.
Nov.

2 Prange, G.B., Jannink, M.J.A., Groothuis-Oudshoorn, C.G.M., Hermens, H.J., Ijzerman, M.J.
Systematic review of the effect of robot-aided therapy on recovery of the hemiparetic arm after stroke (Open Access)

(2006) *Journal of Rehabilitation Research and Development*, 43 (2), pp. 171-183. Cited 622 times.
http://www.vard.org/jour/06/43/2/pdf/prange.pdf
doi: 10.1682/JRRD.2005.04.0076

View at Publisher