

DESIGN AND DEVELOPMENT OF REHABILITATION DEVICE FOR
HEMIPARETIC PATIENTS

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To my beloved mother, father and wife

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ABSTRACT

In this thesis, the development of rehabilitation device for patients who encounter walking weakness due to post-stroke effect is presented. . In order to design an efficient new mechanism, studies were carried out regarding kinematic of human walking. In the study, the motion of a healthy physical subject in walking situation of 1 km/h speed is used as guide to design the device. Thereafter, a mechanism was developed to produce similar motion. The device functions to actuate knee and hip rotation. The device is driven by a single actuator to drive both the hip and the knee joints mechanism. The kinematic analysis of constructed device has been performed and the results conformed the functionality of the suggested mechanism. The fabricated prototype shows the combination of DC motor and cam mechanism can actuated the movement of hip and knee joint simultaneously and may significantly reduced the power consumption. The computer based controller has also been developed with simple and practical application. With the combination of the controller and the fabricated model, the output profile of the rehabilitation device is acceptable by comparing with profile of actual data.

ABSTRAK

Dalam tesis ini, pembangunan rekaan peranti pemulihan untuk pesakit-pesakit yang mengalami gejala lemah untuk berjalan disebabkan oleh kesan sakit strok dibentangkan. Dalam usaha untuk mereka bentuk mekanisma baru yang cekap, kajian telah dijalankan berkaitan dengan kinematik manusia berjalan. Dalam kajian ini, profil pergerakan subjek yang sihat dengan kelajuan 1 km/h digunakan sebagai panduan untuk reka bentuk peranti. Oleh itu, satu mekanisma telah dibangunkan untuk menghasilkan pergerakan yang sama. Peranti berfungsi untuk menggerakkan pergerakan lutut dan pangkal peha yang dipacu oleh satu putaran motor. Analisis kinematik peranti yang dibina telah dijalankan dan semua keputusan menepati fungsi mekanisma yang disyorkan. Prototaip yang dibina membuktikan bahawa gabungan DC motor dan mekanisma *cam* boleh menggerakkan pergerakan kaki untuk berjalan dan pada masa yang sama kurang menggunakan sumber kuasa. Kawalan berasaskan komputer juga telah dibangunkan dengan penggunaan yang mudah dan praktikal. Dengan kombinasi kawalan dan model peranti yang telah direka, profil pergerakan bagi proses pemulihan dapat dihasilkan dan diterima pakai apabila ia dibandingkan dengan profil data sebenar.