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## Development of Upper Limb Rehabilitation Robot Device for Home Setting

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### Abstract

Stroke is one of the leading causes of disability in the world. The stroke patients need professional support for the rehabilitation activity. However, the number of therapist is considered inadequate to support an increasing numbers of stroke patients especially in the rural areas. Therefore, robot based device for rehabilitation is considered one of the solutions for the increasing numbers of stroke patients and to support the therapist. This research presents the development of upper limb rehabilitation device robot. The device is considered portable for home setting and allowed movement on vertical elbow flexion and shoulder/elbow horizontal flexion and extension. The device consists of scissors lift and armrest mechanism that allowed the patients to perform upper limb rehabilitation at X-X, X-Z, Y-Y and Y-Z axis direction. Two linear actuators, motor drivers and Arduino UNO board were used to drive the device.

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### 1. Introduction

Stroke is the third largest cause of death in Malaysia<sup>1</sup>. Stroke causes a damage of cortical tissue and results in disturbed generation and integration of neural commands. Most of the stroke survivors suffers body malfunction that lead to the difficulties in performing activities of daily living (ADLs). Therefore, stable post stroke patients need an intensive rehabilitation at the earliest chance possible to improve odds for recovery of lost physical abilities. However, rehabilitation activity cannot be performed consistently if the number of therapist is inadequate and if the patients live in the rural or remote area which is far away from hospitals or medical centers.

Robot based device is considered as one of the solutions for the rehabilitation problems. Robot has consistency over repetitive tasks and high reliability as compared to humans. Different types of device were developed related to upper limb rehabilitation. In general, the device can be categories into two which are the end-effector and exoskeleton. End-effector based device is described to

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