

CHAPTER

7

HAND CONTROL MECHANISM FOR PARAPLEGIA DRIVERS

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7.1 INTRODUCTION

Hand control mechanism usually used by independent paraplegia drivers. An independent paraplegia driver is a person who can go to the car, enter the car, and drive away to their respective direction without getting helped by other people. There are two types of paraplegia patients: partially or fully impaired. This study focuses on the fully impaired patient. An assistive device used for driving by independent paraplegia drivers is called hand control mechanism. This mechanism is detachable from the car. The reason for designing a detachable mechanism is to allow both disabled and non-disabled people to use the same car. This device that enables the paraplegia driver to control the driving using their own hands can overcome the obstacles in one of their daily routine, self-transportation.

The hand control mechanism operates mainly for the brake and accelerator of the car. The operation of the mechanism is only by pushing and pulling the lever. When the lever is pushed forward, the car will accelerate; when the lever is pulled backward, the car will decelerate. The hand control mechanism will be mounted to the dashboard for the functional control of the mechanism. The mechanism can be fully mechanical, semi-electronic, and fully electronic.

Being available in many design varieties, this mechanism cannot be found in Malaysia. In Malaysia, most of the paraplegia independent drivers make their own hand control mechanism. This scenario will cause bigger trouble if any accident occurs. Thus, a properly authorized hand control mechanism should be in the local market. A well-designed hand control mechanism will increase the confidence of paraplegia patients in Malaysia to drive a car. On top of that, the comfortability of the independent paraplegia driver is very important. The aspects that involved are the driver cannot pull at elbow and rotate the hand simultaneously, keep the wrist straight, avoid twisting the wrist, let use of the thumb, and space for moving control.

The hand control mechanism is specially designed for the independent paraplegia drivers, so they would not have any difficulties when they change the lane, make a three-pointer parking, and make a U-turn. The hand mechanism is user-friendly to the independent paraplegia drivers assisting in any emergency or normal situation. This study is conducted to develop the hand control mechanism for independent paraplegia drivers.

7.1.1 Problem Statement

Paraplegia patients have basic routines like the other normal people. But they are facing some difficulties in carrying out the routines. Some main challenges for the disabled people are toilet use, exercising, extreme activities, and self-transportation. In Malaysia, many disabled people cannot do some of the activities easily due to their physical impairment. This makes the disabled people lost their motivation. In this study, the main problem for the independent paraplegia drivers i.e., self-transportation, is handled. There is no device for assisting independent paraplegia drivers that officially available in Malaysia; this is mainly due to the price of the product. It must be purchased from United States of America (USA) or United Kingdom (UK) companies.

Due to that, paraplegia drivers in Malaysia make their own device. However, these non-official hand control device is not well developed in the local market. This is because it has been made by the independent

paraplegia drivers by their own, either for manual or automatic car. The mechanism needs to be permanently attached or mounted to the steering, while in a family, other family members also would need to use the car. This may result in buying a new car—just to install this mechanism for the disabled person. Being economically stable or not, buying a new car is a critical consideration. This scenario makes paraplegia people in Malaysia not thinking about driving a car. This explains why it is rare to see an independent paraplegia driver in Malaysia.

Furthermore, the imported hand control mechanism cannot be afforded by the local independent paraplegia drivers due to the cost, that is around RM6000. Besides, a highway long journey driving that require higher speed is an obstacle for the drivers. To overcome these problems, the development of a hand control mechanism must be carried out.

7.1.2 Objective

The objectives of this study are:

- (1) To gather information of the overseas and local independent paraplegia drivers.
- (2) To get the information of the difficulties of using the existing hand control mechanism by the local independent paraplegia drivers.
- (3) To develop the hand control mechanism for the local independent paraplegia drivers.

7.1.3 Scope and Limitation

The scopes of this study are:

- (1) The development focus is for automatic car mode only.
- (2) The respondents are Persatuan Orang-orang Cacat Anggota Malaysia (POCAM).
- (3) The analysis involves static and finite element analysis.