

Analysis of Pedal-Switching Characteristics During the Transition to Parking

Yudai Baba¹⁾ Junya Inoue¹⁾ Keisuke Kazama²⁾
Yoshitaka Marumo²⁾ Machiko Hiramatsu³⁾ Hiroshi Mouri⁴⁾

1) Graduate School of Industrial Technology, Nihon University, 1-2-1 Izumicho, Narashino, Chiba, 275-8575, Japan

2) College of Industrial Technology, Nihon University, 1-2-1 Izumicho, Narashino, Chiba, 275-8575, Japan

3) Nissan Motor Co., Ltd., 1-1 Morinosatoaoyama, Atsugi, Kanagawa, 243-0123, Japan

4) Tokyo University of Agriculture and Technology, 2-24-16 Nakacho, Koganei, Tokyo, 184-8588, Japan

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1. Introduction

Pedal misapplication accidents occur regularly, and clarifying their causes is an urgent issue. Parking lots and similar areas account for a particularly high share of these accidents, and the trend is not limited to older drivers⁽¹⁾. In parking lots, driving operation errors are also a major human factor and lead to severe injury more often than delayed recognition⁽²⁾. Some factor specific to parking lots therefore seems to induce misapplication. This study compared pedal operation during normal driving and parking-lot driving.

2. Method

Heel position was detected with switch sensors placed on the floor mat of an instrumented vehicle at 20 mm intervals. Twelve male drivers aged 21–24 years participated with approval of the ethics committee of the College of Industrial Technology, Nihon University (S2025-004) and with informed consent. Two conditions were performed: (a) normal driving on a 500 m campus circuit, and (b) repeated parking at four points in a designated parking area.

3. Results

Pedal switching was divided into two types according to whether the heel stays on the floor as a pivot or is lifted to move the whole foot. Drivers were classified by the mean heel displacement before and after switching, with a threshold of 50 mm. Eight of the 12 drivers were the heel-pivot type, three were the whole-foot movement type, and one changed type with the situation.

For the heel-pivot drivers, the heel tended to move toward the brake pedal and forward during parking (Fig.1). A position change was then defined as a change of 10 mm or more in the lateral direction lasting 100 ms or more. Such a change appeared during the deceleration just before entering the parking area (Fig.2), that is, before the parking maneuver itself. The drivers thus prepare the foot position in advance. The change did not occur in every trial, and in interviews none of these drivers reported adjusting the foot position intentionally.

4. Discussion and Conclusion

The most important finding is that the heel position moves before the parking maneuver and that the drivers are not aware of it. This may reflect an operating strategy for the coming task. The operating mode itself also changed with the situation, as reported previously⁽³⁾. The mode may be selected from both the situation and the driver's own characteristics. When this selection is not conscious, the assumed and the actual foot position can differ. This gap may be a background factor of pedal misapplication.

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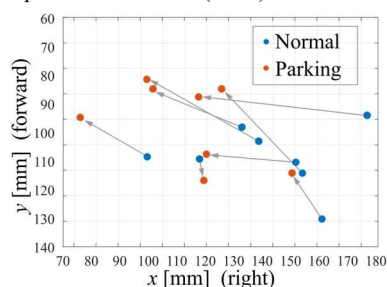
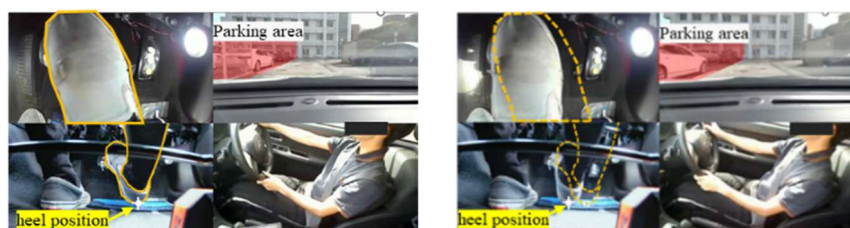


Fig.1 Changes in Heel Position



(a) Before

(b) After

Fig.2 Heel Repositioning