

The Pattern Classification of Body Behavior during Autonomous Driving

Shinya Nishimura ¹⁾ Shoichiro Takehara ¹⁾ Taro Miyao ¹⁾ Masanori Matsuoka ²⁾
Yukio Nishizawa ²⁾

*1) Sophia University,
7-1 Kioicho, Chiyoda, Tokyo, 102-8554, Japan*

*2) ADVICS, Co., Ltd.
2-1 Showacho, Kariya, Aichi, 448-8688, Japan*

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Recently, automated vehicles are being actively developed. Braking is applied frequently and stopping are repeated in a vehicle while driving, so automated vehicle braking has a significant effect on comfortable of vehicle occupant. In particular, automated vehicles are mechanically braked by computers. This indicates that drivers will not apply the brakes, but drivers will be applied the brakes. In other words, drivers do not drive, so drivers become passengers. Therefore, there is a possibility that some divergence and discomfort may occur in the relationship between the occupant's favorite braking and the braking of an automated vehicle. This discomfort increases negative psychological effects such as discomfort and anxiety, and lowers the value of an automated vehicle. Therefore, it is important to consider preferred braking of the occupant in order to investigate the comfortable braking for the occupant of the automated vehicle. Therefore, this study is aimed to clarify the difference in body motion during braking of a vehicle. The experiment is carried out using a vehicle, and the motion and visual information of the occupant in different braking patterns assuming braking during automated vehicle while driving were measured. Then, from the measured data of body parts, the displacement change and angle change of body parts at the time of braking are examined, and the knowledge of body behaviors are obtained so that characteristics of the behavior of the vehicle occupant during the braking are clarified. Subjects are twenty three males. Three-dimensional coordinate of reflective markers fixed on the subjects were obtained motion capture cameras placed around the subject. The experimental vehicle is applied the four patterns of braking by the test driver. Differences in deceleration profiles, such as deceleration and jerk, contribute to the braking preferences of individual occupants. The four patterns of braking are pattern A, pattern B, pattern C, and pattern D. The body behaviors caused by these patterns were measured, and eye mark recorder measured the visual information. One pattern of braking is repeated until the subject can distinguish it from other patterns. This research is approved by the Ethics Committee of Sophia University. Each subject was explained about informed consent before experiments. In this report, we focused on the movement of the trunk and head and classified the pattern. As a result, the motion control performed by humans during braking could be divided into four groups. First, subjects belong to class I can be confirmed the trunk angle change between pattern C and pattern D is small regardless of the magnitude of the input to the body, and stare at small area in both patterns. Therefore, it is considered that subjects belong to class I are always keeps its body upright by starring the front and behaves in an upright posture. Second, the body behavior of class II showed a change in the trunk angle but no change in the head angle. Therefore, it is thought that subjects belong to class II gaze ahead, but do not exert as much force on the body as class I, and are thought to maintain their posture. Third, subjects belong to class III can be confirmed the angle of the trunk changed regardless of the magnitude of the input to the body, and the head angle change was confirmed only for a large input. Therefore, it is thought that body motions of class III behave similarly to that of class II, but head angle changes according to the input acceleration. Finally, subjects belong to class IV can be confirmed the movement of the gaze regardless of the magnitude of the input to the body, and the trunk angle change is larger than other classes. Therefore, it is thought that subjects belong to class IV behave that they do not exert any force to their body on any braking and leave themselves to braking. As a stated above, physical control methods of twenty three subjects were classified into four patterns. Figure 1 shows patterns of body motion in each class.

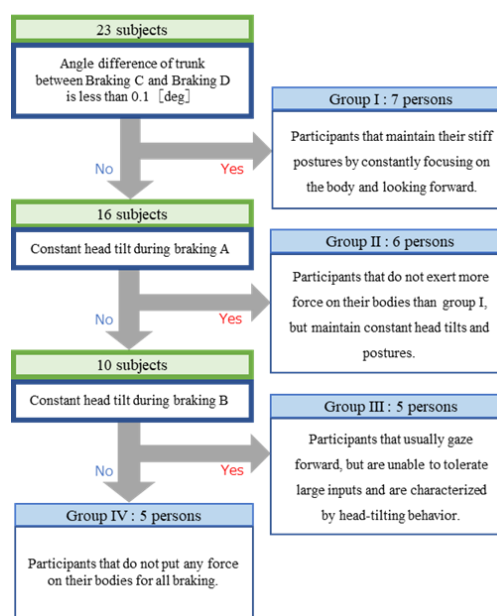


Fig.1 Results of pattern classification for the physical behavior of the experimental collaborator