

Parallel Factor Analysis of Driver's EEG in Lane Change Maneuver for Cooperative Driver Assistance Systems

Toshihito Ikenishi*, Takayoshi Kamada**, Masao Nagai***

*Tokyo University of Agriculture and Technology, Tokyo, Japan
(e-mail: ikenishi@cc.tuat.ac.jp).

** Tokyo University of Agriculture and Technology, Tokyo, Japan
(e-mail: kama@cc.tuat.ac.jp)

*** Tokyo University of Agriculture and Technology, Tokyo, Japan
(e-mail: nagai@cc.tuat.ac.jp)

Abstract: Vehicle technology of the better interaction between human and machine has been called human-electronics in Japan. It is necessary to obtain better relationship between human and vehicle. A driver's information, which can be obtained from steering operation, pedal operation, camera images and physiological information, particularly is important to find a method to determine a driver's operational intention. In terms of using this physiological information, an area of focus is using brain activity. Recently, some former researches have been reported about the investigation of the brain activity of the driver. The traditional decomposition of the electroencephalograph (EEG) has been based on the two-dimension components. In the multiple electrode analysis of EEG, the frequency-spatial domain and the time-spatial domain have been used. However, these conventional methods can only use two-dimensional data. As a multi-channel EEG analysis using multi dimensional data, parallel factor analysis (PARAFAC) method is based on the report. In this paper, we described that the driver's EEG during lane change was decomposed by PARAFAC and we investigated the factor of recognize and judgment from that decomposition result. Consequently, Common to the all subjects has 2 factors which were in the 5-8 Hz and 8-13 Hz. Those factors considered that they were changed by the driver's mental state, during recognition for alpha wave and during judgment for theta wave.

Keywords: Human-brain, Driver behavior, Human-machine interface, Brain-machine interface, Brain computer inter face, PARAFAC
