

Analysis of Relationship between Cognitive Functional Assessment Score and Attention Characteristics of Aged Drivers and Driving Behavior

Shinichiro Goto¹⁾²⁾ **Takeshi Asaoka**¹⁾ **Kaechang Park**²⁾ **Masayasu Atsumi**¹⁾

*1) Information Systems Science, Graduate School of Science and Engineering, Soka University
1-236 Tangicho, Hachioji, Tokyo, 192-8577, Japan (E-mail: sginet510@gmail.com)*

*2) Research Organization for Regional Alliances, Kochi University of Technology
185 Miyanokuchi, Tosayamada-machi, Komi, Kochi, Saitama, 780-0806, Japan (E-mail: park.kaechang@kochi-tech.ac.jp)*

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Japan continues to set new world records for its rate of population aging. Accidents involving elderly drivers and caused by reduced cognitive function continue to occur and have become an issue for society in general. It is expected that cognitive decline of elderly driver is predicted by social system and it takes care of them in early timing to extend the driving lifespan. It is important issue to research the predictive method.

In previous research, it was reported the correlation that the group of cognitive functional assessment score (CS) is related to the steering entropy value (Hp) when turning right at the intersection on the data in aged drivers' inspection. In this research, we did the further analysis that was added the data of attention characteristics using the dash cam video, and the other vehicle operation data.

About the attention characteristics, Figure 1 shows the eye gazing vector and face posing by computer vision from on-dash video image. To confirm the effectiveness in any features from driving to predict the cognitive decline, we also challenged to use the machine learning model called 'ELDANet' which was constructed in our latest research.

We also constructed 3 types of datasets and evaluated the rank correlation value as the test results.

(A-1) Face location, eye gazing direction, head posing of driver
(A-2) Normalized by the location of vehicle and reduction of unsuitable data

(B) Driving operation of steering angle, speed, accel / brake pedal, Geometry

(C) Combined A-2 and B

It was observed that the rank correlation value of attention characteristics (A-2) is better feature than Hp and the other driving operation (B) in specific right turn situation. It was not observed the better value in (C).

In this result, we found that the attention characteristics is better feature than driving operation for the prediction of cognitive decline for elderly driver.



Fig.1 Driving Behavior from Video Image with Annotation of Eye Gazing Vectors and Face Position, Direction Vectors

Table 1 The Result of Experiment

Dataset	Number of Data	Feature (Dimension)	Regression for CS	Classification for CS-C
			Rank Correlation	Accuracy
-	146	Hp (1)	0.3585	-
A-1	106	Face (3) Gaze (6) Pose (3)	0.4312	0.5464
A-2	71		0.5274	0.6198
B	59	CAN (6)	0.4290	0.6242
C	59	Gaze (6) Pose (3) CAN (2)	0.4666	0.6190