

1. Introduction

On-vehicle information processing equipment such as car navigation systems is progressing in functions year by year. For convenient operation and safe driving, the usability of the equipment has become important. To quantitatively evaluate the operation, we have modeled a series of user operations of a car navigation system by separating them into unit operations, and predicted the operation time based on the interface specifications.

2. Methods

2.1 Experimental method

Using a simple experimental interface of keyboard input, menu selection tasks were assigned to six subjects, three in their 30s and three in their 50s (**Fig. 1**). The operations are recorded by keystroke data and video images.

2.2 Analysis method

B (keystroke), H (hand movement), M (mental act) and W (system response) are defined as unit operations, and a series of user operations is modeled by combining these four units. The unit operation time was calculated from the model and the keystroke data.

3. Results

(1) The operating characteristics between the age groups have been quantitatively analyzed (**Fig. 2**).

- There is little difference in the B (keystroke) between the groups.
- Subjects in their 50s need 1.5 - 2 more time for H (hand movement) and M (mental act) as the subjects in their 30s.
- M (mental act) has a significant effect on the task

types.

(2) The operation time for the selection from n menus can be predicted in terms of the unit operation time by the following equation.

$$\text{Operation time} = (n+1) \cdot B/2 + H + M + W$$

Table 1 shows examples of the predicted time.

4. Summary

From the analysis using the operation model, the operation time has been predicted based on the interface specifications. This prediction technique will be applied to the evaluations of operations during driving and voice operations.

References

- 1) Card, S. K., et al. : The Psychology of Human-Computer Interaction (1983), Lawrence Erlbaum Associates, London
- 2) Helander, M. G., et al. : Handbook of Human-Computer Interaction (1997), 533-572, North-Holland

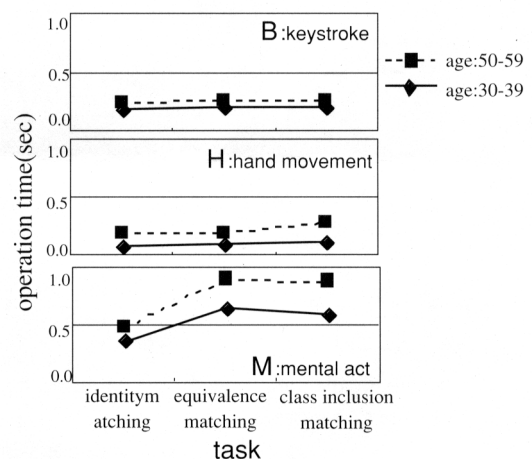


Fig. 2 Experimental result of time for each operation.

Table 1 Predicted time for menu selection.

number of options	age:30-39	age:50-59
2	1.47sec	1.98sec
4	1.67sec	2.23sec
8	2.07sec	2.73sec

(system response time = 0.5sec,
task: class inclusion matching)

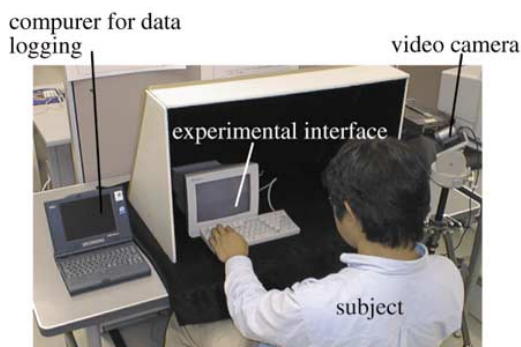


Fig. 1 Experimental apparatus.