Operability of an equipment on Car

Koji AKIMOTO, Graduate School of Yokohama National University
Hajime TAKADA, Yokohama National University
Yoshifusa MATSUURA, Yokohama National University

1. Introduction

Nowadays, the car plays an important part in the society and does people a favor. So the spread of Car Navigation System and the ITS(Intelligence Transport Systems) Technological progress are remarkable in recent years. That is why researches about influences during driving with Car navigation operation are studied frequently(1).

The mainstream in operation system is by touch panel. Man can handle easily by touch panel because they only touch buttons put up on a screen. However, it is expected that that exerts bad influences upon driving position. There is touch panel at front panel, in that. That demands to stretch out arm or hand too much and has bad influence. On the other hand, one by buttons placed next driving seat is inferior to one by touch panel in difficulty to handle although it is expected that the latter one doesn't exert bad influences upon driving position. Then, it pays attention to effect for driver by shift of touch panel position as operate part at the new operation system in this study. In this connection it defines system which is composed of the touch panel placed next driving seat and the monitor which display hand position recorded by camera put just above at front panel as new operation system.

In concrete terms, we measured operation task time, EMG and proceeds questionnaire with shift touch panel position to evaluate operability new operation system.

2. Apparatus

Experimental apparatus is shown in Fig.1. It is divided into driving equipment, new operation system equipment, data acquisition equipment. Driving equipment consists of a steering, a driving seat to construct appearance in the car. New operation system equipment consists of a touch panel, a monitor, a camera as above. Data acquisition equipment consists of two computers, a projector, a screen, a switch, data logger, two cameras, and electromyography. We apply one Computer to impose task with showing in the screen which is in front of subject and present the screen subject operates. The other computer is used for taking in data which is measured by electromyography.

In this study, we don't use driving simulator because it pays attention to infection by bad driving position not driving load in this study.

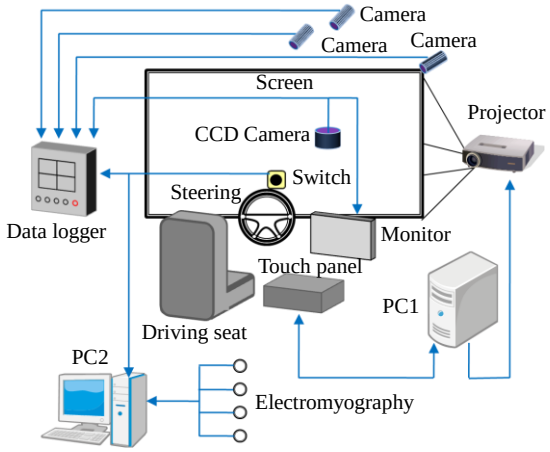

Fig.1 Experimental apparatus

3. Procedures

3.1 Task Subject operates

We impose following things on subject. They hold steering at the beginning. They operate touch panel in accordance with assignment which makes them operate three panels displayed on touch panel with monitor placed at front as soon as assignment is shown in screen. After that, they hold steering again.

We require doing the thing set down above ten times per one position of them.

3.2 Touch panel position

In this experiment, it shifts touch panel position in an anteroposterior direction and vertically direction. Touch panel position is shown in Fig.2. So, we call position from the back 1, 2, 3 and position from high H, M, L. Each position is indicated combination 1,2 ,3 and H.M.L.

- Touch panel position

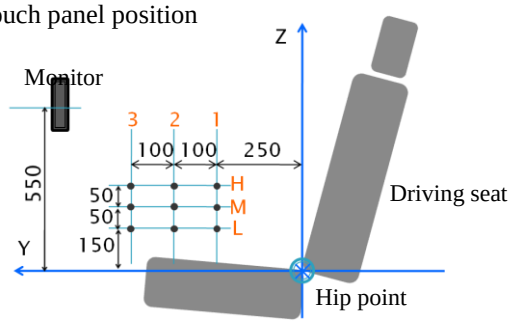

Fig.2 Touch panel position

4. Estimative Index

We measure operation task time and EMG and proceeds questionnaire.

Operation task time is divided into movement time and operation time. Movement time is time spent from losing hold off steering to touching touch panel initially. Operation time is time spent from touching touch panel initially to touching one lastly.

We treat Average of EMG from taking off steering to touching touch panel initially as load for muscle. EMG around arm is measured because the new operation system is different from operation system by touch panel at the point of position.

5. Results and Consideration

5.1 Operation task time

Movement time on each position is shown in Fig.3. This figure shows that position in anteroposterior direction carry more weight than that in vertically direction. Movement time is shortest at "3H". That is why "3H" is near a steering. Movement time is comparatively short regardless of position in vertically direction at y=350[mm].

Operation time on each position is shown in Fig.4.Although there is variance in same position in anteroposterior direction, operation time is short in vertically direction at "2" in a similar way.

As above, Operation task time is comparatively short in vertically direction at "2". Movement time is easily influenced by distance from steering, but operation time is handed off distance. We assume that operation time is short because Subject operate touch panel negligently in position at "2".

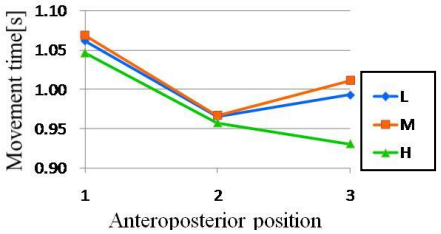

Fig.3 Movement Time

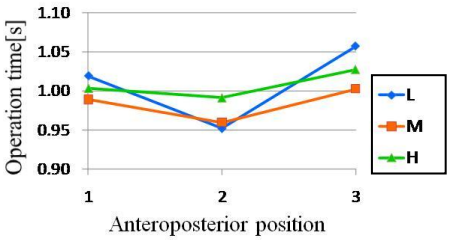

Fig.4 Operation Time

5.2 EMG

Average of EMG put in deltoid from taking off steering to touching touch panel initially is shown in Fig.5. This figure shows that position in anteroposterior direction carry more weight than that in vertically direction also. Average of EMG in position at "1" is axiomatically higher, so that suggests that subject feel incommodity at position near subject. This inclination is verified by average of EMG put in trapezius.

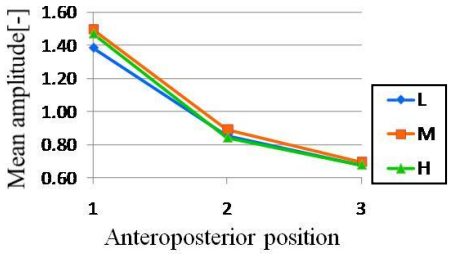

Fig.5 EMG put in deltoid

By questionnaire, ease of operation is mostly dependent on touch panel position in anteroposterior direction also. It suggests that subject feel difficult to operate touch panel placed near subject. As can be seen, position subject think difficult to operate exert subject at the point of operation time and EMG. Therefore, there are most subject who has correlation between ease of operation and EMG.

6. Conclusions

In this study, it was found that ease of operation is dependent on touch panel position in anteroposterior direction and operation task time, EMG, and questionnaire show difference. EMG put in deltoid and trapezius which have influence of shoulder and arm motion.

Furthermore it is needed to investigate effects in situation subjects were made to drive as load.

References

(1) B.ATSUMI, T.WAKITA, "Function Accessibility of Navigation and Route Guidance System While Driving", *The Japanese Journal of Ergonomics* (2000), 142-143