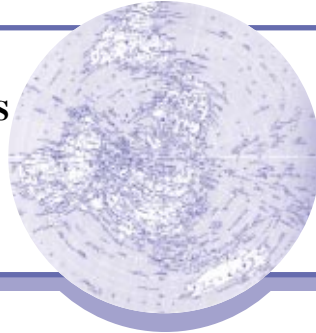


## SPATIAL ORIENTATION AND NAVIGATION IN ELDERLY DRIVERS

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### Why This Research is Needed

This project was motivated by the well known observation that elderly drivers have a much greater accident rate per mile driven than younger drivers. Driving is obviously a task involving considerable division of attention, e.g. between operating vehicle instruments, attending to other vehicular traffic, reading road signs, listening to the radio, etc. In addition to these tasks of vehicle operation another major task demanding attention of the driver is finding one's way. By identifying specific issues which impact elderly drivers such as way finding, this research may help reduce the accident rate among elderly drivers.

### Research Objectives

To determine how elderly drivers—in comparison to young and middle-aged drivers—navigate and spatially orient themselves while driving, and to explore difficulties faced by elderly drivers operating their vehicles in different driving environments.

### Methodology

To evaluate young and elderly drivers' ability to learn and integrate spatial information when driving, testing is carried out both on the road and in a virtual-reality driving simulator. The basic task involves repeatedly driving through an environment until a practice route can be driven without errors or prompting by an experimenter. Once the driver has learned the route, the experimenter asks the driver to stop at different locations and aim a pointer at landmarks and intersections. The driver's accuracy indicates how well he or she has gained a general spatial knowledge of the surrounding area while driving.



*A view of the road within the virtual driving simulation*

The simulator program uses a route very similar in shape to the actual driving route, but with somewhat fewer intersections and landmarks, and no other traffic on the road. The orientation testing with a pointer is carried out in a similar fashion to the real-world test. Comparison of data from the real and simulated driving tasks has confirmed that drivers exhibit similar performance patterns in both environments. Thus from this point on, the simulator can be used to perform more detailed experiments on how drivers' ability to orient themselves is affected by the nature of the driving task.

A survey questionnaire has also been administered to considerable numbers of young, middle-aged, and elderly drivers. The results of the questionnaire are still being analyzed and the results will be correlated with performance on the two driving tasks described above.

## **Research Results**

Preliminary analysis of survey data suggests that elderly persons drive differently than younger persons; they make shorter trips, drive less at night and in heavy traffic, and report more distress after losing their way, rather than the frustration typical of younger drivers. The results of the actual and simulated driving tasks also support the original hypothesis that acquiring and maintaining spatial orientation is more problematic for elderly than young drivers and hence could be a distracting factor.

## **Research Impacts**

Confirming that older drivers have greater difficulty than younger drivers in maintaining spatial orientation suggests the possibility of developing some intervention procedures to provide techniques for enhancing the spatial orientation of elderly drivers in particular, but in fact for any drivers who experience difficulty in way finding.

## **What's Next**

The original simulator route had very few landmarks and aiming was only carried out with respect to intersections. However, work has begun on a second simulator condition with more landmarks so it will be possible to make more detailed comparisons.

In future simulator experiments, it will be possible to control a wider variety of variables that may impact way finding and navigation. These will include the nature of the environment that is being traversed, the complexity of the route (number of turns, curved vs. straight paths, the length of route, the distinctiveness of landmarks, etc.), the driving conditions (weather, visibility, traffic, etc.).

## **Related Publications/Presentations**

de Ridder, S.N, Elief, C., Diesch, A., Gersehnson, C., Pick, H.L. Jr., (2001). "Driving while staying oriented." Paper submitted for presentation at the 45th Annual Meeting of the Human Factors and Ergonomics Society, Minneapolis.