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7. SYMPOSIUM ON COMPUTER-BASED DRIVING SYSTEMS FOR RESEARCH, ASSESSMENT, AND ADVISEMENT

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Computer-based driving systems for research, assessment, and advisement: An introduction

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Currently, there are perhaps a dozen computer-based driving "simulation" systems in the country that have supported a fairly substantial amount of basic and applied research. In this symposium three such systems will be demonstrated and evaluated. The term "simulation" is in quotes because none of the systems being considered here is a complete simulation; rather, each one simulates some aspects of the person-automobile context felt to be important for research, assessment, and/or advisement. Thus, an important issue addressed by each contributor is: How much realism is appropriate for the targeted goals of the system? None of the contributors feels that anything like a complete simulation is appropriate for his or her goals, owing to at least two considerations: (1) cost: a reasonably complete simulation could cost over $50,000 and thus become prohibitively expensive for realistic widespread application; and (2) participant comfort: more complete systems than those described in this symposium have been known to produce motion sickness and other types of discomfort in a nontrivial proportion of the drivers. With these constraints, the presented systems vary in realism, and one must ask what functional and/or psychological attributes are gained with the increases or decreases in realism.

A second important issue involves the system-design attributes that relate to predictive validity, for example, for actual driver crash and/or moving-violation records. The most realistic system may not necessarily be a better predictor within a reasonably finite time period (e.g., one hour) than, say, a reasonable vision test (including testing of dynamic and peripheral acuity) plus a battery of cognitive minitests that tap into driving-related functions (e.g., decision making with a heavy information load).

A third issue for consideration concerns the types of data that can be obtained and output from the system, and the usefulness of the output format both to the professional using the system and to the drivers who might be affected by the system's output (e.g., perhaps by losing their licenses).

A fourth important issue is the extent to which the same type of system can serve one or another of the three targeted goals, consisting of: (1) research, yielding new information; (2) assessment of driving skills in a broad population; and (3) advisement of drivers who are at above-average safety risk. Some of these goals may conflict with others in their implications for system design, as suggested by information in the two columns of Table 1.

Table 1
Two Characterizations of Research Paradigms

Paradigms for Ecological Validity	Paradigms for Basic Research
Methods	
The research environment should resemble natural settings in as many ways as possible.	The research environment may create an artificial situation in order to control extraneous variables or to separate factors that are confounded in nature.
Results	
The results should make predictions about everyday performance tasks.	The results should test predictions about, and increase our understanding of, underlying processing mechanisms.
Generalizations	
The empirical findings should generalize to real-world behavior.	The theory should generalize to other appropriately defined situations.

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To address the issues outlined above, we have contributors with rather different philosophical approaches and computer-based systems. Rosamond Gianutsos is a neuropsychologist in private practice who works with, among others, victims of head trauma, stroke, and Alzheimer's disease. She must help patients (and their physicians) make serious decisions about whether they should drive, and if so, in what environmental contexts. Scott and James McKnight represent a nonprofit organization doing applied research and product development for various clients who may be concerned about public safety—perhaps including local police departments and driver-training schools. William Schiff, Steve Cross, and Wendy Arnone are from an applied psychology department and are thus concerned about (1) obtaining new empirical data with which to test their theoretical ideas (e.g., that people are good at developing strategies to compensate for many types of cognitive or visual weaknesses), and (2) developing a system that has value for individual driver assessment, counseling, and training. Finally, the discussant, John Eberhard, from the U.S. National Highway Traffic Safety Administration, has had many years of experience in basic and applied research on driving. He has also been involved in philosophically and politically sensitive policy discussions concerning who should be permitted to drive and under what conditions. He is a strong advocate of trying to improve driver safety in the elderly rather than taking away their licenses and, thus, much of their independence.

With this introduction, I encourage the reader to carefully compare and contrast the various systems in terms of the issues mentioned above, and to evaluate what computer-related and psychological factors or attributes are involved in the design of each system.