Part-Task Simulation in Driving Research

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•A CONSIDERABLE AMOUNT of energy has been devoted to discussions of simulation techniques, methods, and design. From a purely engineering standpoint, the development of system simulators is a complex and challenging exercise. However, the nature of their designs depends primarily on the uses to which they are to be put and on the knowledge of the performance of the system to be simulated. In driver simulation, it is evident that the emphasis has been on training drivers. The inability to specify the human performance variables has led to designs of varying complexity, using face validity as a criterion.

Simulators for research on the surface appear to be rather rare. Yet, this is something of an optical illusion, for much of what goes on in the laboratory employs simulation, although unrecognizable relative to a face validity criterion. Any attempt to study natural phenomena under controlled conditions in the laboratory involves simulation in one form or another. What normally determines its characteristics are the objectives of the research, the pre-existing knowledge of the phenomenon in question, and a concern for the interaction processes. In this context, simulation is a research strategy or methodology required for the conduct of research on certain classes of problems.

From the standpoint of this paper, the interest in simulation arises solely from a desire to subject certain aspects of driving to study under laboratory conditions. Because of the nature of these studies, the apparatus required is very simple and it perhaps should not be dignified by the name simulation. It is toward this particular class of research strategy that the present paper is directed.

PART-TASK SIMULATION

Simulation as a methodology has existed for many centuries. Any plan, physical mock-up, or mathematical abstraction of reality must be considered a type of simulation. It is the degree to which reality is to be represented that determines the type of simulation that the experimenter uses to study a specific phenomenon.

A number of considerations are involved in the researcher's selection of a point on this continuum of simulation. First, the intent of the researcher may be primarily to describe a phenomenon. Typically, such an orienting philosophy has preceded the major scientific disciplines and has been characteristic of their infancy. The researcher may be concerned with the functional aspects of a phenomenon with a desire to understand the process by which a phenomenon occurs. The latter approach typifies the sophisticated sciences such as physics and the emergence of new scientific disciplines such as biophysics.

Second, the lack of available functional mathematical equations defining the static and dynamic states of phenomena likewise determines the tendency toward a full-scale representation of reality. Third, when immediate application is desired, the tendency appears to be one that permits a large body of implicit assumptions to be made and a heavy reliance on intuition as to what constitutes the major aspects of the phenomena in question. Fourth, there is an emotive aspect which determines how one simulates a particular aspect of the real world. The researcher may find closure more likely in a simplified but coherent modeling of specific aspects of reality or he may be distressed by an apparent lack of closure in anything short of what looks and feels like the real world. The scientist or engineer concerned with driving behavior has probably consid-

Paper sponsored by Special Committee on Driving Simulation.