Computer Model of Driving Behavior: The Highway Intersection Situation

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ABRIDGMENT

•A DIGITAL computer model of the perceptual, decision-making, and response processes of the driver has been formulated for the highway intersection situation. Including simulated vehicle characteristics, the model presents a simulation of human behavior in a dynamic control task. The model is completely deterministic with the possibility for inclusion of probabilistic functions when desirable. A completely determined process was selected to facilitate the study of the effects of various pertinent parameters.

Figure 1 is the summary flow chart of the computer model. Each process of this flow chart is further defined by subroutines (as numbered) which provide the detail required for the computer program. The set up block of Figure 1 provides for inputs of the following parameters which may be varied for a particular run: (a) initial location

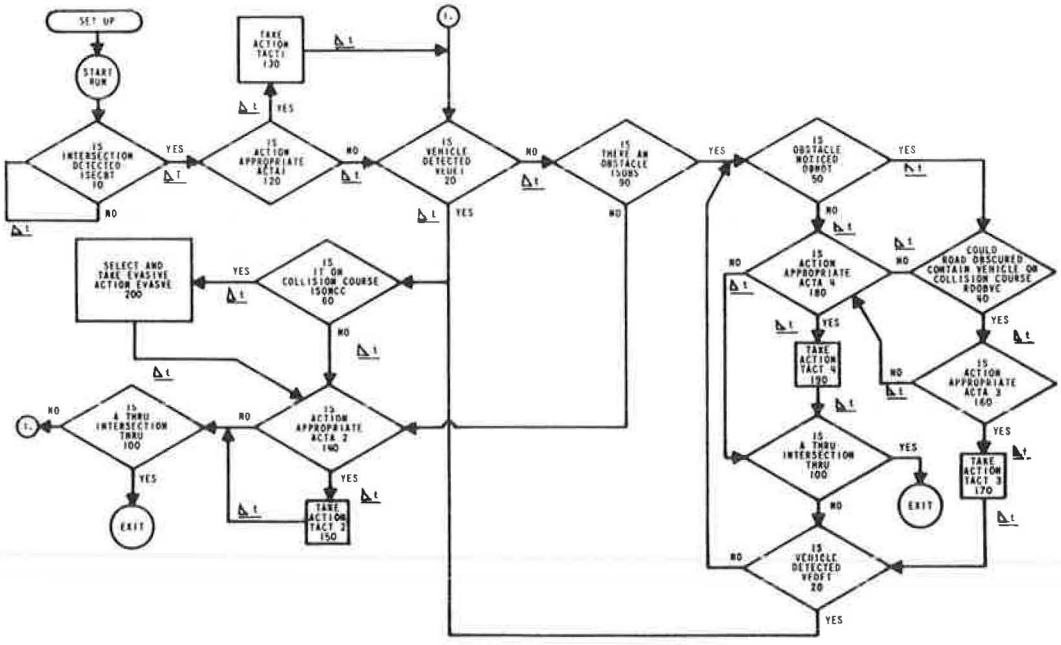

Figure 1. Summary flow chart.

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and velocity of the opposing vehicles, (b) obstacle locations, (c) maximum deceleration and acceleration capability of the modeled driver's vehicle, (d) maximum viewing distance from the modeled vehicle, and (e) pertinent perceptual and decision-making parameters and threshold values.

A parameter study of the foregoing variables was conducted to determine the effects on driver performance and accident or near-accident occurrence. Some of the parameters were more important in determining driving behavior than others. These were (a) how far ahead the driver is considering the consequences of his decisions, (b) the time required for each information process and decision, (c) the threshold for perceiving angular velocity, (d) the driver's vehicle velocity, and (e) location of the obstacle-to-view. In addition, there were significant interactions among these variables.

This technique of computer modeling of the driver-vehicle combination shows great promise as a method for examining the pertinent factors affecting performance of the driving task. The magnitude of this problem in including relevant and irrelevant perceptual inputs, logic and details of the simulated information processing and decision making, and the vehicle characteristics precludes an exclusively experimental approach. A model formulation is essential to further studies in this area. This digital computer model seems particularly suited to the problem, but the real test of the model must come from experimental validation, both of the overall output and of particular aspects.