

***Visual/Motion Cue Integration:
An evolutionary view from flight to ground vehicle simulation***

(An Invited Presentation)

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ABSTRACT

Rapidly improving technology has stimulated substantial improvements across the many subsystems in vehicle simulators in general. In particular human sensory systems stimulation has improved across the board. Image generators, once the highest cost item on a simulator, have essentially become a commodity (at least to the extent of the hardware) at substantially lower cost (from a million dollars a channel to about one thousand dollars), display systems while still expensive, the cost has decreased and the performance has improved. At the same time platform motion systems have also improved in performance. However, there continue to be two elements that present challenges; the integration of all the subsystems in the simulator and the determination of the characteristics of these systems which are necessary for performing the tasks for which the device is to be used.

This presentation deals with both, but begins with a short history of vehicle simulation, both flight and ground. The human operator perceives his/her environment, both statically and dynamically, through the integration of several physiological systems. The various transducers in these systems sense the changes in energy impinging upon them, begin processing them in the lower centers of the central nervous system, and ultimately create a perception in the brain. Each of these systems possesses different spatial and temporal response characteristics. The presentation will examine these and discuss modeling techniques and metrics to aid in the integration task. The modeling techniques discussed include human operator models which can be used in the acquisition and design phases in order to determine training or research effectiveness.

The presentation closes with a summation of critical integration issues and mitigation approaches.

BIO

Frank Cardullo is currently a full professor of mechanical engineering at the State University of New York at Binghamton. Professor Cardullo conducts research in the area of man-machine systems, mathematical modeling and analysis of the dynamics of both the human operator and the machine. He has applied this research to the perception and stimulation of visual and motion cues and computational methods for real time systems. He also has been an active consultant in this area for many aerospace companies and U.S. Government agencies. He is the author of over 70 technical publications, and has been awarded a patent for the "Advanced G-Seat". Professor Cardullo has been invited to lecture at 13 different universities and research institutes in Europe and Asia. He is a recipient of the AIAA De Florez Award for Flight Simulation and Training.