A New Approach to Modeling Driver Reach

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The reach capability of drivers is currently represented in two ways. The SAE Recommended Practice J287 presents maximum reach capability surfaces for selected percentiles of a generic driving population. The J287 surfaces are parameterized by a packaging factor that combines a large number of vehicle interior variables into a single "G" score. Surfaces are available for several different values of G. J287 is based on a study conducted in the early 1970s with vehicle seats and restraints, and a driver population, that differ from those in current vehicles. Recently, digital human figure models have also been used to model driver reach capabilities. In typical use, a family of figure models that span a large range of the target driver population with respect to body dimensions are positioned within a digital mockup of the driver's workstation. The articulated segments of the figure model are exercised to simulate reaching motions, and driver capabilities are calculated from the constraints of the kinematic model or comfort models.

Both of these current methods for representing driver reach are substantially limited. The J287 surfaces are not configurable for population characteristics, do not provide the user with the ability to adjust accommodation percentiles, and do not provide any guidance on the difficulty of reaches that are attainable. The figure model method is strongly dependent on the quality of the models used for posturing and range of motion, and, in any case, cannot reliably generate population distributions of either reach capability or difficulty.

A new method of modeling driver reach capability is presented. The method is based on a unified model of reach difficulty and capability, in which a maximum reach is a maximally difficult reach. The new model is made possible by new measurement methods that allow detailed efficient sampling of an individual's reach-difficulty function. This paper summarizes the experimental approach and presents the structure of the new integrated model of population reach difficulty and capability.