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3D MEASUREMENT OF OCCUPANT VARIABLES FOR AUTOMOTIVE BENCHMARKING USING AUTOMATED DIGITAL PHOTOGRAMMETRY

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ABSTRACT

This paper describes the automated photogrammetric measurement, for the purpose of competitive automotive benchmarking, of occupants as they interact with a vehicle. Both metric and non-metric data was used to compare and evaluate the vehicle performance with respect to ergonomic design. Retro-reflective targets were applied to key body positions on the occupants and they were then instructed to undertake various static tasks. As they held their pose for each task, the occupants were rapidly photographed to record their body position in relation to the vehicle.

What started out as a small, almost trivial photogrammetric task that was well suited to the measurement application, grew into something much larger. In all, some 30 occupants representing a wide population demographic were each assigned 10 poses in 5 different vehicles. This resulted in over 1500 individual photogrammetric surveys and over 26,000 images. The data acquisition phase of the project was completed in just 2 ½ days.

The sheer size of the project presented many challenges and required the development of a custom script to automatically extract project identifiers from image folders. Moreover, the selection and alignment of the measured 3D coordinate data for each occupant and pose needed to be fully automatic, as did the generation of the output results for each individual task.

This paper describes the measurement methodology adopted, reviews the conduct of the data acquisition and automatic data reduction phases, summarizes the results obtained, and discusses some unique challenges associated with the photogrammetric measurement of human subjects.