3D Scanning of Military Free Fall Operators Using a Cluster of Microsoft Kinect Systems

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Abstract

Simulating individuals in free fall with combat and parachute equipment requires accurate 3D models, but scanning individuals in free-fall position is difficult. Existing techniques generate a simplified 3D model using photographic and video data to approximate torso and limb size and orientation. While such techniques are useful in reducing computational overhead, they may not completely address the effects of combat and parachute equipment on the aerodynamic characteristics of the individual. We are experimenting with a four Kinect scanning cluster to create a 3D surface model of an individual flying in a vertical wind tunnel. The Microsoft Kinect offers a low cost, highly portable, real-time solution to mobile scanning. Our approach is to create a series of networked clusters, with all clusters containing a laptop, a Kinect, and Kinect mount. Clusters are assigned to a server that controls the triggering impulse for each captured frame of data. Each cluster is manually aligned to a calibration object in a global registration process and then incrementally refined, per frame, using iterative closest points. To overcome the inherent latency in transmitting data from clusters to the server we store all data locally in each cluster and synchronize to a server clock. Data are refined and merged as a post processing step. The resultant 3D model of the subject in the wind tunnel will be further processed to estimate wetted surface and other appropriate metrics.

Keywords: 3D Body Scanning, Microsoft Kinect, Military Free Fall