The Potential for Dense Dynamic 4D Surface Capture Illustrated with Actual Case Studies

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Abstract

Recent developments in 3D surface imaging technology have opened up the possibility of capturing very granular models of skin and soft tissue behavior in human subjects. In the past studies of facial or body movement have entailed the use of optical markers or very crude attempts to fit video photographic sequences to sparse deformable models. While such techniques have been adequate for the special effects industry they are of little value to medical and anthropometric studies where the value is in the detail and sub-millimeter moves may have significance. Rather than just seeing a general limb movement we can record the muscles rippling under the skin. Not only is the capture and rendering of this information challenging but new analytical techniques have to be developed which allow movement data to be presented in a manner where patterns can be identified and numerated to support the investigations and draw appropriate conclusions.

3dMD was the first company to develop a dynamic dense surface 3D capture device with first system being installed at Cardiff University in 2005. Over the past 8 years 3dMD has worked closely with Cardiff and several other universities to not only develop the capture, rendering and optical tracking technology but establish research and evaluation protocols to use this information to further research and understanding of external dynamics of human form. Many validated academic papers have already been reviewed and published for clinical, anthropometric and behavior studies.

This talk will chart history of this project and explain why other technologies have been unable to provide definitive results. Detail and guidance will be given on the capture protocols and project/session workflow and how such technology can be applied in everyday situations. Most importantly the lecture will be illustrated with actual case studies many of which have never been seen before publically. These will include cases looking in facial expression, muscle and anatomic movement, inference of internal dynamics based on soft tissue deformation and the sequence of two people interacting.

Finally the talk will indicate the areas where dynamic 3D will be used in the future both as a measurement tool in its own right as well as a calibration for low cost movement sensors. These will include behavioral, body dynamics and clinical uses. One thing is clear there is much to be discovered and understood by applying this technology and surprising conclusions can be drawn quite rapidly because the data is so complete.

* www.3dmd.com