Markerless vs. Marker-Based Motion Capture - Is Marker-Based the Floppy Disk of Motion Capture

Abstract: Since Muybridge, video has been a valuable tool for understanding how an animal moves. In human biomechanics, the most popular approach for measuring movement with video is to apply reflective markers to the skin and capture their three-dimensional motion with multiple camera views. Marker-based technologies are versatile. They provide researchers with the ability to build sophisticated biomechanical models that estimate kinematics, kinetics, and predict soft tissue forces. Recently, however, new markerless technologies have emerged that promise to overcome many marker-based limitations such as inconsistent coordinate system definition, low sample sizes, and confinement to lab environments. In this debate, Dr. Julie Stebbins will defend marker-based technology's dominance in the field. At the same time, Dr. Kevin Deluzio will argue that markerless technologies will ultimately relegate marker-based approaches to the past.

1. Julie Stebbins

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Julie completed her undergraduate degree in Brisbane, Australia, before moving to Oxford, UK to undertake a PhD. This focused on assessing foot deformity and motion in children with Cerebral Palsy. She is now employed as a Clinical Scientist and is the Operational Lead at the Oxford Gait Laboratory, running a busy clinical service and research program including ad diverse range of research projects, such as surgical outcomes in Cerebral Palsy, foot and ankle biomechanics, upper limb motion analysis and model development. She has helped to set up gait laboratories in different places around the world, including within the UK and Europe, Malta, and most recently in Addis Ababa. She has previously served on the ESMAC committee and coordinated the Gait Course. In addition, she is Deputy editor for the journal Gait and Posture.

2. Kevin Deluzio

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Short Bio:

Professor of Mechanical and Materials Engineering, Dean of Engineering and Applied Science, Laboratory Head of Human Mobility Research Laboratory, Queen's University

Dr. Deluzio began his academic career at Dalhousie University in 1999 as one of the first faculty members of the new School of Biomedical Engineering, with a cross-appointment in the Dept. of Surgery. He established the Dynamics of Human Motion Laboratory where his research focussed on the investigation of the biomechanical factors of knee osteoarthritis and its

treatment. He is currently the Dean of Engineering and Applied Science at Queen's University, a Professor in the Dept. of Mechanical and Materials engineering and the Laboratory Head of the Human Mobility Research Laboratory. Dr. Deluzio has served on the executive of both the Canadian Orthopaedic Research Society and the Canadian Society for Biomechanics. He is a Fellow of the Canadian Academy of Engineering and the current Chair of Engineering Deans Canada.

Dr. Deluzio's research involves the study of human locomotion to investigate the biomechanical factors of musculskeletal diseases such as knee osteoarthritis. He is interested in the design and evaluation of non-invasive therapies as well as surgical treatments such as total knee replacement. Dr. Deluzio's work in quantitative human motion analysis combined with pattern recognition techniques provides the means for objective and sensitive measurement of joint function.

3. Michael Rainbow

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