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**Signatures of Human Movements**  
**– Understand Gestural Content Using Motion Capture Trajectories**

Type of creative work: digital prints

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Statement of Purpose:

Unlike any kind of artistic representation, motion capture is faithful to nature. Therefore, the trajectories obtained from human movement using 3D motion capture technology shows the beauty of the nature of our movement, which has never been revealed before with scientifically proven accuracy. For faithfully conveying the beauty of complex and multi-segmental human motion, this paper tries to initiate the exploratory Pattern-Finding of the movement in order to unveil more hidden beauties and art from our nature.

Historically, depictions of human movement have had the particular challenge of representing time-based events in a single image. Pre-photography, movement was represented by capturing a stop-action visual effect (e.g. Diskobolos of Myron). When used as means to suggest the essence of motion, effects need not be accurate anthropokinetically. They may be merely representational, relying on iconography, cultural loading and for the experiential knowledge of the viewer.

The time exposure and multi-frame stop action photographs of E. J. Muybridge during the post 19<sup>th</sup> century sparked controversy in the art world, as realist painters became conscious that their works were not so true-to-life, and Muybridge's work using human subjects and multi-camera stop action photo initiated a scientific approach to human movement representations (Cavanagh, 1990; Solnit, 2003).

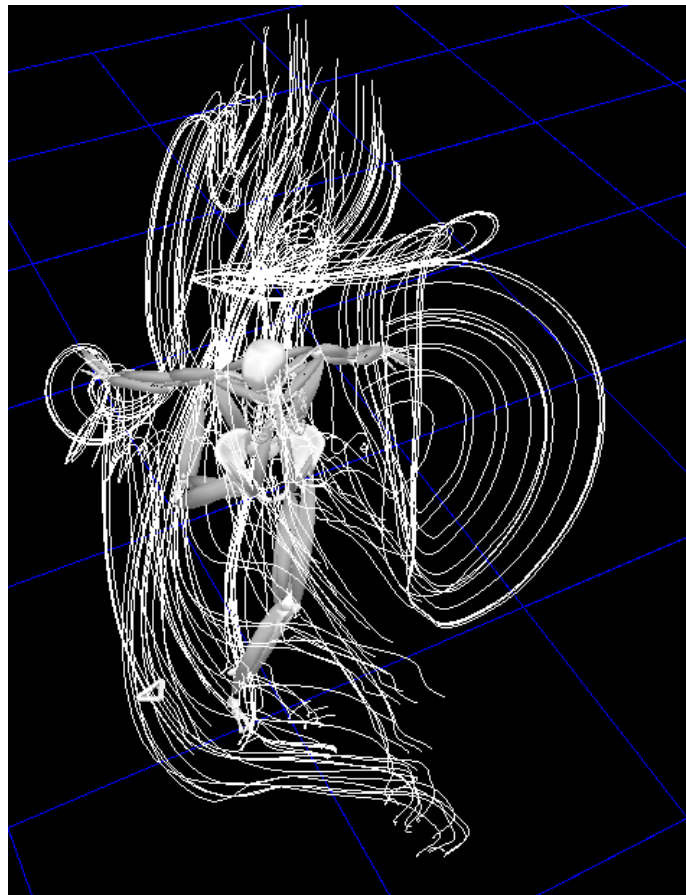
If photography tested the liminality of visual culture in the early 20<sup>th</sup> century, 3D motion capture does so in ours. Cognition in these dynamic worlds relies upon the viewers to subliminally compress information from multiple images into a summative experience. As an extension of video techniques, 3D motion capture overcomes our memory-limitation and permits the accurate recording of human movement in 3D computer space, resulting in time-based movement trajectories that can be used as pattern-finding of various human movements from sports to art performances. A collection of such trajectories could represent and mine human movement as a tool of communication; collectively, they become a signature, a graphic that conveys the essence of human movement and is used as a form of identification. Such signatures allow us to effortlessly recognize complex human movement forms. They offer, via a mere snapshot and in under one second, the identity of the movement without requiring conscious cerebral processing of the individual defining characteristics.

Gesture communicates information, the meaning of which is driven by empirical experience. Perceptions of gesture as an unfolding of time-based events are intrinsically integrated with the form and function of human movement. These are keys to the aesthetic experience of

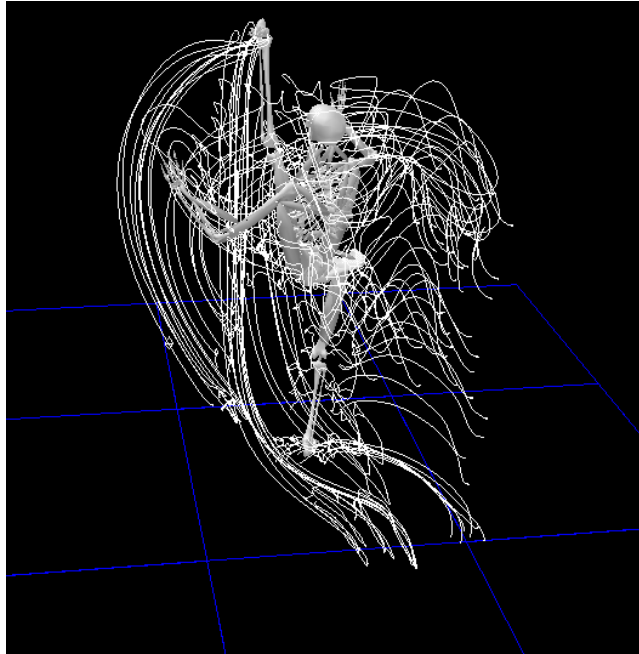
interpreting gesture. When attempting to present the dynamic content of human gesture in a single still image, synthesis must occur; both time and body must be represented. These are essential for image reading. Since the viewer has experienced the phenomenon of gesture as a time-based event, interpretation should also be a time-based phenomenon. Informed by this, communication must be linked to the culture of the viewer, where iconography, visual analogy, and/or personal experiences all can play a role.

In order to initiate dialogue on the above issues, the current paper supplies several examples of movement signatures generated using 3D technology. These exemplary prints should show the uniqueness of selected activity by relative emphasis on factors such as stability, balancing, athleticism, power, and quality of movement (control, smoothness/abruptness). As such, motion capture trajectories can aid discourse about perceptual characteristics for us to explore and abstract the beauty of human movement. The objective nature of the movement signatures would provide significant food for thought with regards to understanding and analyzing human gesture as a means of communication, culture exchange and aesthetics exploration.

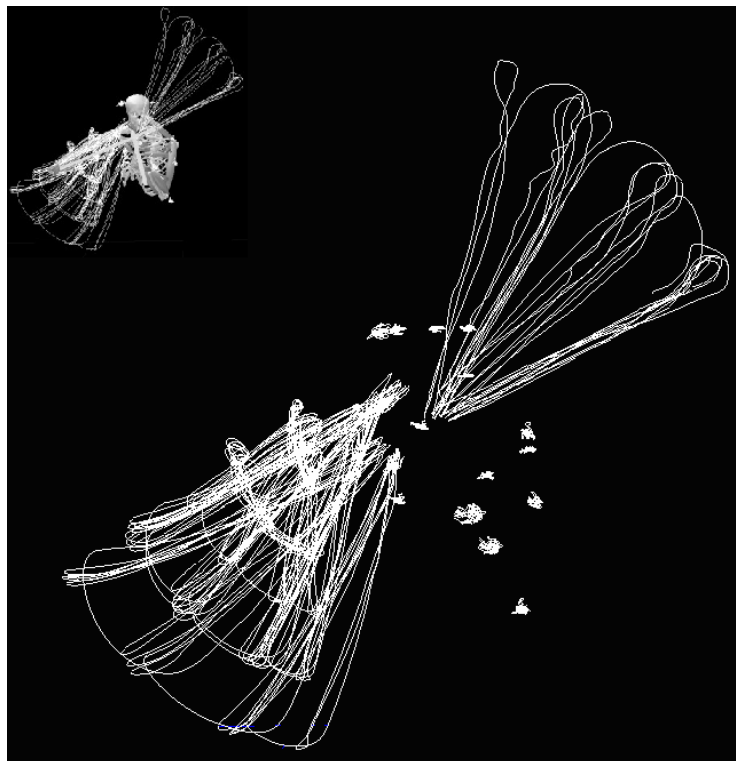
Example 1: The signature of soccer kick, showing power & dynamism.



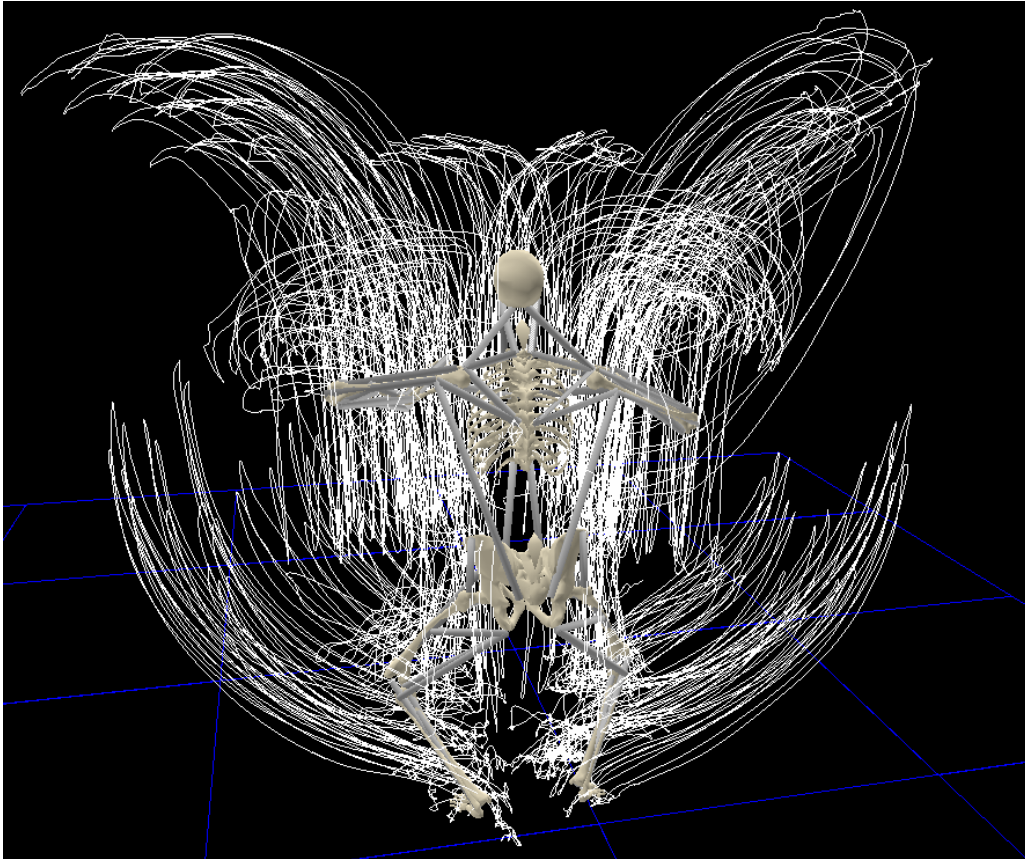
Example 2: The signatures of Axe Kick in Tae Kwon Too – left leg trajectories is in contrast to those of the rest of the image, showing dynamism.



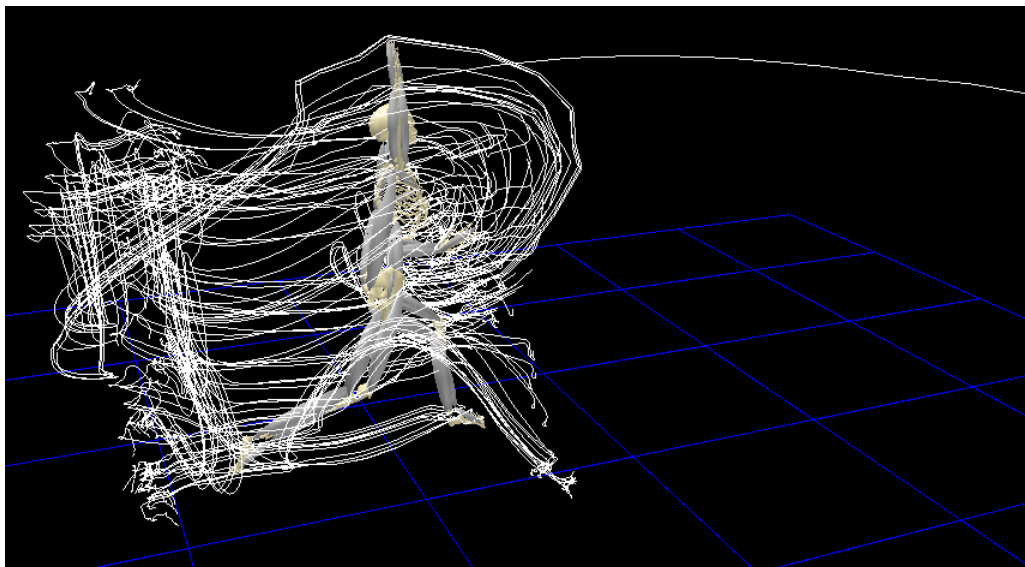
Example 3: The signature of violin performance, showing quasi-static trunk & left arm and artistically smooth-moving right arm & bow, which are well represented by movement trajectories without referential human-form.



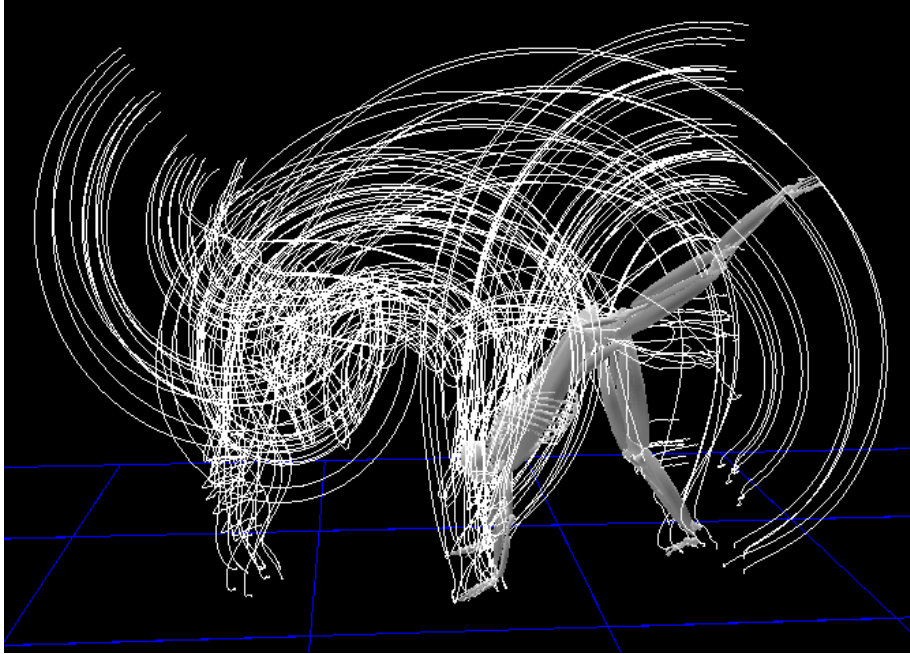
Example 4: The signature of Indian Dance – elements of architectural symmetry, balance, regularity and consistency of movement.



Example 5: The signature of baseball pitch.



Example 6: The signature of hand spring in gymnastics.



### **Acknowledgement**

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### **References**

- Cavanagh, P. (1990). The mechanics of distance running: a historical perspective, in *Biomechanics of Distance Running* (ed: Cavanagh, P.). Champaign, IL: Human Kinetics.
- Solnit, R. (2003). *River of Shadows: Eadward Muybridge and the Technological Wild West*. New York, NY: Viking Penguin.