Docket #: S05-433

A New Accurate Method of 3D Full Body Motion Capture for Animation

Stanford researchers have patented a unique approach for accurate and precise unencumbered 3D movement analysis for full motion 3D animation.

The system architecture is modular and includes:
1. Multiple synchronized cameras acquisition
2. Foreground/Background segmentation
3. 3D representation reconstruction
4. Tracking of the representation through a model
5. Kinematics extraction and outputting

This invention works with the model generation methods and software described in Stanford docket **S07-254, S07-086, and US Patent 8,180,714.**
This markerless motion capture system is accurate enough for biomechanical, clinical, sports, animation, video gaming, design, ergonomics, and surveillance applications.

Video of Markerless Motion Capture

Related Markerless Motion Capture Technologies also available for license:
S06-193– US Patent 8,139,067 & S06-193B -software associated with Stanford docket S06-193
S07-254– US Patent 8,180,714 & S07-086 -software associated with Stanford docket S07-254
S08-122– US Patent 8,384,714

Applications

- Initially developed for **biomechanical and clinical** uses but can also be used for:
    - Sports performance evaluation or sports medicine

- Animation and computer graphics
- Digital movies
- Interactive gaming and video games industry
- Biofeedback and rehabilitation
- Design and engineering
- Ergonomics
- Visual arts and any art using biological signals as an input or output
- Robotics - development of biomimetic robots
- Surveillance

Advantages

- **Accurately and precisely measures** three-dimensional kinematics of the dynamically moving object or human.
- **Simple and time-efficient**
- **Markerless** - No requirement for the placement of any device or object on the subject's body
- **Low cost** – uses off the shelf cameras, no custom hardware required
- **Many data points** - Synchronizes video streams from different views that maximize the amount of information made available by the system
- **Can operate in outdoor conditions** and does not require a specific controlled environment
- **Does not require a specific protocol set up**
- Provides straightforward full body kinematics
- Broad applications

Publications

- Corazza S, Mündermann L, Chaudhari A, Demattio T, Cobelli C, Andriacchi T: A markerless motion capture system to study musculoskeletal biomechanics: visual hull and simulated annealing approach, Annals of Biomedical Engineering, 2006,34(6):1019-29.
- Mündermann L, Corazza, S, Andriacchi, T: The Evolution of methods for the capture of human movement leading to markerless motion capture for biomechanical applications. Journal of NeuroEngineering and Rehabilitation, 3(1), 2006.

- Corazza S., Mündermann L., Andriacchi T., A Framework For The Functional Identification Of Joint Centers Using Markerless Motion Capture, Validation For The Hip Joint, Journal of Biomechanics, 2007.
- Mündermann L., Corazza S., Andriacchi T., Accurately measuring human movement using articulated ICP with soft-joint constraints and a repository of articulated models, CVPR 2007.
- Mündermann L, Corazza S, Anguelov D, and Andriacchi TP: Estimation of the accuracy and precision of 3D human body kinematics using markerless motion capture and articulated ICP, ASME Summer Bioengineering Conference, Vail, CO, June 22-26, 2005.

Patents

- Published Application: 20080031512
- Issued: 7,804,998 (USA)

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