

Motion Capture Databases Discussion of Open Problems

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mocap.cs.cmu.edu

6 hours of motion capture data

asf/amc format

Collected with the Helen Hayes Marker set
(41 markers)

Corresponding video



mocap.cs.cmu.edu

42% locomotion: 5% jumping, 3% running, and 33% walking

29% common scenarios: cleaning, waiting, gestures

16% physical activities: basketball, boxing, dance, exercise, golf, martial arts

7% interacting with the environment: rough terrain, playground equipment

6% two subjects interacting

Unique performances: pratfalls from a clown, break dancing, and several modern dance performances

Access

Freely available on the web via keyword search or download of the complete database.

CMU Graphics Lab Motion Capture Database
Home | Search | Tools | Resources | Rendered Movies | FAQs

View All: Subjects | Motions | Browse: Motion Categories

Search Help
subject number (e.g. 40) | motion or keyword (e.g. run) | SEARCH

Subject #2 (various expressions and human behaviors) file index								
Image	Trial #	Motion Description			Frame rate	Feedback		
	1	walk	trd	c3d	anc	Animated 120	Feedback	
	2	walk	trd	c3d	anc	rng	Animated 120	Feedback
Subject #3 (walk on uneven terrain) file index								
Image	Trial #	Motion Description			Frame rate	Feedback		
	1	walk on uneven terrain	trd	c3d	anc	rng	Animated 120	Feedback
	2	walk on uneven terrain	trd	c3d	anc	rng	Animated 120	Feedback
	3	walk on uneven terrain	trd	c3d	anc	rng	Animated 120	Feedback
	4	walk on uneven terrain		c3d	anc	Animated 120	Feedback	

What was it used for?

As of May 2005, over 40 technical papers published in graphics, vision, activity recognition, biomechanics, databases using mocap.cs.cmu.edu (with no affiliation to CMU).

Most common area was activity recognition

In May 2005, averaging 2000 accesses/month by unique IPs (after an attempt to cull for web crawlers)

What is missing?

Almost everything there is a “performance” and doesn’t necessarily reflect “natural” human activities

Few behaviors involve interaction (with people or with objects other than the floor)

Hand and face motion was not recorded

Degrees of freedom in back/shoulder were inadequate

Video not calibrated or carefully synchronized

Methods for access were very simple

Kitchen Capture

Database of kitchen activities recorded using many different sensors:

- Motion capture with improved skeleton, hopefully hands
- Cameras (in room and on body)
- Microphones (in room and on body)
- Accelerometers
- Occasional use of other sensors: ground forces, object interaction forces, EMG, eyetracker

Long Captures: full meals cooked and consumed

Kitchen



Why the Kitchen?

Complex manipulation and mobility tasks

- Requires an understanding of object manipulation and interaction
- Record forces and hand motion

Long capture of natural activities

- Mitigate effect of laboratory capture

Why the Kitchen?

Food preparation, consumption, and nutrition central to assistive technology applications

- Aging in place
- Obesity
- Accidents in the home
- Job coaching

What data are we recording?

Training data: labels/ground truth

Hand-labeled semi-automatically

Tests: unlabelled data

Record long captures—full meals (cooking and consumption)

Record more modalities than will likely be necessary and record at higher quality to provide a gold standard

Synchronize data

Tightly within a modality

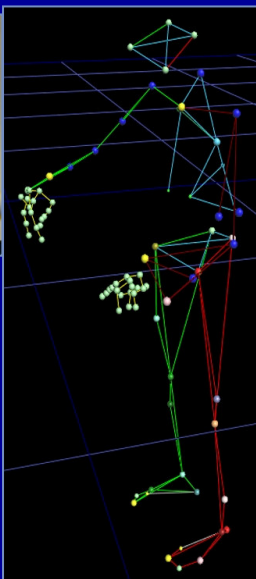
As tightly as possible across modalities

Via button switch light flashes/noise once/session

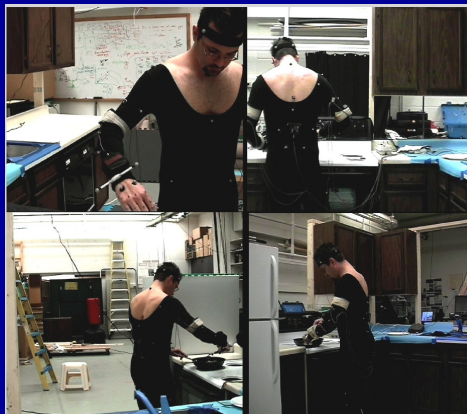
Sensors And Data



Mocap



Multiple Camera Video



Sensors And Data

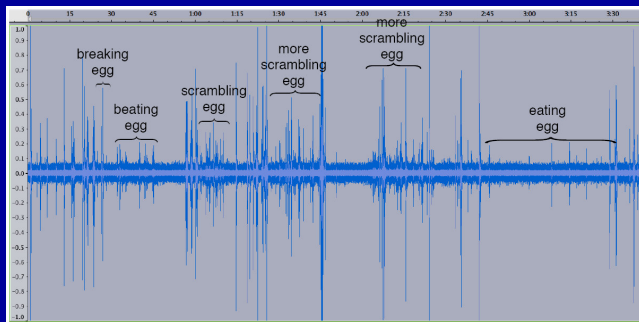
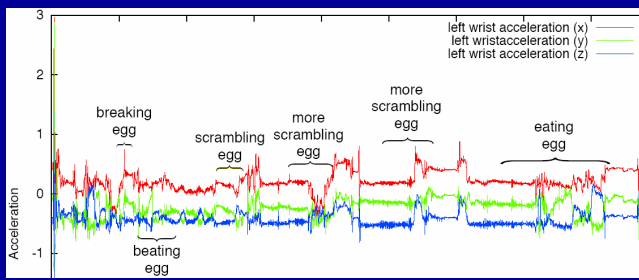


Sensors And Data



accelerometer

microphones



Technical Challenges

Synchronization

Long recording sessions

Occlusions

Are we recording the right modalities with sufficient resolution in time and space?

Your input is welcome: jkh@cs.cmu.edu

Open Problems

Dimensionality reduction

Data representation

Poses or motion segments

Data compression

Segmentation

Fine or coarse grain

Classification and clustering

Retrieval

Full state

Partial state (performance animation)

Generative models

Filling of gaps due to occlusions (single marker or higher level)

Generation of human motion

<http://www.cs.cmu.edu/~christos/TALKS/SIGGRAPH-07-tutorial/>