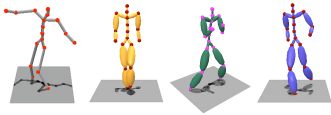


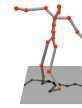
## MotionVis

Donovan Parks



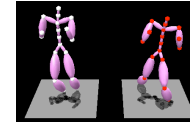
## Outline

- Project motivation and goal
- Details of projects
- Video showing results
- Future work and conclusions



## Motivation

- Large motion capture DB's widely used in the film and video game industries
- This has created a desire to be able to search these databases for *logically* similar motions

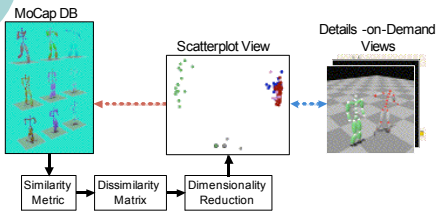


## Project Goal

- Numerous similarity metrics have been proposed:
  - Which of these should be preferred?
  - What are their respective strengths and weaknesses?
  - How can a given metric be improved?
- Develop an environment for analyzing the structure of a motion capture DB under a given similarity metric

## Project Overview

- InfoVis environment for visualizing MoCap DB under a given similarity metric

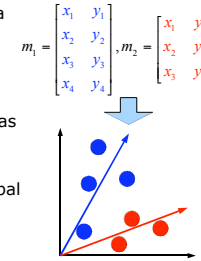


## CMU MoCap Database

- Publicly available database of MoCap data (mocap.cs.cmu.edu)
- Project considers a subset of the CMU database
  - 110 walking sequences
  - 45 running sequences
  - 18 jumping sequences
  - 5 boxing sequences
  - 3 cartwheel sequences

## Li's Similarity Metric

- Treat each frame as a point in high-d space
- Hypothesis: Similar motions will have a similar principal axis as determined by PCA
- Angle between principal axes is used as the similarity measure

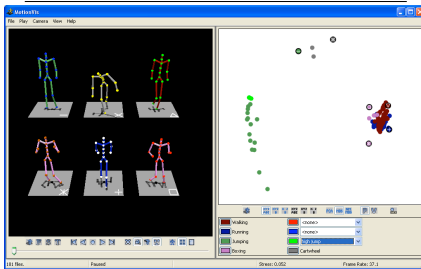


Li and Prabhakaran (2006)

## Dimensionality Reduction

- Three dimensionality techniques considered:
  - PCA / Classic MDS (linear, fast)
  - Metric MDS (nonlinear, slow)
  - Non-metric MDS (rank order, slow)
- With 2 dimensions:
  - Classic MDS has a stress of ~0.08
  - Metric MDS has a stress of ~0.05
  - Non-metric MDS has a stress of ~0.03

## Visual encodings



## Future Work

- Fix various short-comings of current implementation
- Consider other MoCap similarity metrics
- Dealing with data that has an intrinsic dimensionality > 2

## Conclusions

- Environment for aiding understanding of a MoCap-based similarity metrics
- Provides information about a similarity metric that is hard to obtain from:
  - analyzing numerical results
  - existing visualization environments

## Literature

- Implemented similarity metric:
  - Chuanjun Li and B. Prabhakaran. *Indexing of motion capture data for efficient and fast similarity search*, 2006.
- Other similarity metrics:
  - Lucas Kovar and Michael Gleicher. *Automated extraction and parameterization of motions in large data sets*. ACM Trans. Graph., 23(3):559568, 2004.
  - Meinard Müller, Tido Röder, and Michael Clausen. *Efficient content-based retrieval of motion capture data*. ACM Trans. Graph., 24(3):677685, 2005.
- Related InfoVis papers:
  - Chris Roussin Rich DeJordy, Stephen P. Borgatti and Daniel S. Halgin. *Visualizing proximity data*, 2007.
  - Jonathan C. Roberts. *State of the art: coordinated and multiple views in exploratory visualization*. Proc. Conference on Coordinated and Multiple Views in Exploratory Visualization, 2007.