Retrieving Similar Movements in Motion Capture Data

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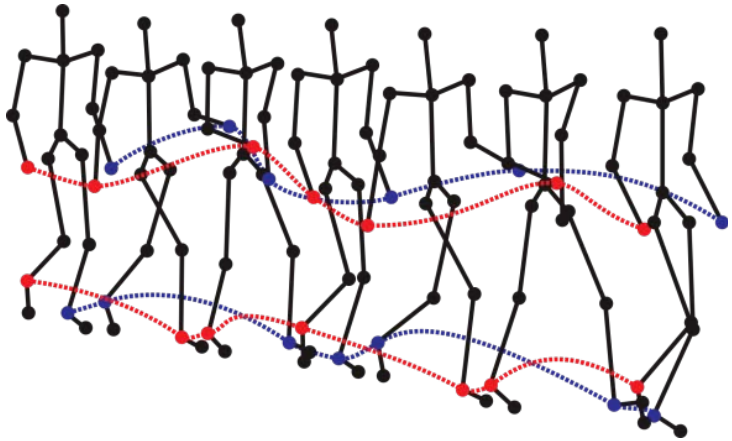
Introduction

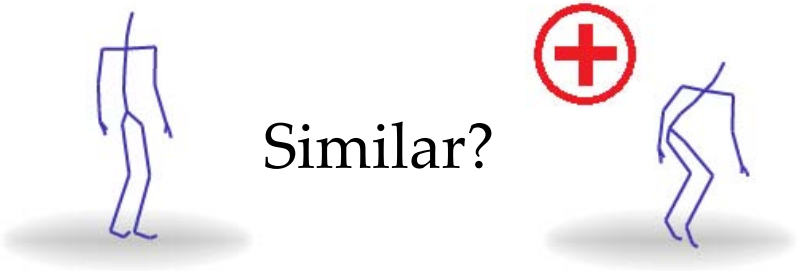
- Motion Capture Data ~ Human Motion Data
  - Sequence of poses of 3D joint coordinates



- Capturing devices:
  - Tracking markers attached to a human body (e.g., Vicon)
  - Systems of synchronized cameras (e.g., Microsoft Kinect)
  - Estimating 3D joint coordinates from ordinary videos

Introduction

- Analysis of recorded motion data in various areas:
  - Health care – success of rehabilitative treatments
  - Sports – performance aspect comparison
  - Security – person identification, event detection
  - Computer animation – realistic motion synthesis



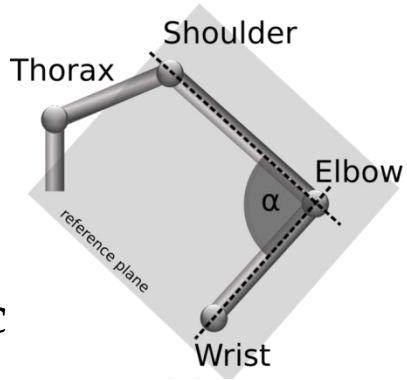
- Challenge – increase *findability* of recorded motions
  - Annotations – limited to given motion classes
  - Content-based retrieval – requiring a query example

Content-based (Sub-)motion Retrieval

- Content-based retrieval:
  - Search for motions in a database that are similar to a query motion example
  - Approaches:
    - Sequence-based approach – searches for entire motions only
    - Subsequence-based approach – searches for all possible sub-motions within recorded database motions
  - Components:
    - Similarity model
      - Motion features (descriptors)
      - Motion similarity function considering temporal variances
    - Indexing & searching

Our Sub-motion Retrieval Approach

- Similarity model:
  - Motion features – joint-angle rotations
    - Each pose = 28-D vector of angles of joints
    - Individual poses compared by the L_1 metric
  - Motion similarity function
    - Average distance between key poses based on the L_1 metric



- Indexing & searching:
  - Indexing all motion poses (28-D vectors) by the L_1 metric
    - Any metric-based structure (e.g., Metric-Index [Novak, 2011])
  - A specialized key-pose retrieval algorithm
    - Sedmidubsky, J., Valcik, J., and Zezula P. A Key-Pose Similarity Algorithm for Motion Data Retrieval. In *12th International Conference on Advanced Concepts for Intelligent Vision Systems (ACIVS 2013)*. Springer, 2013.

Our Sub-motion Retrieval Approach Online Demonstration

- Online demo: http://disa.fi.muni.cz/motion-retrieval/
- HDM05 motion database [Muller, 2005]:
  - 102 motions of 491,847 frames (poses) ~ 68 minutes

Conclusions & Future Work

- Conclusions:
  - Content-based subsequence search in motion data
  - Online web application for sub-motion retrieval

- Future research directions:
  - Improving retrieval efficiency to achieve *sublinear* search costs with respect to the length of database motions
  - Developing new similarity models to achieve better retrieval effectiveness

Questions?

Thank you for your attention.

Try our online demo:
http://disa.fi.muni.cz/motion-retrieval/