Modeling Abstractions for Dance Digital Libraries

Επίπεδα Μοντελοποίησης για Ψηφιακές Βιβλιοθήκες Χορού

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HDMS 2014-Athens
“In a few years, if you can read notation, the dances of the world will be as close to you as your local library”

N. Schurman, S. L. Clark, 1972
(Modern Dance Fundamentals)
“In a few years, if whether you can read notation or not, the dances of the world will be as close to you as your local digital library”
Labanotation

- Notation System based on Laban Movement Analysis (Rudolf von Laban, 1928)
- uses symbols to describe movement
- is a well structured language with clear semantics
The basics...

(a) Staff

(b) Symbols

(c) Body Parts
Digital Libraries

“A Digital Library is a potentially virtual organization that comprehensively, collects, manages and preserves for the long depth of time, rich digital content and offers to its targeted user communities specialized functionality on that content, of defined quality and according to comprehensive codified policies.”

Dance Digital Libraries

- Dance Related Content (text, music, video, scores)
  e.g., Dance Digital Archive: [http://www.dance-archives.ac.uk](http://www.dance-archives.ac.uk)
  eClap: [http://www.eclap.eu](http://www.eclap.eu)

How to browse, search and compare the movement?
Objective

Representing dance movement in a comparable, searchable way for further computational analysis and user access.

To compare we need to define!

1. What is a “dance”?
2. What are the movement segments of dance?
3. How these segments are described/represented?
Our theoretical basis

- Labanotation- Choreological Research- Dance Analysis and Documentation

- Conceptual Models for Cultural Heritage
  e.g., FRBRoo -Doerr et al. (2008)

- Music Analysis, Representation, and Score Following
  e.g., IEEE 1599- Haus, G. (2009)

- Linguistics (Morphological Analysis) analogy
Dance and Movement Entities

- “a dance” is a **Dance Piece**, an expression of a particular **Dance Type** or **Dance Genre**, or part of a **Dance Work**. It has a beginning and an ending. It is captured through a (descriptive or prescriptive) **Dance Record** or a **Score**.

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Graphical representation of dance and movement entities.
Dance and Movement Entities

- Within the Score, movement is represented through Movement Entities, which are subject to temporal relations.
Ideally: dances as lists, trees or directed graphs of movement entities

Are they similar?
Challenge: The nodes are not well-defined!

- Labanotation is a universal notation system, but not the universal written language of dance practitioners.
- The way movement is described using natural language, notation or other implies a segmentation of “a dance”.
- This segmentation is dance tradition dependent (analogy with morphological structures of language).
<table>
<thead>
<tr>
<th>Dance (Kaeppler)</th>
<th>Dance (IFMC)</th>
<th>Dance (performing work)</th>
<th>DanceOWL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kineme</td>
<td>Element</td>
<td>Element</td>
<td>Movement Entity</td>
</tr>
<tr>
<td>Morphokine</td>
<td>Cell</td>
<td>-</td>
<td>Movement Entity</td>
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<tr>
<td>Motif</td>
<td>Motif</td>
<td>Motif</td>
<td>Movement Entity</td>
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<tr>
<td>Choreme</td>
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<td>Phrase</td>
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<td>Segments</td>
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<td>Units</td>
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<tr>
<td>Larger Movement Structures</td>
<td>Macro-Structures</td>
<td>A Work-Choreography</td>
<td>“a dance”, a Dance Piece, Dance Work or Expression of a Dance Genre</td>
</tr>
<tr>
<td>Dance Genre</td>
<td>DancType</td>
<td>Choreographe r’s Work</td>
<td>Dance Type, or Dance Genre</td>
</tr>
</tbody>
</table>
Introducing Movement Entities

- **Movement Entities**: represent dance structure segments that have their own attributes and can be described in different levels of abstractions.

- A Movement Entity can be equivalent to a *Symbol in Labanotation*, a simple *Labanotation Concept* e.g., Turn, Step, Rotate, Contract, a *General Movement Concept* e.g., Run, Stand or a *Specific Movement Vocabulary Concept* e.g., a “Pirouette en dedans”.

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Movement Entities and Layers

- **Labanotation Symbols Layer:**
  - e1 ("direction_symbol", "middle", "place", "left support")
  - e2 ("direction_symbol", "low", "forward", "right leg gesture")

- **Labanotation Concepts Layer:**
  - m1 ("middle", "place", "left support")
  - m2 ("low", "forward", "right leg gesture")

- **Generic Movement Concepts Layer:**
  - m1 ("Standing", "Position", "OnLeftLeg")
  - m2 ("Raising", "Gesturing", "RightLeg")

- **Specific Movement Vocabulary Layer:**
  - m1 ("degage", "devant")
We propose: A Multilayer Approach

- Generic
  - Specific Movement Vocabulary (SMV)
  - General Movement Concepts (GMC)
  - Labanotation Concepts (LNC)
  - Labanotation Symbols (LNS)
  - Graphical

- Conceptual
- Notational

- Dance Description
- Structural
- Movement Description
Example: from one layer to the other

Notational (graphic) → LNS → LNC → GMC → SMV

DirectionSymbol (Middle, Place) on Left Support DirectionSymbol (Forward, Low) on Right Leg Gesture → Left Support/Step (Middle, Place) and Right Leg Gesture (Forward, Low) → Standing on one (left) leg, rise slightly right leg → a ballet kineme (Degage devant)

Or a folk dance leg kineme
A Multilayer Approach

- Distinguish different Movement Entities with the same name.
- Find similar Movement Entities that have different names.
- “Guess” missing information through the rules
- Higher Level description
- Hierarchical
- Extensible
- Knowledge of the specific dance traditions is represented

- Difficult to generate data automatically.
- Few datasets available.
- Knowledge of specific dance traditions is required.
Conclusions & Future

- Organize dance and movement descriptions and distinguish between different levels.
- Provide a basis for rule-based semi-automated dance notations similarity search.
- Exploit existing knowledge that comes from the research of movement analysis and praxis of the dance.

ToDO

- Express and implement mapping rules between the concept hierarchies and the notational layers.
- Expand these rules to include links to higher layers as well, enriching with Specific Vocabularies.
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