



TOPOS TOOLKIT FOR PURE DATA

exploring the spatial features of dance gestures for interactive musical applications

LUIZ NAVEDA
STATE UNIVERSITY OF MINAS
GERAIS (BRAZIL)

IVANI SANTANA
FEDERAL UNIVERSITY OF
BAHIA (BRAZIL)

CONTEXT

MOTION CAPTURE SYSTEMS

accelerometers



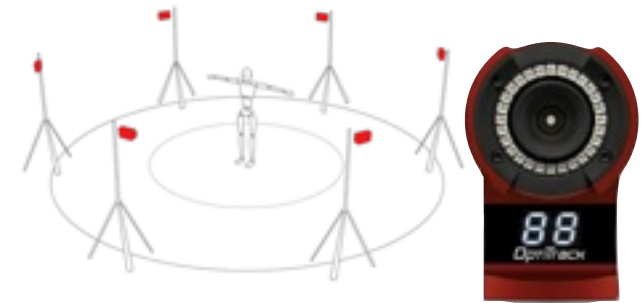
<100 USD

infrared
3D image



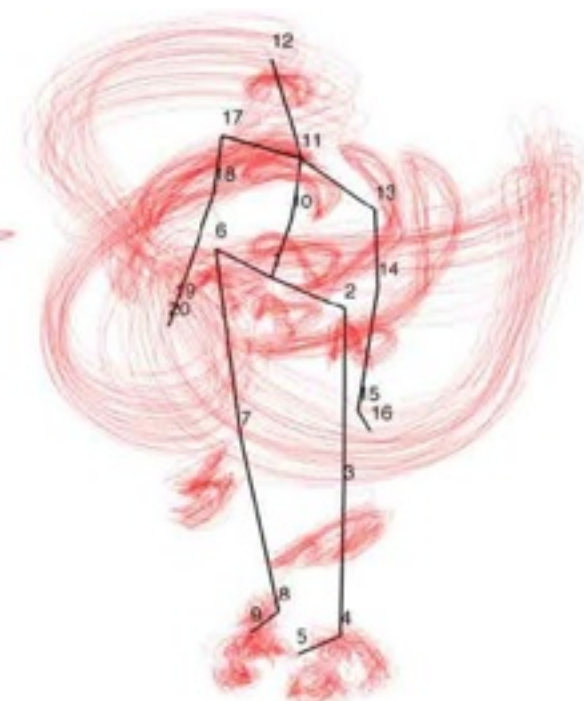
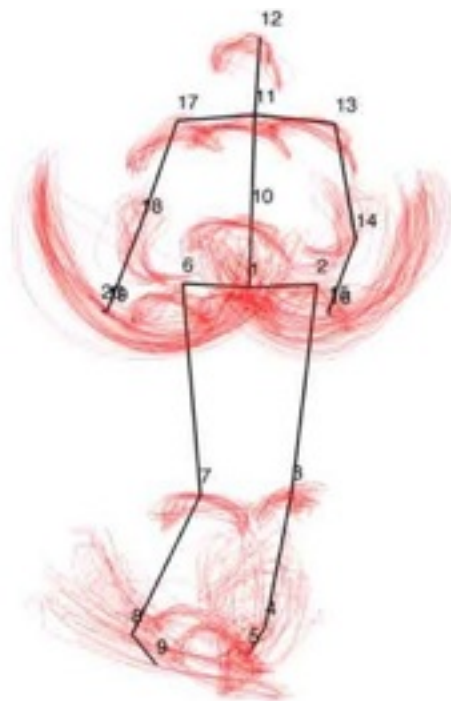
<300 USD

infrared
3D marker

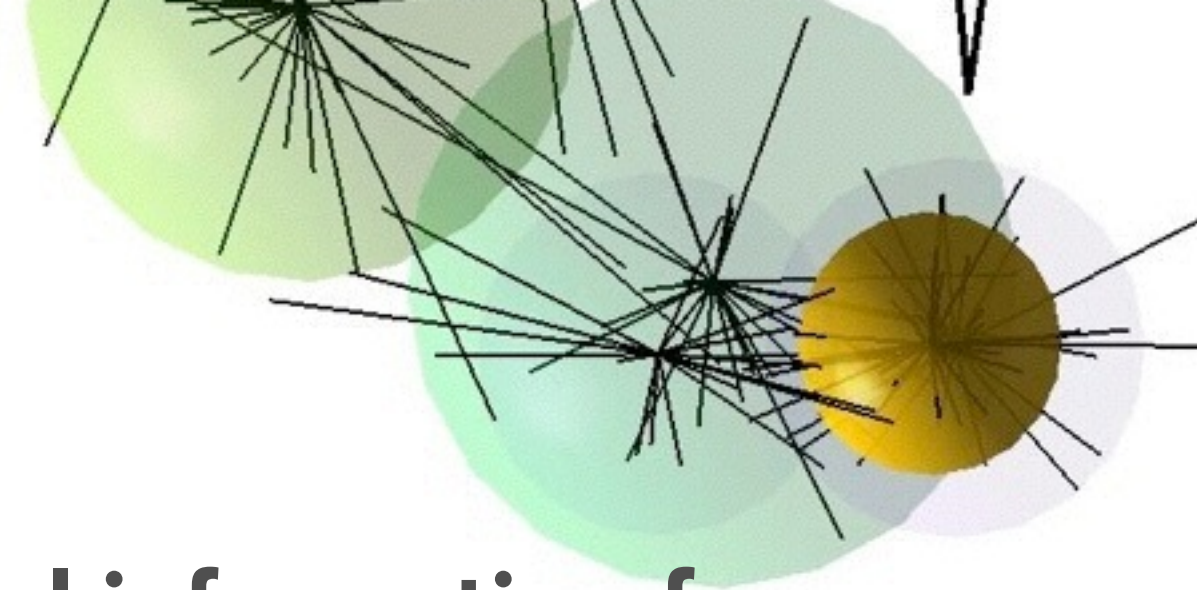


>5000 USD

MOTION CAPTURE DATA



PROBLEMS

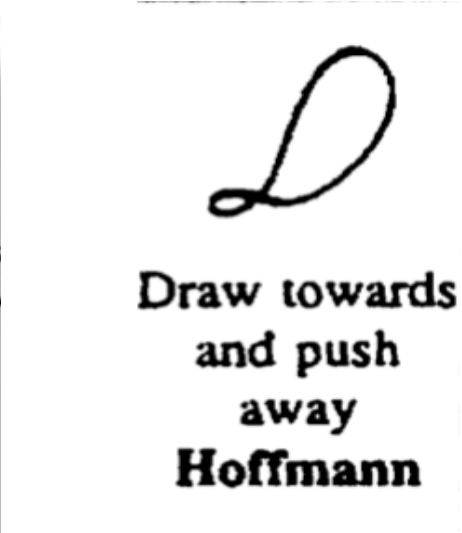


- How to extract realtime **high-level information from** motion capture data of music and dance performances?
- **Imposed** Cartesian coordinates → **meaningful** feature descriptors for dance and music?
- **Complex** full body datasets → **simple** and accessible motion descriptors
- **"Ad-hoc"** programming routines → **fast** prototyping and mapping

REPRESENTATION OF MUSIC AND DANCE GESTURE



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n, his Sister, this 17.11.17 is humbly inscribed by their most oblige



Be...

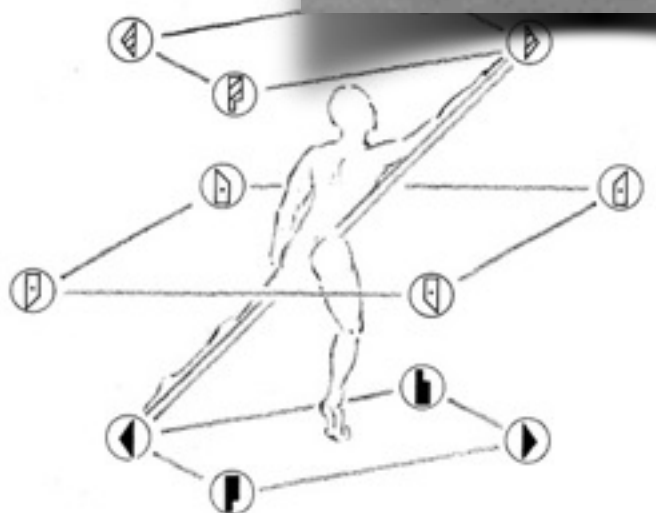
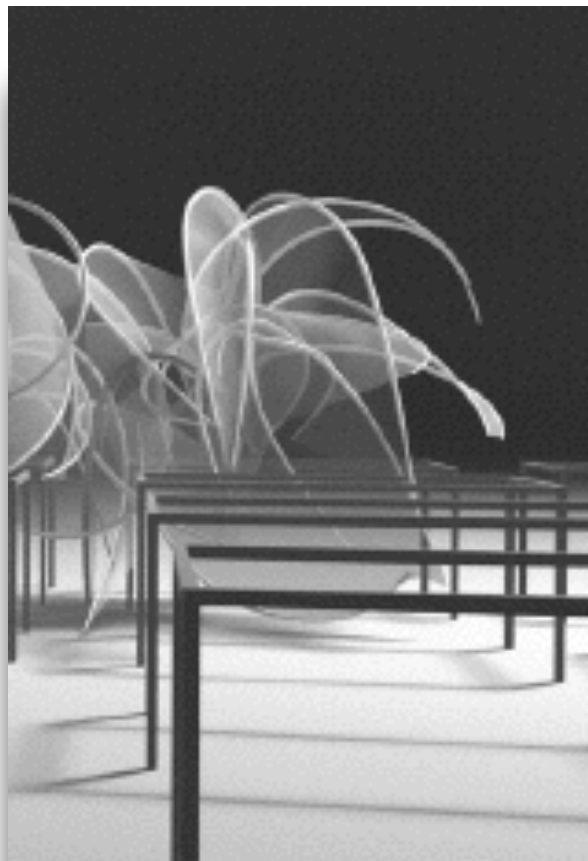
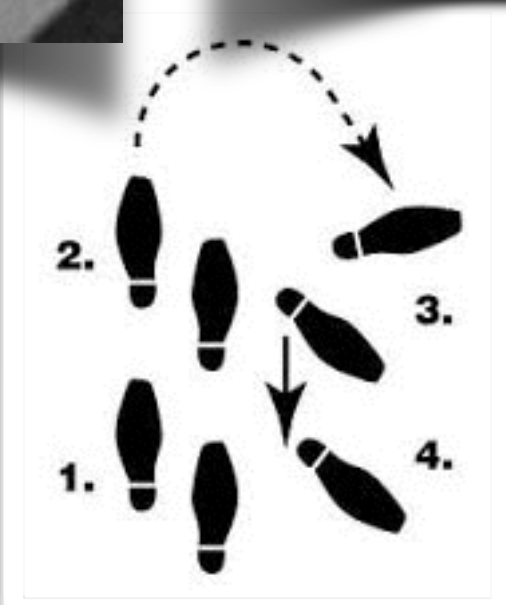



FIG. 34.—Naturally equilibrated bodily attitude.

left arm and leg: ◀ right arm: ▶



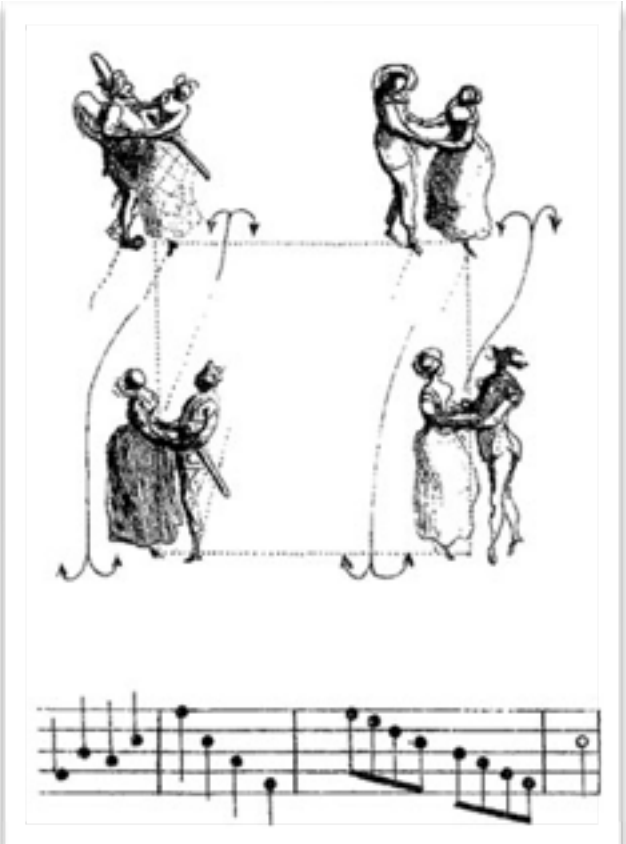
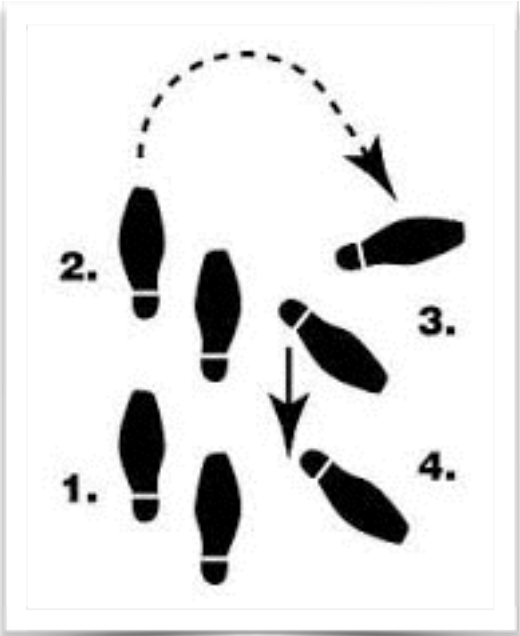
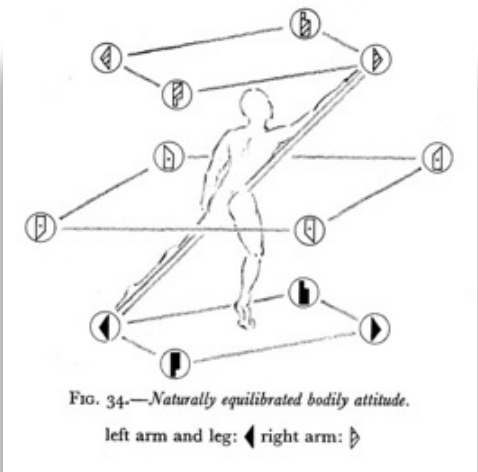
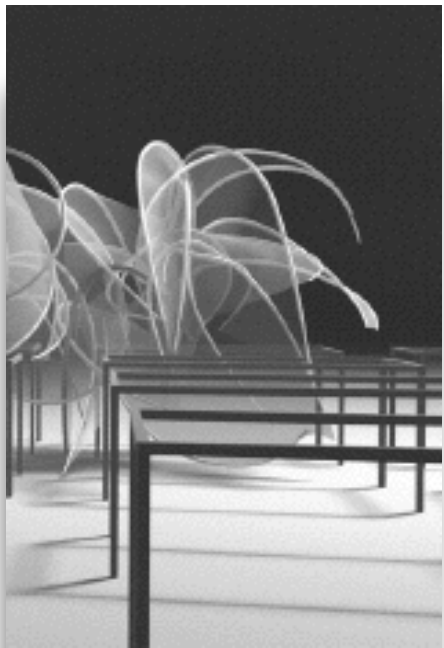
REPRESENTATION OF MUSIC AND DANCE GESTURE





Draw towards
and push
away
Hoffmann

Becking curves
1928

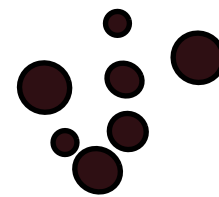


COGNITION OF SPACE AND GESTURE

Paillard (1991)

Morphokinetic:

Deals with shape or form regardless of spatial location



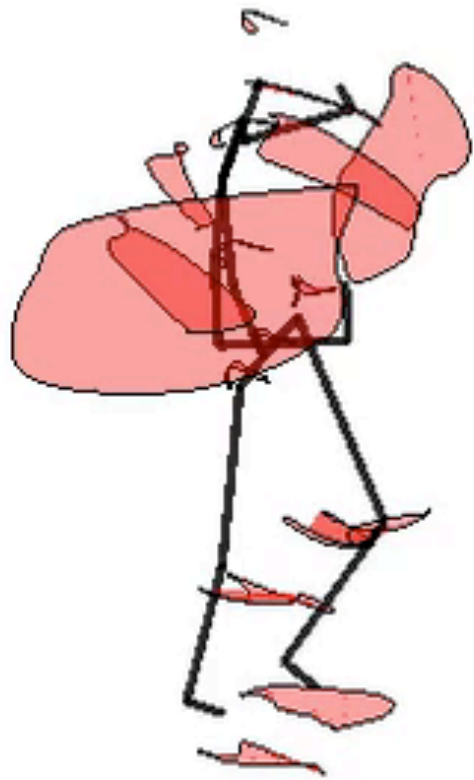
Topokinetic:

Deals with spatial location and spatial intentionality regardless of shape



COGNITION OF SPACE AND GESTURE

Paillard (1991)



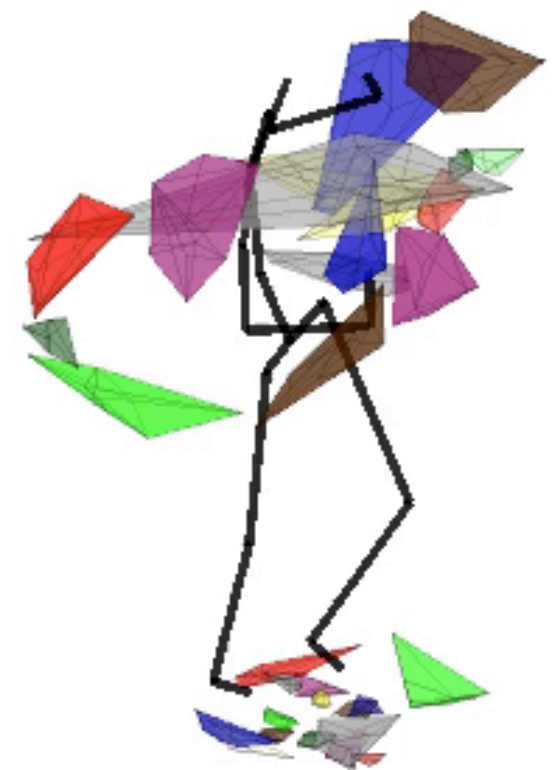
Morphokinetic:

Deals with shape or form regardless of spatial location

Leman & Naveda (2010)

Topokinetic:

Deals with spatial location and spatial intentionality regardless of shape

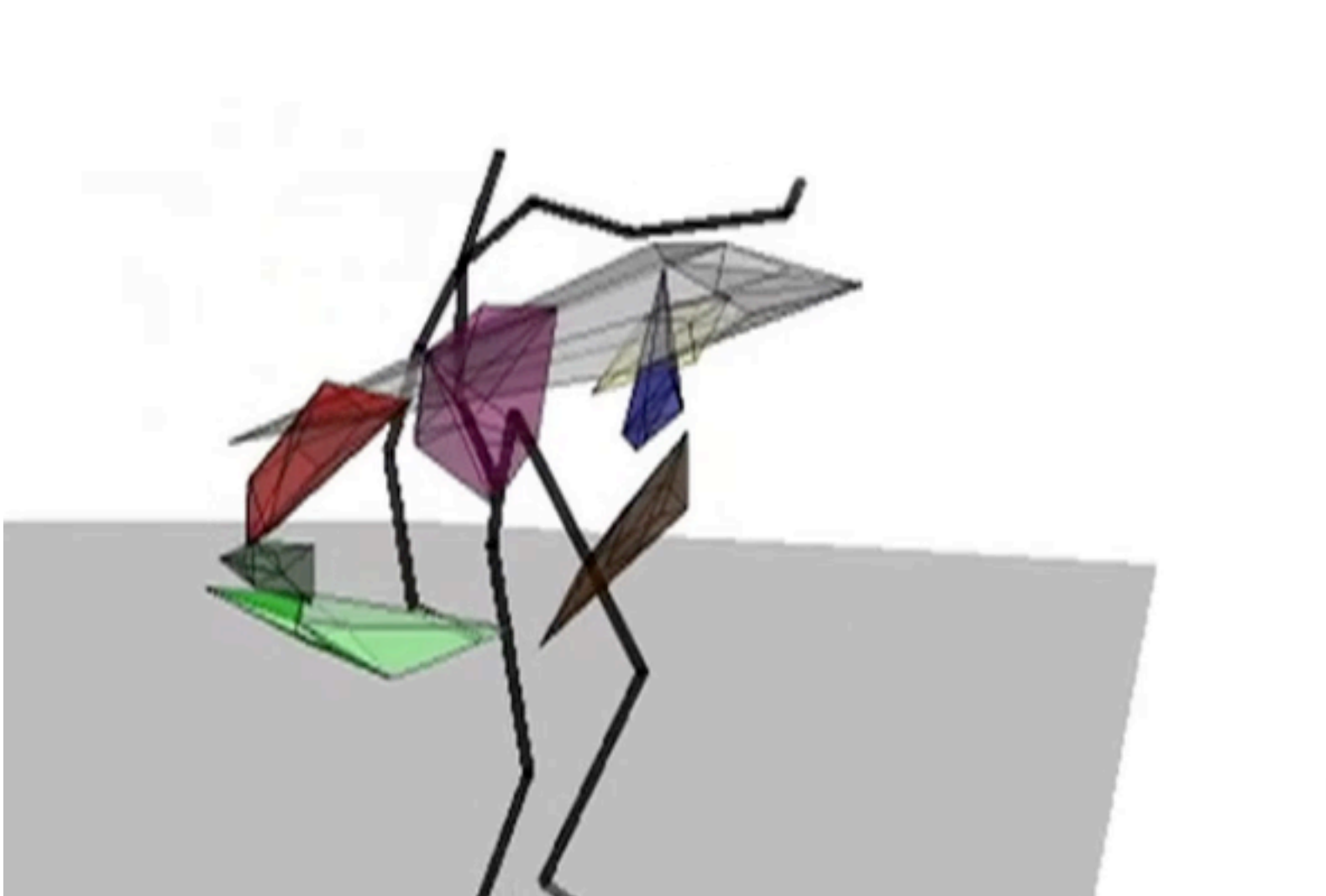


Naveda & Leman (2010)

TGA

Naveda & Leman (2010)

TOPOLOGICAL GESTURE ANALYSIS



Topokinetic:

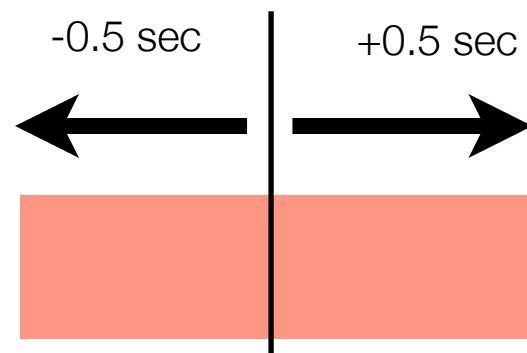
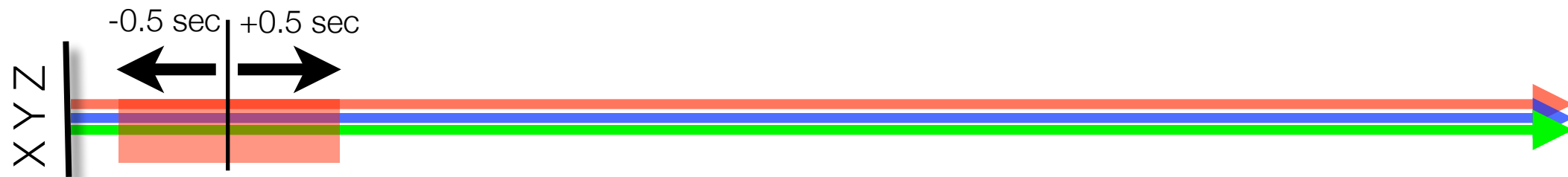
Deals with spatial location and spatial intentionality regardless of shape

WTGA

Naveda & Santana (2010)

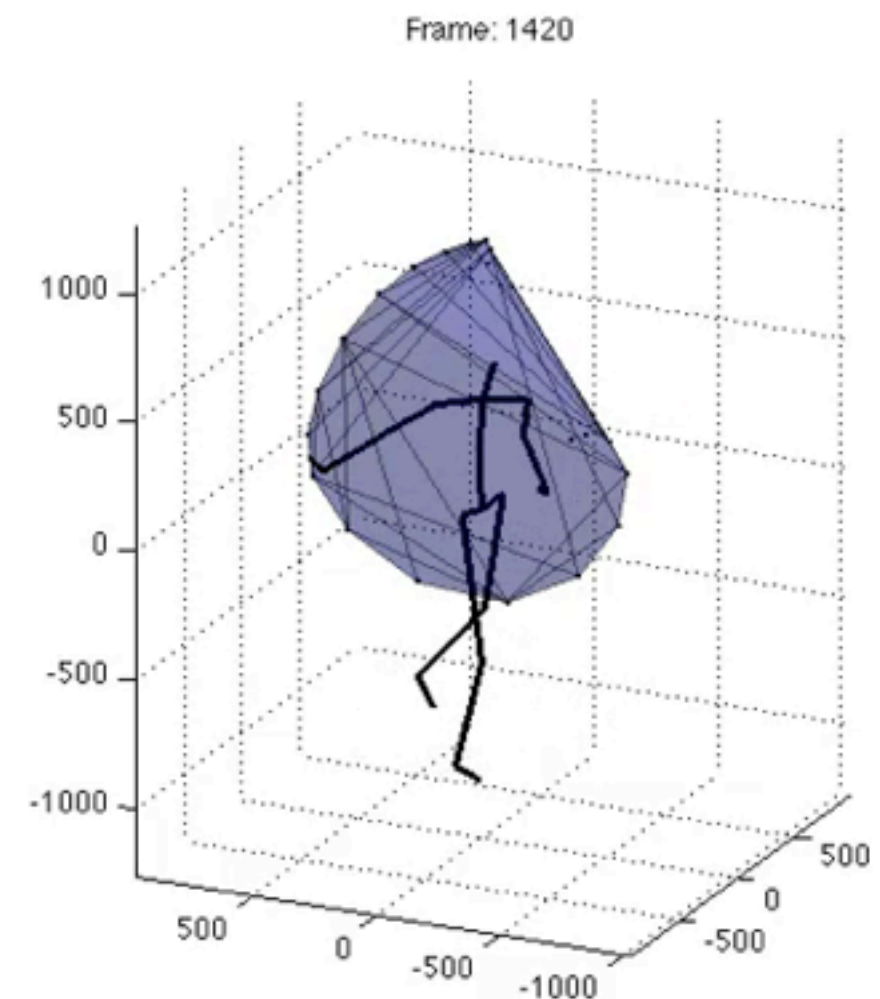
WINDOWED TGA ANALYSIS

- Topologies are defined by previous and next movement trajectories

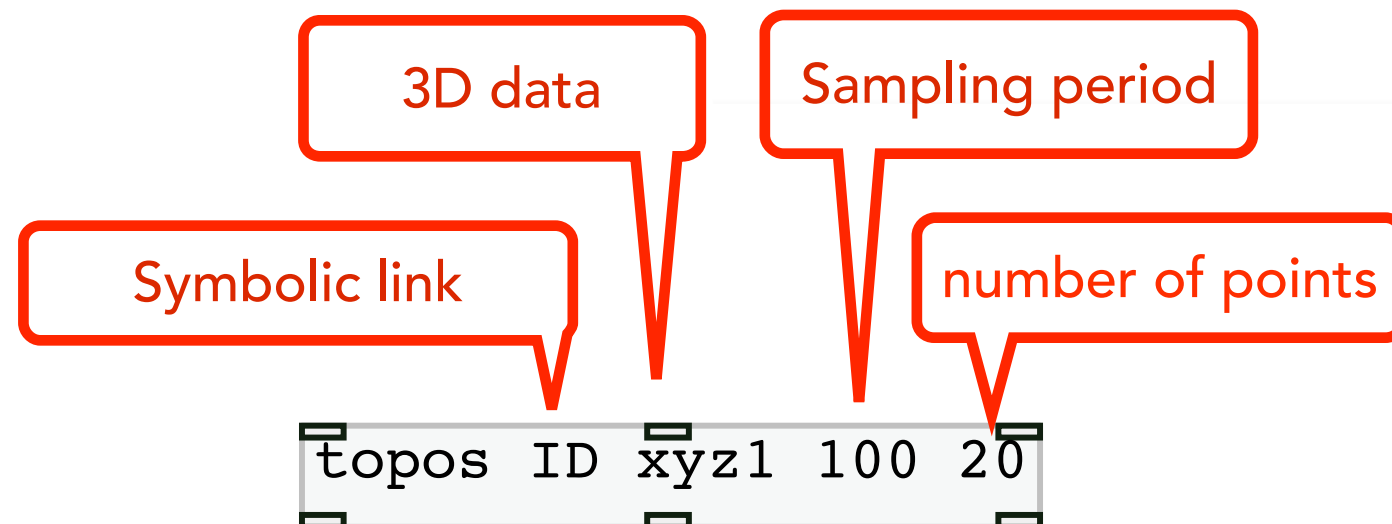
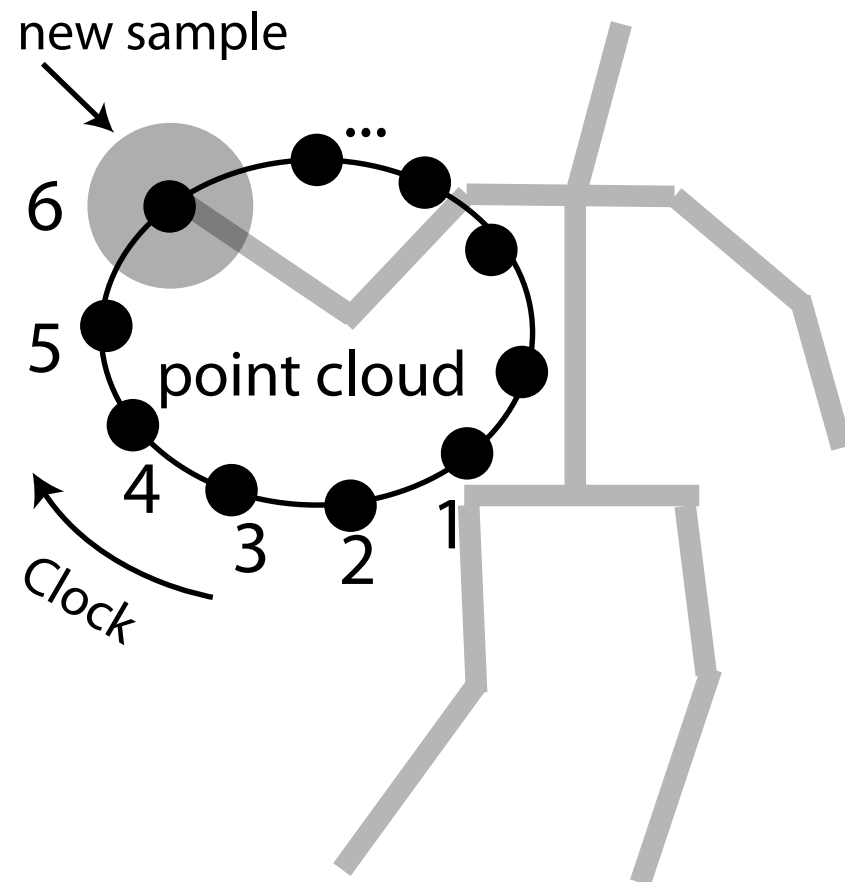


Short-Term Memory
Preceding gesture

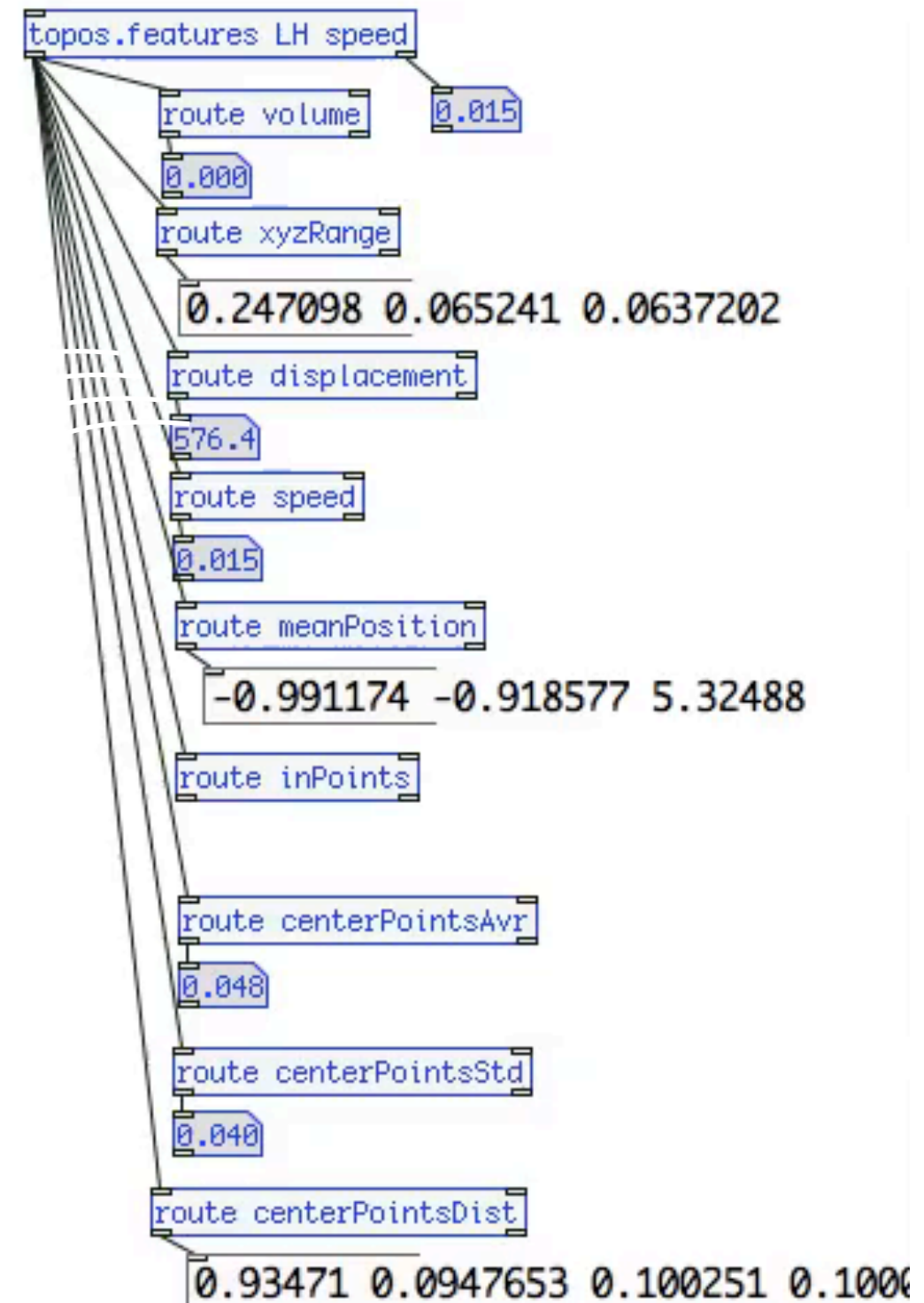
Intentionality
Upcoming gesture



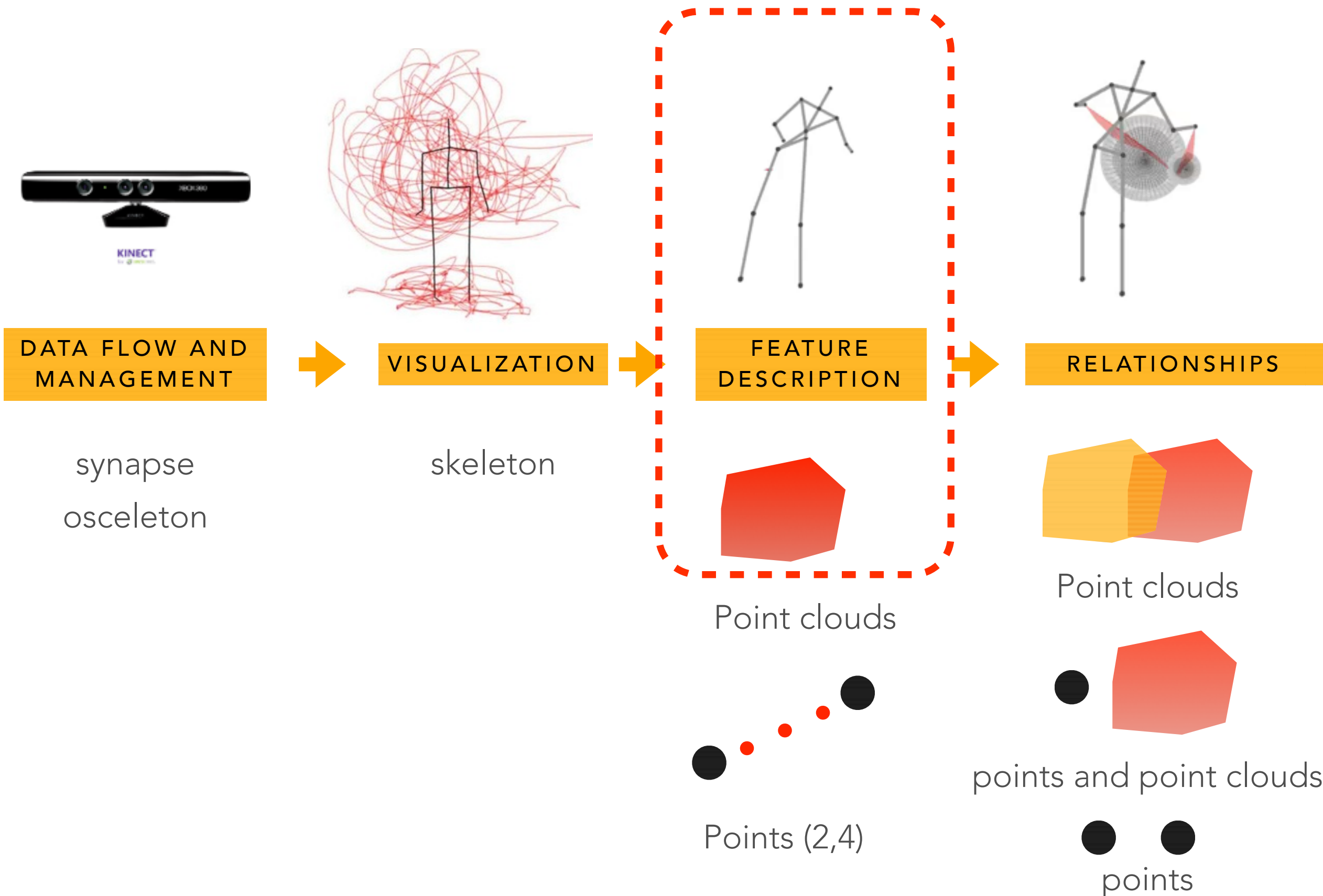
TOPOS ALGORITHM



"TOPOS" FEATURES



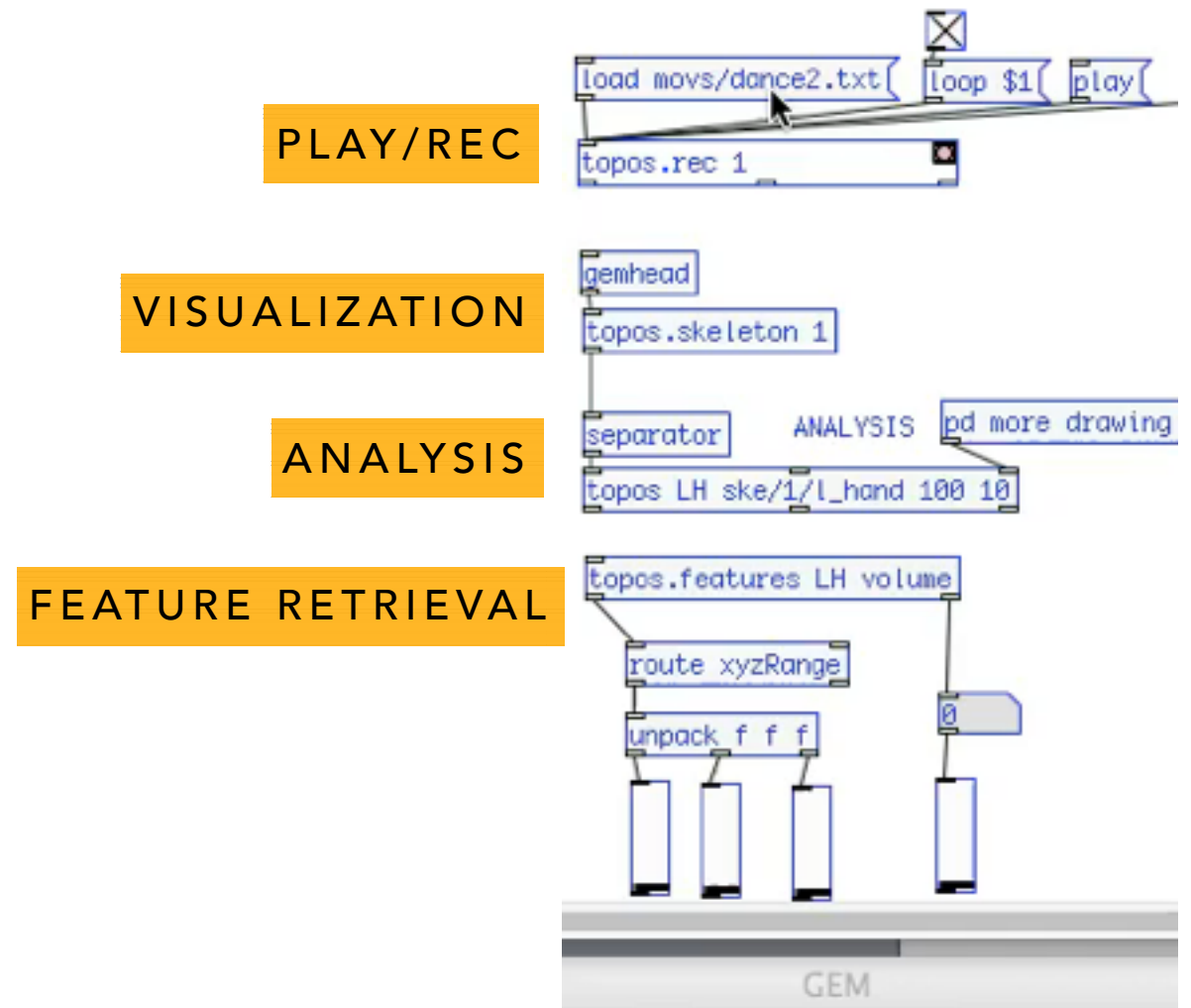
TOPOS LIBRARY



TOPOS LIBRARY

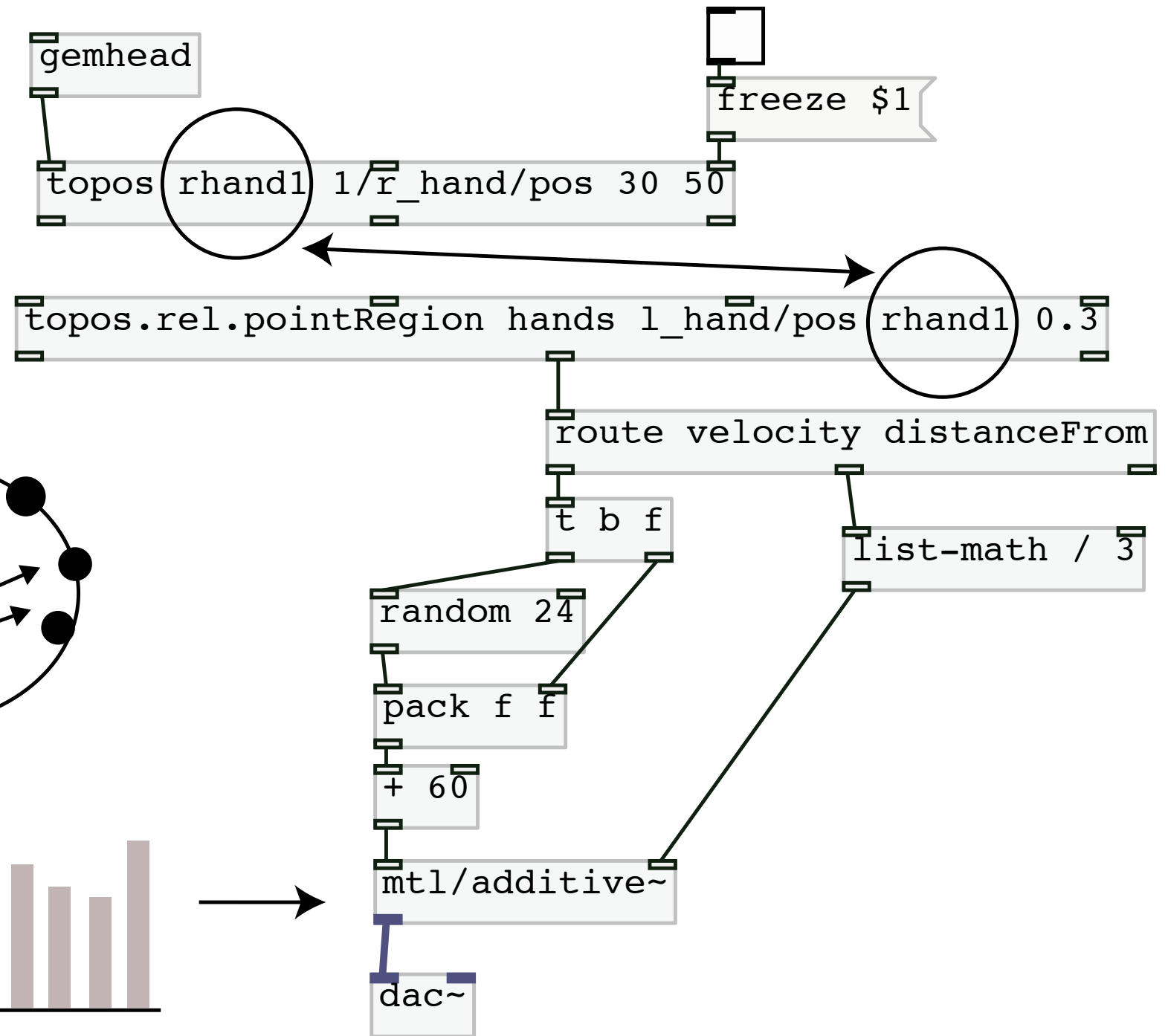
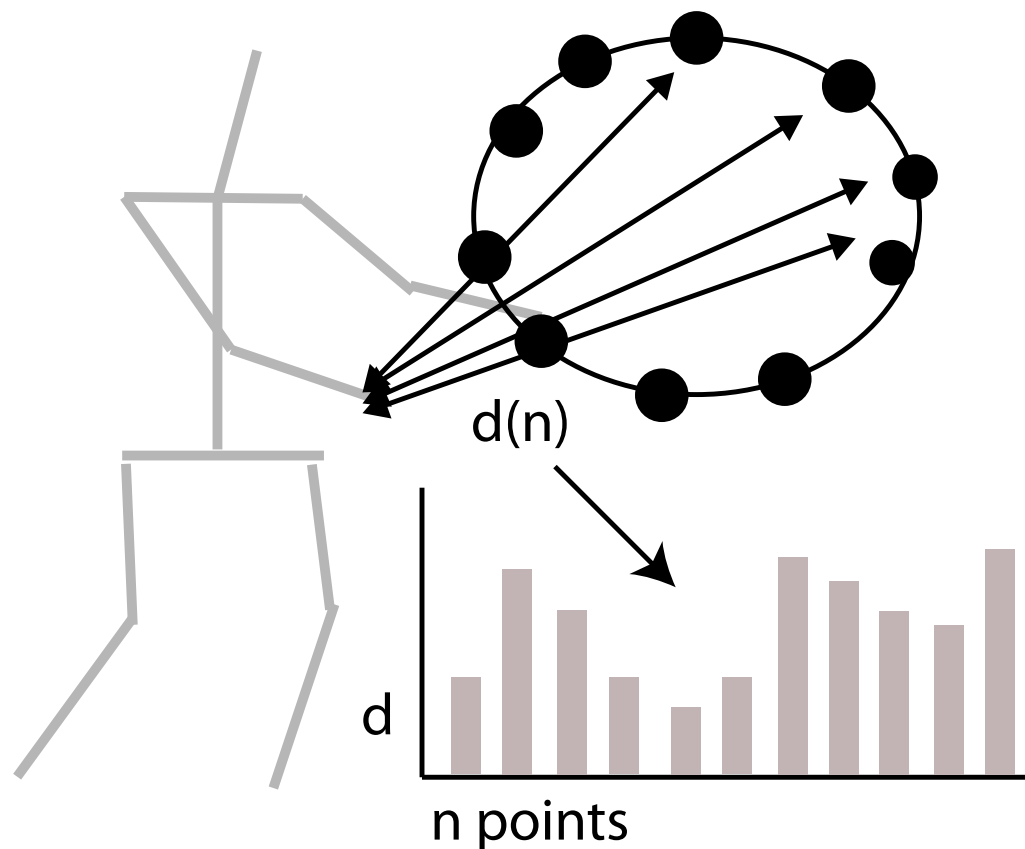
- INPUTS: KINECT (OSCELETON, SYNAPSE), MOCAPTOOLBOX* OR RECORDED DATA
- 11 ABSTRACTIONS/OBJECTS
- ENTIRELY WRITTEN IN PURE DATA

```
topos ID xyz1 100 20 topos.quality
topos.features ID topos.geo.2 ID xyz1 xyz2
topos.geo.4 ID xyz1 xyz2 xyz3 xyz4
topos.rel.regions ID IDtopos1 IDtopos2 0.3
topos.rel.points ID xyz1 xyz2 0.3
topos.rel.pointRegion ID xyz1 IDtopos 0.3
topos.skeleton 1 topos.rec topos.rec.slave
```

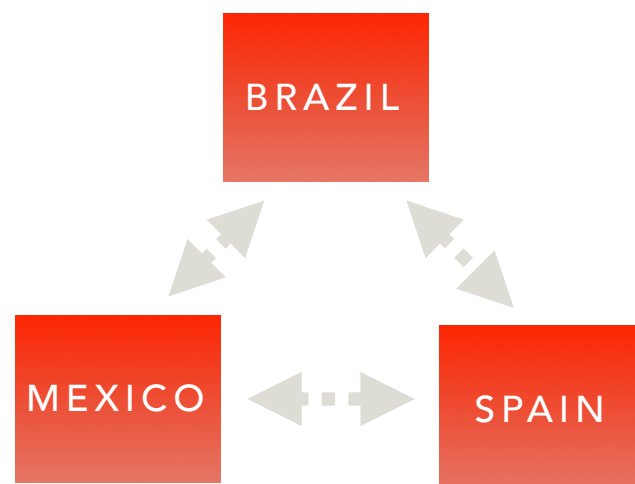


SYNTHESIS

Distances from lhand to the point cloud of rhand are used as magnitudes of oscillators in additive synthesis



CASE: DARMSTAD 58' (2013-14)



AUDIO, VIDEO, CONTROL

Receiving 2 skeletons
Sending 1 skeleton

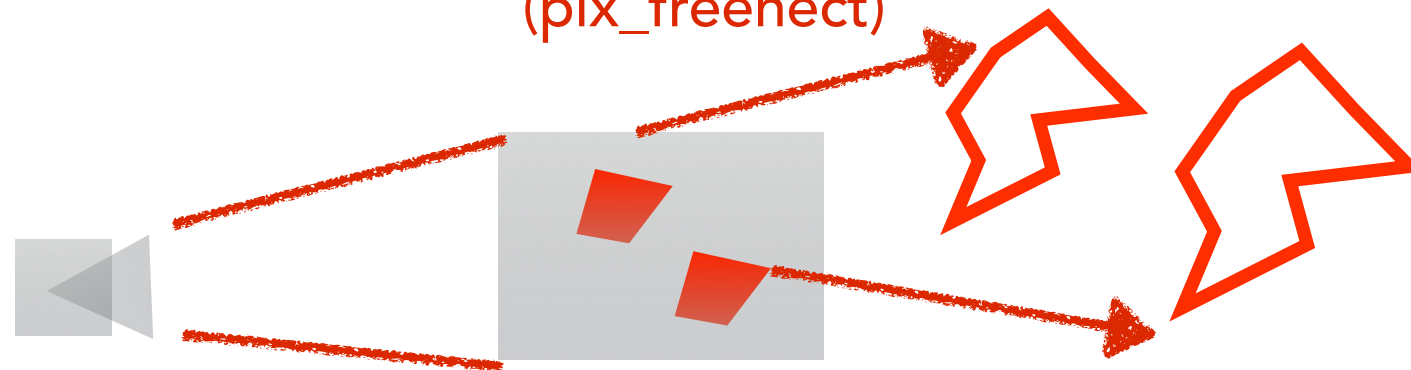
CASE: MIRADAS DO CAOS II (2014)



kinect

blob detection
(pix_freenect)

Topos Library



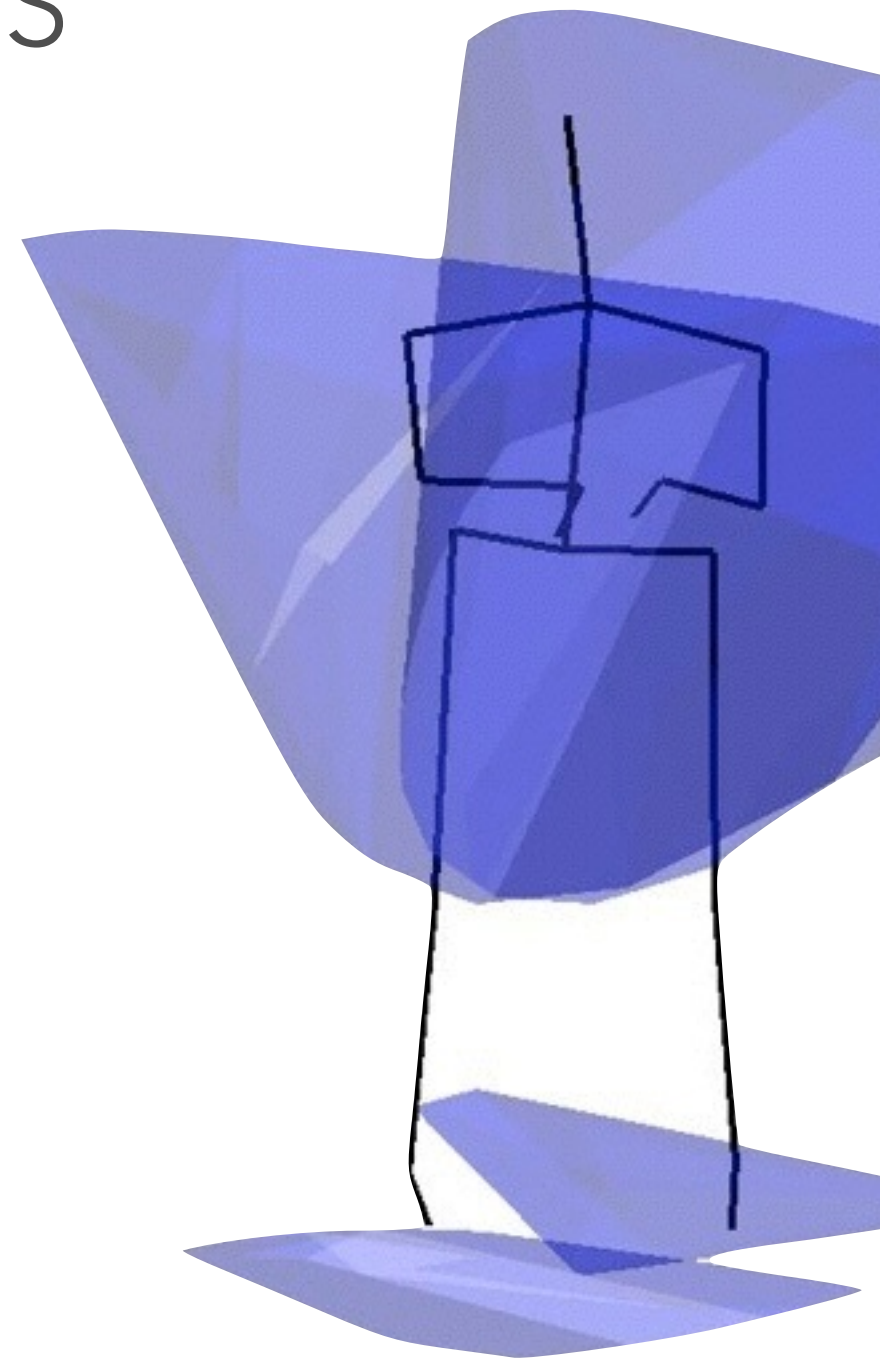
FINAL CONSIDERATIONS

- **Contributions**

- Minimal set of tools for high-level descriptors
- Provide access to a number of features and gestural relationships

- **Problems**

- Contextual features X strict synchronisation
- Dance traditions X expertise in controlling sound



Thanks!



Library, tutorials and documentation
www.naveda.info