Mphil in Digital Architectonics
University of Bath

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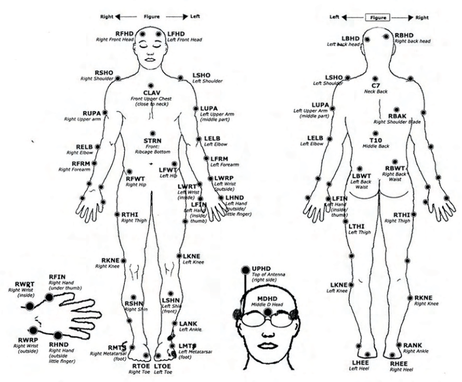
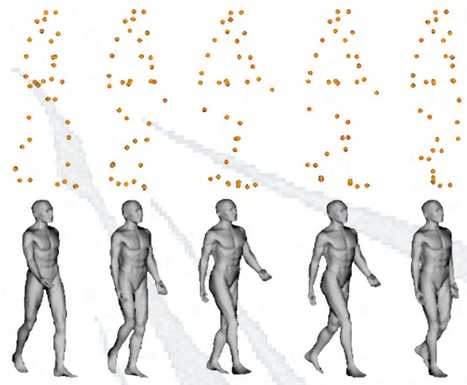
Dance Movement + 'Ribbon' Modelling

Marker Label Chart

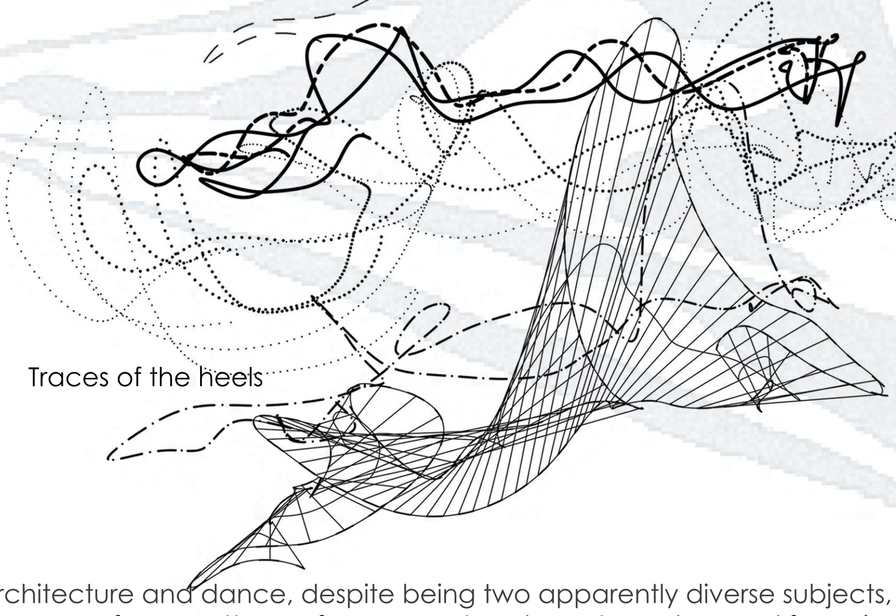


Markers Position + Body Movement



Traces of the wrists

Traces of the heels



Dance Movement Paths

- wrist
- elbow
- shoulder
- spine
- knee
- heel

Architecture and dance, despite being two apparently diverse subjects, present a complementary relationship regarding space and movement. As Peponis (1997) has pointed out, dance performs patterns of movement and creates ephemeral forms in space, while architecture, by its material substance, restricts the possibilities of movement. As the exploration of the dance- space relationship gradually evolved, I focused on a particular spatial element, the 'ribbon'. 'Ribbons' and dance seem to share a common vocabulary. Notions like balance, rotation, folding, parallelism, opposition, as well as knots, are encountered in both 'ribbon' formations and dance movement.

I. Definition

An object can be recognized as 'ribbon', when it is distinctively long and narrow and of minimal thickness. So, a single 'ribbon' can be defined by properties such as its width and length, and also by its profile, its open or closed shape etc. Its direction/motion in space can be straight, diagonal, round, spiral etc. and may change either in 2D space (xy, xz, yz) or in 3D space (x,y,z).

II. Techniques that can be applied to transform a 'ribbon' include the following:

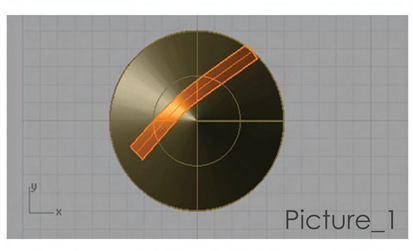
Stretching: only its width, only its length, or both (scale)
Turning: in a random way or in a defined one (like spiral), in 2D or 3D, etc.
Folding: in random or defined angles, in various numbers of points, in 2D or 3D, etc.
Regarding the formation of a 'ribbon' composition, this can be produced by the placement of 'ribbons' either in parallel or in opposite arrangements, creating various effects. Other techniques that can produce 'ribbons' are by subtracting elements from a single surface or by splitting/bisecting a single surface.
The potential of a typical 'ribbon' to transform itself, suggests that its structure and geometry can be ideally described by a parametric modeling procedure.

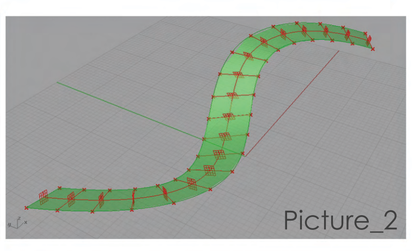
III. Freezing Dance Movement

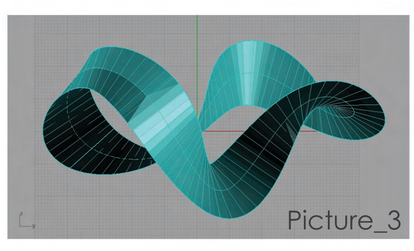
The method followed for the generation of form involved the translation of Motion Capture Data into geometry.
Mocap is a way of recording movement from a physical person, in order to be used into 3D animation of any 3D character. The position of the markers can be stored as coordinates of points that change during time.
Either the basic movement of the body or the movement of two symmetrical limbs can be used to generate 'ribbons' and be connected with geometric parametric definitions composed in Grasshopper.
These include 2 possible ways to design a 'ribbon' and also 2 possible geometric transformations.

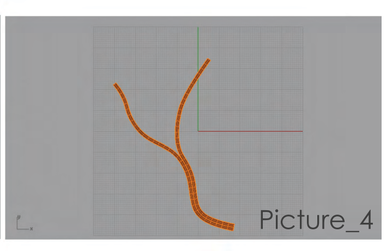
The present parametric models present two different ways of producing a 'ribbon':
- As a geodesic on a curved surface *(Picture_1)*
- As a series of lofted lines along a curve-path *(Picture_2)*

Two techniques that can be applied to transform a 'ribbon' are also represented parametrically. These include:
- The twisting of a 'ribbon' *(Picture_3)*
- The bisection of a 'ribbon' *(Picture_4)*


Picture_1


Picture_2


Picture_3


Picture_4

The outcome of this process could form the basis for the design of objects such as furniture and urban equipment, to projects of larger scale such as playscapes, skateboard areas, roalercoasters etc. creating a tactile experience of dance.