25

The Technical Setup

To see a World in a Grain of Sand,
And a Heaven in a Wild Flower,
Hold Infinity in the palm of your hand,
And Eternity in an hour.
William Blake (1757–1827)

In this chapter, we want to make the idea explained in chapter 24 more precise in an explicit technical sense. Of course, this must rely on a concrete model of performance, one which is much more explicit than the generic setup for statistics, although statistics are a very strong argument for the construction of analytical rationales built upon weights and operators. We refer to figure 25.1 for the following discussion.

So this is the background structure leading to a given performance output: We identify the output by the set of performance fields, which are defined on the leaves of a stemma. They are the four framed bottom fields shown in our figure. This performance output stems from the input field of the primary mother shown on top of the stemma. This input field is usually just the diagonal default field.

The primary mother field is then altered by an operator shown by the blue circle arrow. This could be a primavista operator. Then, the resulting field is restricted to the three shown subframes. They might be defined by right hand, left hand, or some temporal delimitation.

After those restrictions, we get fields on daughters, as shown in our graphics. On each of these daughters, we have one operator of Lie type (this is a general assumption in view of the generic nature of Lie-type fields, as shown in section 17.1). The more important feature here is the interaction between different daughters of one and the same mother: sisters' family life. This interaction is precisely what Beran's averaging process was expressing! So we have to introduce operators that transfer information between sisters. These

G. Mazzola, *Musical Performance*, Computational Music Science,
DOI 10.1007/978-3-642-11838-8_25, © Springer-Verlag Berlin Heidelberg 2011

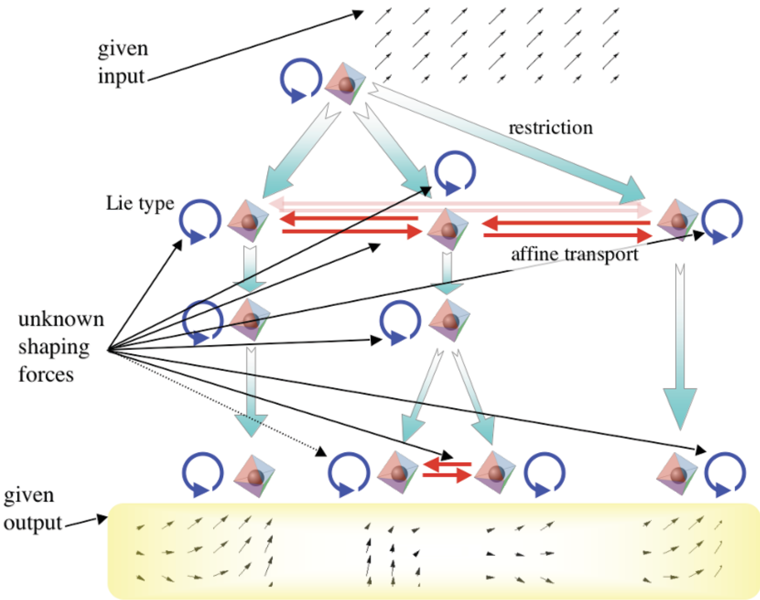

Fig. 25.1. The stemmatic display of operators and their family members under quasi-sexual propagation of LPSs.

operators take the field from one given LPS and transfer it to a sister frame by a unique affine morphism. All sister fields are then added when their affinely transported versions are available on a given frame. This process is visualized in figure 25.2. The summing of the sisters' transported fields is however also weighted according to a matrix $W^M = (W^M_{ij})$ of weights W^M_{ij} for sister i to sister j in the family of one mother M.

What is the meaning of such a weight? Suppose that the daughters of mother M are indexed according to increasing onset interval. So if $i < j$, then daughter i is a portion played earlier than daughter j, and the quantity W^M_{ij} measures the influence of daughter i on daughter's j expressive shaping. This is a causal influence, while the other case, $i > j$ is a final influence: The earlier daughter is influenced by the later daughter. The case $i = j$ means autocorrelation of daughter i.

This variety of values W^M for sister acts is very large, so we decided to restrict the shape of such a matrix to a variety defined by four real parameters: $causalStart$, $causalEnd$, $finalStart$, $finalEnd$. There is still a large variety of shapes that can be given to these matrixes; see figure 25.3 for nine examples of such matrixes that we represent as 'flying carpets.' The causal extremum is to the left, and the final extremum is to the right of each carpet surface.

With this setup of the stemma, we have a large number of system variables: four for the flying carpet of every mother, and then all the operators' parameters. Therefore, the inverse problem in this context is that we first

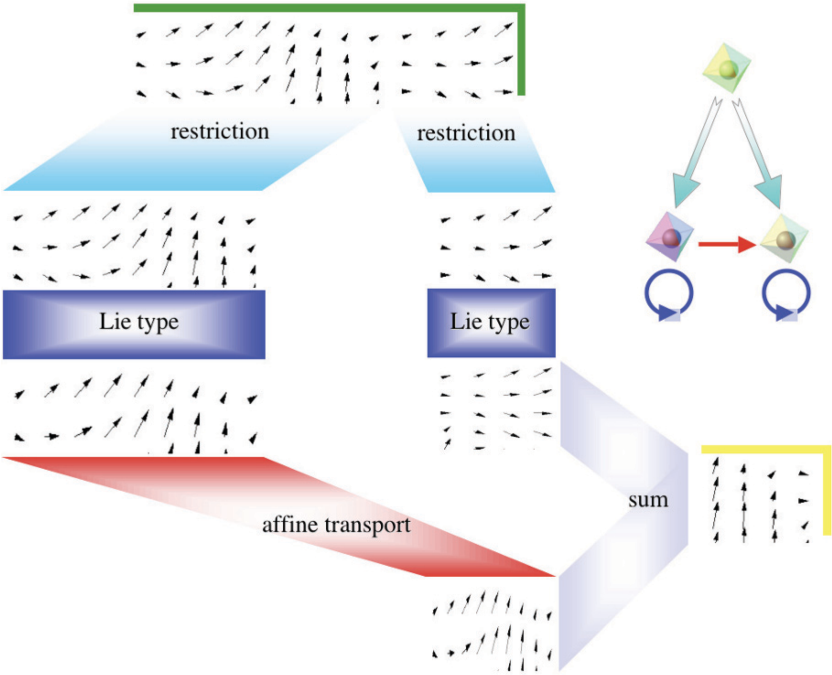

Fig. 25.2. The process of interaction between sister performance fields.

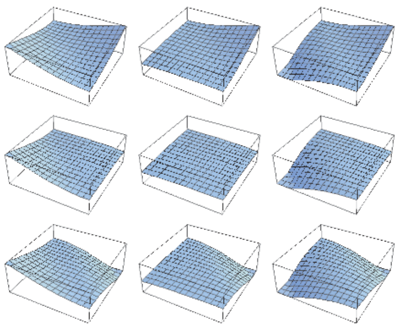

Fig. 25.3. Nine shapes of the interaction matrixes defined by four parameters, $causalStart, causalEnd, finalStart, finalEnd$.

have to choose one big stemmatic inheritance scheme with all its mothers and daughters as nodes. We then have to choose the Lie operators, together with their individual sets of weights in every node, and then we are ready to talk about numerical variables: the carpet parameters and the Lie operator parameters. Figure 25.4 shows the variety of interpretations generated by the present setup of stemmatic structures. For every output data, we have a fiber over

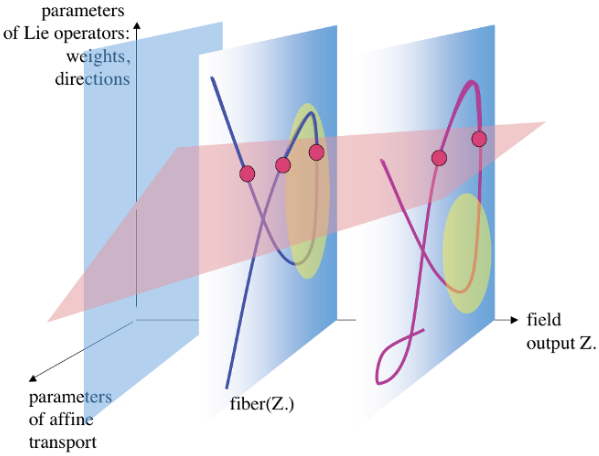

Fig. 25.4. The variety of parameters for given performances is shown in the space, which is spanned by the field output, the affine transport parameters, and the Lie operators' parameters with their weights. For every output data, we have a fiber over that data—this is drawn with a vertical blue plane, the parameters for that output being shown as a curve through the plane. The red surface represents the flying carpet-driven subvariety, with its relatively small number of points (in red) crossing the carpet-space and the fiber curve.

that data—this is drawn with a vertical blue plane, the parameters for that output being shown as a curve through the blue plane. The red surface represents the flying carpet-driven subvariety, with its relatively small number of points (in red) crossing the carpet-space and the fiber curve. Roberto Ferretti has shown [84, section 46.2] that generically these fibers are isomorphic, so it is necessary to restrict them to reasonably fine subvarieties in order to obtain characteristically different interpretative varieties.