9

Articulation

A bad word whispered will echo a hundred miles.
Chinese proverb

Articulation adds a completely different phenomenon to performance. While we had seen that a priori onset, pitch, and dynamics can be performed independently from each other, articulation introduces performance of duration as a situation where this new parameter is intrinsically connected to the other time parameter, namely onset. Let us first discuss performance of duration

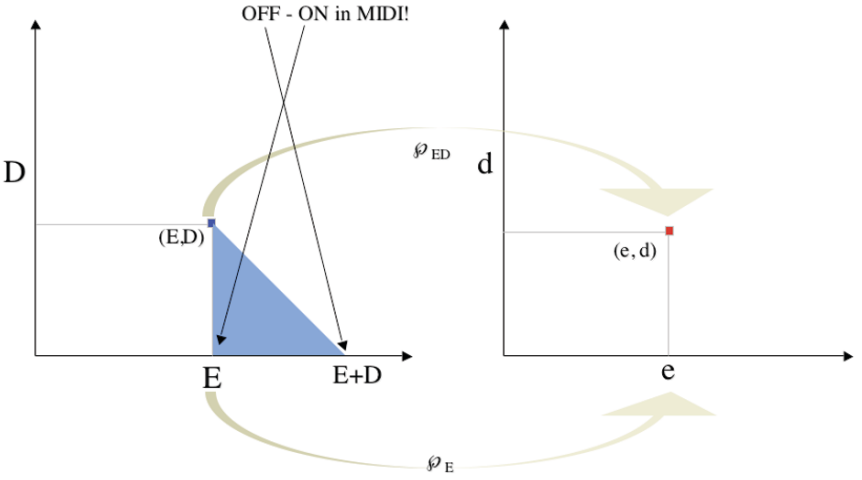

Fig. 9.1. Default performance of duration relates to performance of onset by reference to the offset time that results from adding duration to onset.

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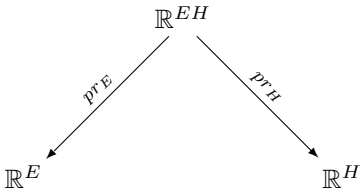
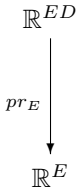
without any further shaping of articulation (figure 9.1).

This situation means that the ending of a note is determined by the beginning of the next note, or pause, which means that the offset of the note with onset E and symbolic duration D is the onset $E + D$. This information implies that the physical duration d of a note with these coordinates is $d(E, D) = e(E + D) - e(E)$ (this is known as "OFF - ON" in MIDI code).

Performance of duration is therefore intrinsically connected to performance of onset. Duration is, unlike pitch, dependent on onset performance, but not vice versa—onset is a more basic parameter than duration. The default situation with onset and pitch could be described by the two projections of EH space to E and to H space



whereas the situation with onset and duration would only have one projection of ED space to E space:



We shall make all this more precise later, but it is good to get an early idea of the hierarchy of spaces intervening in performance theory.

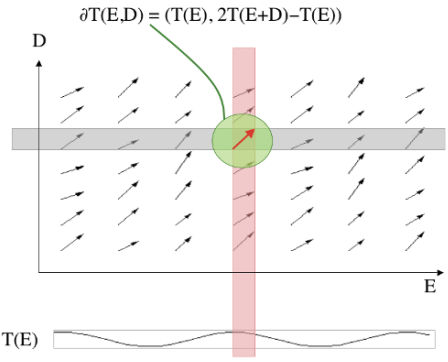


Fig. 9.2. The performance field of a default performance of onset and duration.

Now, let us calculate the performance field associated with the above performance map $\wp_{ED}(E, D) = (e(E), e(E + D) - e(E))$. The field is

$$\mathbf{Ts}(E, D) = (T(E), 2T(E+D)-T(E)),$$

and we see that its D component also depends on E, not only on D. Figure 9.2 shows this situation. The projection to onset (vertical bar) gives us the tempo field. The horizontal bar shows that the D component of the field is also a function of onset. This field is called *parallel field* and denoted by $\mathbf{Ts}(E, D) = \partial T(E, D)$ since its calculation works in parallel to the tempo curve.

So this elementary situation demonstrates that the assumption that every common field is a Cartesian product of one-dimensional fields is erroneous. The same phenomenon occurs when we calculate default performance fields for onset E and symbolic crescendo C (with associated physical crescendo c), which is a loudness change along the note much like D, but relating to L instead of E. Same with glissando G (with associated physical glissando g), which is a parallel to pitch H, and we therefore have parallel fields $\partial I(L, C)$ for crescendo and loudness, and $\partial S(H, G)$ for glissando and pitch.

To give an example of articulation, let us consider a tempo field where the default duration is multiplied by a factor $\lambda \neq 0$, i.e. $\wp_{ED}(E, D) = (e(E), \lambda(e(E + D) - e(E)))$, and such that the tempo has shape $T(E) = 1 + 0.4\sin(E)$. Then we have the articulation field

$$\begin{aligned} \mathbf{Ts}_\lambda(E, D) &= (T(E), (1 + \lambda^{-1})T(E + D) - T(E) \\ &= \partial T(E, D) + (\lambda^{-1} - 1)(0, T(E + D)) \end{aligned}$$

which is the default parallel field for $\lambda = 1$, and yields a legato field for $\lambda < 1$ and a staccato field for $\lambda > 1$ (figure 9.3).

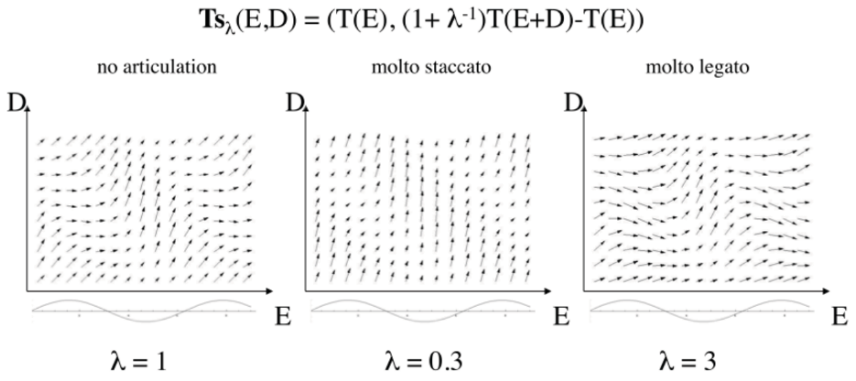


Fig. 9.3. An articulation field for a family of performances as a function of a system parameter λ.