Is OT NP-hard?

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Idsardi (2006) offers a streamlined proof of the thesis that the generation problem of OT is NP-hard, by encoding the Hamilton path selection problem of directed graphs in a set of ranked constraints that will generate optimal surface forms that correspond to Hamilton tours if these exist, and the empty parse if no Hamilton tour exists. To the extent that OT is not entirely cast in concrete as to what constraints it permits, it is very hard to obtain a full characterization of its complexity, and Idsardi takes pains to justify the linguistic nature of the constraints employed in his encoding scheme. His is a welcome attempt to shed light on this complex matter, but as we shall demonstrate here, it falls short precisely in justifying the constraints employed.

The problem is with what Idsardi calls *self-conjoined constraints* of the form $^*\alpha^2$, constraints that forbid the reuse of an element in a domain. Idsardi notes that constraints of this form are widely used in phonology – what he fails to note is that whenever such a constraint is used (Grassman's Law, Lyman's Law, etc) it is always over a bounded domain. On the whole, phonology countenances very few unbounded domains: the typical situation is when larger structures are built out of the basic building blocks via intermediate structures. We don't go from phonemes to words in a concatenative fashion: what we see is syllables (quite possibly with their own internal structure, but at any rate a very bounded and finitistic domain), feet, and perhaps cola as intermediary structures. To the extent unbounded structures (e.g. unbounded feet) are sanctioned, the only dissimilatory effects (self-conjunction constraints) that we see over these are restrictions pertaining to a finite (and very small!) inventory (nodes in the feature geometry) which is by definition incapable of encoding arbitrarily many distinct units.

But if we can't have an arbitrary size inventory, we can't encode an arbitrary size directed graph, and the whole machinery of complexity theory loses its grip – what we have is a finite class of size-limited problems. The informal motto of Koskenniemi and Church (1988) remains applicable: if it ain't broke, don't fix it.

References

William J. Idsardi (2006) A Simple Proof that Optimalityy Theory is Computationally Intractable. *Linguistic Inquiry* **37** 271-275

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