Sub-symbolism and Phonology

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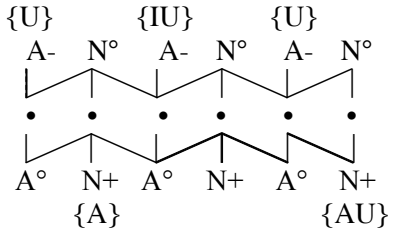
The aim of this presentation is to show how computational linguistics has influenced recent renewal in grammar-based phonology. Far from the strictly *implementational* or *eliminativist* models, SMOLENSKY [1999, 2009] proposes another vision of the relation between computational and grammar-based phonology : the purpose is to share the knowledge built from both domains and to converge toward a *sub-symbolic model* which establishes the link between "neural substrate" and symbolic computation.

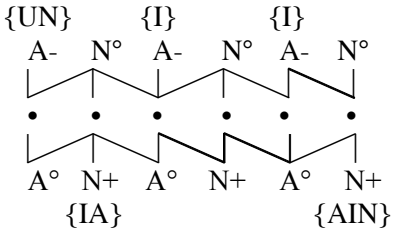
The idea has already been developed, in a similar way, in the work of LARSON G. [1992], GOLDSMITH J. & LARSON G. [1992] in their treatment of the *Sonority Sequencing Generalization*. DELL & ELMEDLAOUI's [1985] serial treatment of Imdlawn Tachelhit which is based on inherent sonority, as in CLEMENTS [2009], represents the *static* view of sonority which has been challenged by a *dynamic* view where sonority hierarchy and syllables emerges from the interactions of segments in a neural network (see [fig. 1] for the activation law of the network, and examples in Tachelhit [fig 2, 3] and english [fig. 4, 5]). We can consider that this treatment in turns gave rise to GOLDSMITH [1993] which seems deeply rooted in both autosegmental phonology and the advances in connexionnism.

Recent phonological researches [BRANDÃO DE CARVALHO : 2005, 2008] seem to take a step further in the direction of *mutual information*. We can consider, following Klein [1993], that subsymbolic models can feed symbolic approaches. In a metaphorical way, cells in a linear network can be considered as squeletal positions, i.e. timing slots, and relations of excitation and inhibition between cells, for they are relations between positions, may be considered as *contours*. In the following examples in french, proximal and distant relationships, the contours, between *C-positions* and *V-positions* control the expression of laryngeal features. Hence consonants (de)voicing is not part of contoïds representation but is derived form nuclei activation.

fr. *pa*[kəb]*o* "liner"



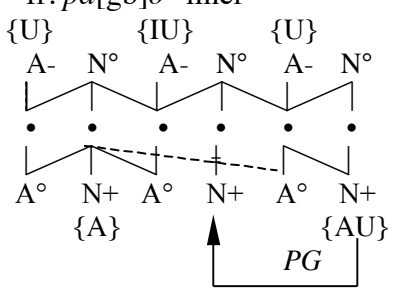
fr. *mé*[dəs]*in* "doctor"



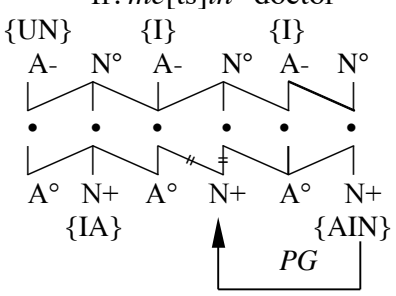
Elements
C-positions
Squeleton
V-positions
Elements

French schwa loss can be seen as an effect of PG (*Proper Government*) which inhibits the expression of schwas provoking voicing or devoicing of obstruents. As a consequence if we consider C/V segregation, we must establish, in the activation law, a third relation which intervenes between N+ positions, depending on their strength/transition weight, where cell k_n influences cell k_{n-2} on the N+ tier.

fr. *pa*[gb]*o* "liner"



fr. *mé*[ts]*in* "doctor"



Elements
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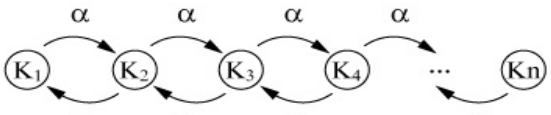

fig. 1

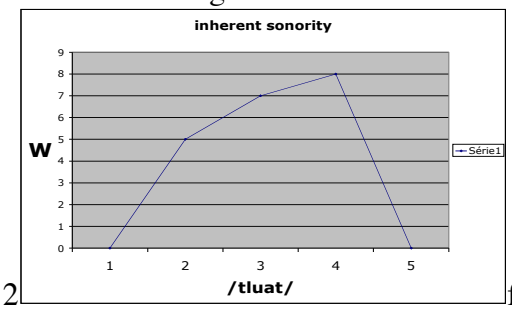

fig. 2

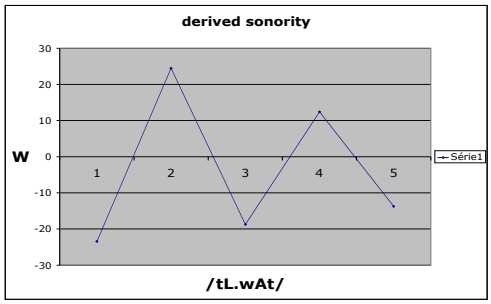

fig.3

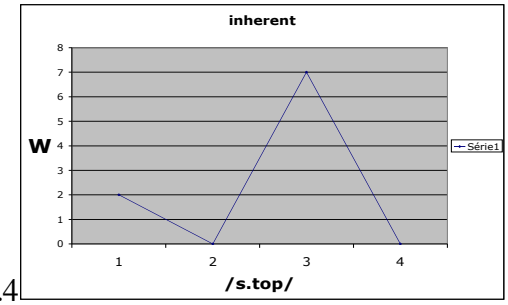

fig.4

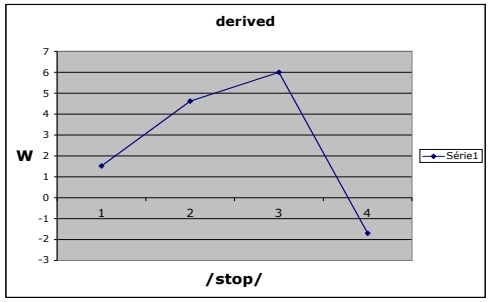

fig.5

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