Linear and non-linear *f*0 modelling techniques for tonal target location

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In acoustic work on tonal alignment, tonal targets are often defined as visible *f*0 minima and maxima within the *f*0 contour. However, such targets might be difficult to detect either because they are masked by segmental perturbations or because they are not realized as sharp *f*0 turning points (ie, in plateau configurations). Automatic procedures of *f*0 modelling, both non-linear such as MOMEL (Hirst&Espesser, 1993; Hirst *et al.*, 2000) or linear such as the least-square fitting (LSF) algorithm (D'Imperio, 2000, *inter alia*) have been recently employed in order to extract tonal target information in a more objective and consistent way than human labelling.

In this work, we question the validity of some specific automatic algorithms for tonal target localization by concentrating on data from Neapolitan Italian. In Neapolitan, intonation has a pragmatic value, so that LH nuclear rises are later in questions (L*+H) than in statements (L+H*). We first hypothesized that when a consonantal perturbation is present in the region for the L, LSF is more prone to error than MOMEL, since it is more sensitive to microprosodic variability. Moreover, when tonal targets are not realized as well-defined *f*0 peaks or valleys, the use of non-linear techniques (such as the logistic regression) might help to shed light on the phonological representation of the *f*0 contour.

A corpus of read speech was collected, in which paroxytones proper names contrasting for consonantal identity of the accented syllable onset (*Nina* vs. *Rina vs. Dina*) were embedded in the carrier sentence: "La mamma vuole vedere la X (*The mother wants to see (the) X*)". The sentences were read by three Neapolitan speakers as either yes/no questions or narrow focus statements, with a nuclear accent on the target word and a prenuclear (L)H* on *La mamma*.

For both MOMEL and LSF, the automatic location of the L nuclear target was independent of the identity of the onset consonant of the target word. However, when the LSF was fitted through the region from the onset of the host prosodic word to the H nuclear target (Petrone&Ladd, 2007), this resulted in a better fitting of the *f*0 curve than MOMEL.

An additional issue concerns a subtle difference in the slope and shape of the *f*0 region immediately following the prenuclear accent, which is noticeable between statements and questions. Specifically, while in questions the *f*0 assumes a concave shape at the boundary between the first ([la ˈ mamma]) and the second ([ˈ vuole]) prosodic word (see Fig. 1, left), in statements the *f*0 falls linearly from the prenuclear H peak to the region around the end of the host prosodic word (Fig. 1, right).

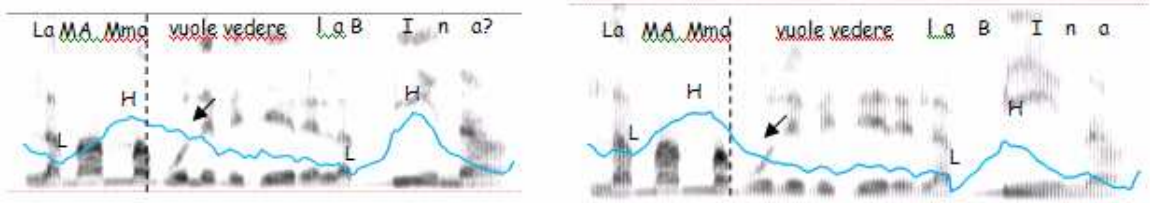

Figure 1: F_0 contour of a yes/no question (left) and late narrow focus statement (right) for the utterance *La mamma vuole vedere la Bina* "The mother wants to see (the) Bina". The dotted line marks the end of the first prosodic word. The region following the prenuclear rise is indicated by the black arrow.

Results from both logistic and linear piecewise regression modelling suggest the presence of a tonal target marking the end of the prosodic word, which would be differently specified in statements (L_A) and questions (H_A). This tonal difference might enhance the phonological contrast, hence improving identification of questions vs. statements, for which no morphosyntactic differences are generally exploited and whose main cue is the different alignment of the nuclear accent.

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