

Connected speech in Romanian: A window into the evolution of a sound system

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Laboratory phonology has gradually re-shaped our understanding of phonology, pushing us beyond the study of categorical alternations, to the task of observing and interpreting patterns in variation. In this respect, the importance of speech corpora for phonological research is uncontested (Ernestus & Baayen 2011; Cole & Hasegawa-Johnson 2012, and references therein). While certain types of variation can be elicited in the laboratory (Warner 2012), the pool of variation present in our natural communicative environment is much richer than what can be obtained in a controlled setting. If this richness is considered in its full extent it can reveal new and important facts about phonological processes. Reduction processes, for example, are affected by language-specific factors, and by different speech situations. Reduction may be due to coarticulation, or to higher order selection of reduced variants (Ernestus et al., 2015). Both are relevant for phonological processing, since coarticulation patterns can be language-specific (Manuel 1999).

My talk is set within the same context. I examine some reduction processes in Romanian, as they occur in three types of speech: semi-prepared speech from radio broadcast news and more casual spontaneous speech from radio debates (together forming Corpus 1 – Vasilescu et al., 2014; Vasilescu et al., 2015), and casual elicited conversations (Corpus 2 – Niculescu, forthcoming). One example of phenomena that my colleagues and I have studied is the variable deletion of the enclitic masculine definite article *-(u)l* (Chitoran et al., 2014; Vasilescu et al., 2014): *omul* ‘the man’ is realized as either [omul] or [omu]. Impressionistically, [l] deletion is very frequent in a casual, conversational style of speech. In these studies, an ASR system was used as a tool to detect instances of inter- and intra-speaker variation. ASR systems have been successfully used as a tool to locate and systematically explore variation in large annotated corpora (Adda-Decker & Lamel, 1999; Adda-Decker 2006; Vasilescu et al., 2012). In an ASR system, the training process of the acoustic model generates segmentations into words and on a subword level, into phone segments. The phonemic labeling resulting from the segmentation process depends on the acoustic model configuration, and on the pronunciation variants included in the dictionary. For the definite article two transcription variants were provided: *-ul* and *-u*. When the speech input does not match the transcription because it is not canonically pronounced, errors are generated. These errors are of interest for linguistic studies because they allow us to locate the contexts in which variation occurs, to investigate the acoustic manifestation of the variants, and to identify emerging patterns that are linguistically relevant.

We applied this analysis method based on forced alignment to 3.5 hours of Corpus 1. We compared the findings to those obtained by the manual investigation of the same amount of casual conversational data in Corpus 2. In Corpus 1, the system was able to robustly detect the final [l] whenever it was realized with a strong release burst, but rarely detected it when it was realized with approximant-like formant structure, as well as when it was absent according to our visual spectrographic analysis. That is, the ASR system marked as deleted instances where there was no evidence of [l] in the acoustic signal, as well as instances when it was unreleased.

Two main differences were found between Corpus 1 and Corpus 2:

- the absence of the article (undetected by human visual/auditory analysis) is 2.5 times more frequent in the very casual Corpus 2 (81%) than in the broadcast data of Corpus 1 (27%), where it is undetected by the ASR system and human analysis. This shows that the absence of the article is affected by the degree of formality of the speech situation – the more casual the speech, the more likely the absence of *-l*.
- the absence of the article is context-sensitive in the more formal style in Corpus 1, but not in the very casual, spontaneous speech in Corpus 2. In Corpus 1, the article is missing more often before a following consonant-initial word (30%) than before a vowel-initial word (13%). In

Corpus 2, the rate of absence of the article is the same (80%) in both consonantal and vocalic contexts.

Taken together, the two results clarify the nature of the variation encountered in the realization of the definite article. Its production ranges from a full consonantal realization to what can be considered a weakened vocalic variant, to full reduction. The fact that the absence of *-l* is context-dependent in the more formal speech but not in the casual style, has important implications for phonological and psycholinguistic models. The tendency to eliminate the article has been interpreted as a weakening of its morphological marking of definiteness, which is shifted instead to the preceding [u], historically a desinence vowel (Avram 2009 [1959]; Chitoran 2001; Chivu et al., 2012). The investigation of large corpora allows us to observe patterns of variation that, in turn, can inform in a unique way our understanding of what is linguistically planned, produced, and perceived.

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