Voicing profile of Polish and German sonorants in obstruent clusters

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Our study aims at defining and analyzing voicing profiles of Polish and German sonorants. We look particularly closely at voicing profiles of rhotics (Polish [r] and German [R]) in obstruent clusters. Thanks to the use of digital phonetic tools (IMS German Festival synthesis system) which extract voicing profiles as a frame-by-frame basis in continuous speech, we were able to study all phonotactically possible contexts of sonorants available in our speech corpora. In the first step we used ESPS get_F0 tool to obtain frame by frame voicing probabilities at a sampling rate of 100 frames per second. After that get_F0 used an autocorrelation technique to calculate voicing probability. The value of those probabilities is always categorical (0 or 1). For each segment we extracted the following features: consonant type, place of articulation, voicing structure of the segment, its preceding and following phone, word position, syllable structure, position in the syllable and voicing profile by extracting the voicing probability at 10%, 20%.... 90% of its duration.

Our investigations conducted on Polish and German have shown that in both cases left-phoneme context is crucial in determining voicing probability of following sonorant. As predicted by Gussmann (1992, 2007) Polish [r] devoices word-finally and thus its voicing probability is dependent on syllable structure (its desyllabification), because sonorants cannot be incorporated into a syllable structure that violates the Sonority Sequencing Principle. This structural factor seems to influence voicing profile of Polish [r] more than its position in phonological string (Rubach, 1996, 2008) as the word and syllable-initial sonorant [r] with the same left-voiceless stop context demonstrated devoicing due to its licensing for voicing through its syllabification, in much smaller degree as its word and syllable-final counterpart. Studies concerning German sonorants n(Möbius, 2004) show that sonorants remain fully voiced with left sonorant and vocalic context through almost all their duration, while they tend to undergo devoicing when preceded by voiceless obstruent. The strength of devoicing, of which the strongest neffect is observed for [R], has been said to depend on the presence or absence of syllable boundary between sonorant and the voiceless obstruent preceding it.

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