

SOCIOPHONETIC RESEARCH AT THE UNIVERSITY OF NEW BRUNSWICK

Wladyslaw Cichocki *

Department of French, University of New Brunswick
PO Box 4400, Fredericton, New Brunswick, Canada E3B 5A3

Résumé

Dans notre laboratoire, nos intérêts de recherche se trouvent au carrefour de la sociolinguistique et de la phonétique. Nous utilisons les techniques de la phonétique acoustique dans l'analyse de la variation régionale, sociale et stylistique dans les variétés de français acadien parlées au Nouveau-Brunswick. Parmi les traits segmentaux analysés figurent la consonne /r/ et l'affrication de /t, d/ ; l'analyse des traits prosodiques comprend entre autres l'application des métriques rythmiques aux unités prosodiques telles que la phrase accentuelle.

Mots-clés : changement et variation linguistique, français acadien, phonétique acoustique

Abstract

Research in our laboratory is situated at the interface of sociolinguistics and phonetics. Acoustic phonetic techniques are used to analyze regional, social and stylistic variation in the varieties of Acadian French spoken in New Brunswick. Studies analyze segmental features such as the consonant /r/ and the affrication of /t, d/; the study of prosodic features includes the application of rhythm metrics to prosodic units such as the accentual phrase.

Keywords: Acadian French, acoustic phonetics, language variation and change

1 Introduction

The field of sociophonetics lies at the interface of sociolinguistics and phonetics. Broadly speaking, researchers in this area study variation in the sound system of one or more languages with a view to understand how social factors – such as age, gender, social class, social networks – structure this variation. The research spans both speech production and perception. A central theme is the study of the origin and spread of change in sound systems. Acoustics provides several instrumental techniques that are used for this study. Indeed, the fine-grained details revealed by acoustic techniques have contributed significantly to the development of this field.

2 Laboratory Setting

Work in our laboratory at the University of New Brunswick in Fredericton, NB, focuses on variation and change in Acadian French. Spoken predominantly in Canada's Atlantic region, this dialect is distinct from Laurentian French, which is found in Québec, Ontario and provinces and territories to the west and north. Our interest is in regional (geographic), social and stylistic variation in this dialect.

We currently work with two databases. The RACAD (*Reconnaissance automatique de l'acadien*) corpus is a recorded set of readings by 140 speakers from the five main francophone regions of New Brunswick [1]. Based on the

TIMIT corpus of American English, the RACAD corpus was designed for the development of automatic speech recognition systems. Of special interest to linguists are the two "calibration sentences", which include words that are expected to show significant regional differences in pronunciation. Three extralinguistic sources of variation can be studied: region, age and gender.

The other database that we work with is a set of sociolinguistic interviews conducted according to the protocol of the PFC (*Phonologie du français contemporain*) project (www.projet-pfc.net). Participants in this database are twelve native speakers of Acadian French from Tracadie, a small town in northeastern New Brunswick [2]. The three main extralinguistic factors of interest are age, gender and style (including reading, spontaneous conversation and semi-directed interview styles). It is worth noting that this project has an international context; PFC is a collaborative research program that brings together researchers from many countries who analyze French spoken in different parts of the French-speaking world and who often use these data to inform phonological theory.

Acoustic analyses – which include spectrographic and oscillographic analyses, formant analysis, F0 tracking, duration and intensity measurement – are carried out with *Praat* software (www.fon.hum.uva.nl/praat/).

The students who participate in our research projects are usually undergraduates. They study acoustic phonetics in an introductory level course in phonetics, offered in third year, and in specialized seminars, offered in fourth year.

* cicho@unb.ca

3 Recent Research

Our research focuses on identifying sources of systematic variation in speech production at both segmental (that is, vocalic and consonantal) and prosodic (or suprasegmental) levels.

3.1 Segmental variation

The /r/ consonant Spectrographic analyses of RACAD data show that this consonant is pronounced both as an alveolar trill, [r], (in the front of the mouth) and as a velar or uvular fricative or trill, [R], (in the back of the mouth). Effects of age on this variation suggest that there is an ongoing change from [r] to [R]; that is, younger speakers use the (back) [R] variant more often than older speakers. Furthermore, northern regions have a greater frequency of the innovative variant [3]. An interesting finding is that this change appears to be limited to syllable-onset positions in a word, as in [frã.se] "Français" and [ka.ra.kɛt] "Caraquet".

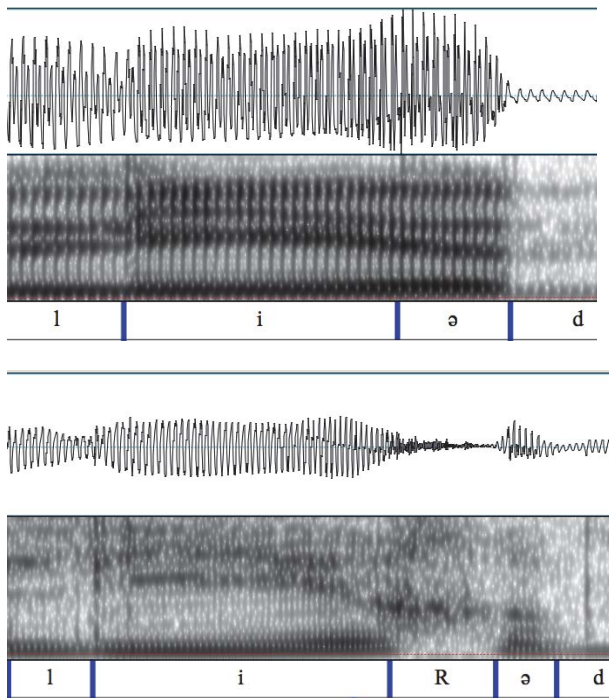


Figure 1: Oscillographic traces and spectrograms of "lire d(ans)". Upper figure show an off-glide pronunciation of the /r/ consonant; that is, "lire" is pronounced [liə] (spoken by a 44-year-old male from Moncton/Dieppe in southern New Brunswick). Lower figure shows a fricative pronunciation of /r/ in the back of the mouth; that is, "lire" is pronounced [liRə] (spoken by a 20-year-old female from Edmundston in northern New Brunswick).

In postvocalic syllable-final position, the articulatory realization of the /r/ consonant seldom resembles a consonantal constriction such as [r] or [R]. Instead, speakers produce vowel-like pronunciations, as in [liə, liɛ] "lire", a process called r-vocalization. See Figure 1 for a comparison of these vocalic and consonantal pronunciations. To

determine the precise nature of the vocalic pronunciations (called off-glides), we are examining vowel formant trajectories from the start of the vowel to the end of the word. Dr Paul De Decker, a visiting scholar at our laboratory from the Memorial University of Newfoundland, is collaborating on this research question.

Affrication of /t, d/ The affrication of the /t/ and /d/ consonants before certain vowels and glides is one of the most distinguishing features of Laurentian French. These affricate consonants are generally alveolar [ts, dz], as in [pø.tsit] "petite" and [a.ka.dzi] "Acadie". Until recently, this affrication was absent from most varieties of Acadian French; speakers said [pø.tit] and [a.ka.di], with a [t, d] stop. Figure 2 illustrates both the [ts] affricate and the [t] stop pronunciations of the first /t/ in "petite".

Based on our work with the RACAD data, age effects show that younger speakers have greater frequencies of the affrication feature than do older speakers, leading to the inference that this is an ongoing sound change [4]. Region effects suggest that speakers from northern New Brunswick are the leaders in this change.

However, in certain words the place of articulation of the affricate is sometimes palatal and not alveolar, as in [vã.dzy] "vendu" instead of [vã.dzy]. Because it is not always possible to hear the difference between these two pronunciations, we use acoustic analyses – spectral cuts and measures of centre of gravity – of the fricative section of the affricate to determine which variant a speaker is producing. The palatal pronunciation is an innovation that is found mainly in southern regions of New Brunswick.

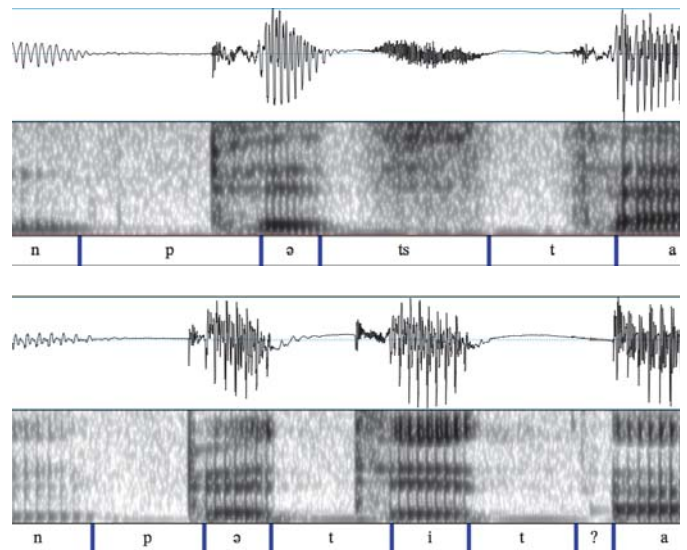


Figure 2: Oscillographic traces and spectrograms of "(une) petite a(ge)nce". Upper figure shows a [ts] affricate pronunciation of the first /t/ in "petite". Note that the speaker has deleted the /i/ vowel that follows this /t/; that is, "petite" is pronounced [pøtst] (spoken by a 24-year-old female from Shippagan in northern New Brunswick). Lower figure shows a [t] stop pronunciation of the /t/ consonant; that is, "petite" is pronounced [pøtit] (spoken by a 25-year-old male from Paquetville in northern New Brunswick).

3.2 Prosodic variation

Timing of segmental intervals Our recent research on prosodic features has been looking at rhythm and, more specifically, at speech timing. We apply rhythm metrics to measure variability in the durations of vocalic and consonantal intervals. Results for the RACAD data show that there are significant timing differences between northern and southern varieties in New Brunswick: northern varieties have greater variability in both vocalic and consonantal interval durations [5]. Also, the %V metric, which measures the percentage of the speech in an utterance that is vocalic, shows higher values among southern speakers than among those from northern regions. Ongoing research is examining how processes such as r-vocalization and the affrication of /t, d/ contribute to this durational variability.

Timing of accentual phrases We have also applied rhythm metrics to study the timing of prosodic units that are larger than segments, such as syllables and accentual phrases. The accentual phrase, also called a rhythmic group, is a sequence of syllables that is demarcated by a stress. Analyses of the PFC-Tracadie data show important stylistic differences in the timing of these units: spontaneous speech style has greater variability in accentual phrase duration than reading style [6]. In our current research we are examining the makeup of the accentual phrase [7]. Figure 3 illustrates the segmentation of part of one of the sentences in the RACAD corpus into segments, syllables and accentual phrases.

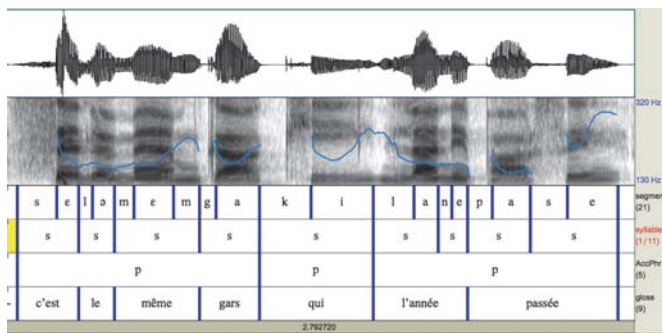


Figure 3: Oscillographic trace, spectrogram and F0 curve of "C'est le même gars qui l'année passée ...". The four tiers below the acoustic analyses indicate: segments, syllables, accentual phrases and word glosses. (spoken by a 55-year-old female from Moncton/Dieppe in southern New Brunswick).

4 Other Applications

Our initial research on rhythm metrics was developed with Dr Sid-Ahmed Selouani and colleagues at the Shippagan, NB, campus of the Université de Moncton. In the context of this collaboration, we applied rhythm metrics to automatic speech recognition systems that are being developed to distinguish between groups of speakers. This work has

focused primarily on the speech of native and non-native speakers of Arabic [8].

Finally, many of our students speak French as a second or third language, and some of them are interested in analyzing their own pronunciation in French. As a result, in their class research projects these students choose to carry out acoustic analyses that compare their pronunciations with those of the native French speakers in our databases. In this sense, work with acoustic phonetic techniques and with large speech databases serves as a language-learning tool.

References

- [1] Cichocki, W., Selouani, S.-A. & Beaulieu, L. (2008). The RACAD speech corpus of New Brunswick Acadian French: Design and applications. *Canadian Acoustics* 36: 3-10.
- [2] Cichocki, W. (2014). The PFC-Tracadie Corpus: A variety of Acadian French spoken in northeastern New Brunswick (Canada). In Barysevich, A., D'Arcy, A. & Heap, D. (eds) *Proceedings of Methods XIV. Papers from the 14th International Conference on Methods in Dialectology*, Bern, Peter Lang, 149-157.
- [3] Cichocki, W. & Perreault, Y. (to appear). Contribution à l'étude phonétique et géolinguistique du R en français parlé au Nouveau-Brunswick. In Hallion, S. & Rosen, N. (eds) *Actes du colloque «Les français d'ici»*. Québec: Presses de l'Université Laval.
- [4] Cichocki, W. & Perreault, Y. (to appear). L'assibilation des occlusives /t/ et /d/ en français parlé au Nouveau-Brunswick : nouveau regard sur la question. In Arrighi, L. & Gauvin, K. (eds) *Les français d'ici : Regards croisés*. Québec: Presses de l'Université Laval.
- [5] Cichocki, W., Selouani, S.-A., Ayed, A.B., Paulin, C. & Perreault, Y. (2013). Variation of rhythm metrics in regional varieties of Acadian French. *Proceedings of Meetings on Acoustics* 19, 035082. [DOI: 10.1121/1.4800686].
- [6] Cichocki, W. (2015). The timing of Accentual Phrases in read and spontaneous speech: Data from Acadian French. *Canadian Acoustics* 43(3): 109-110.
- [7] Cichocki, W. (to appear). Profil temporel du groupe rythmique en français acadien : variabilité stylistique. *Repères DoRiF*.
- [8] Selouani, S.-A., Alotaibi, Y., Cichocki, W., Gharssallaoui, S. & Kadi, K. (2015). Native and non-native class discrimination using speech rhythm- and auditory-based cues. *Computer Speech and Language* 31: 28-48.