

Evidence from Egyptian Arabic for the role of the foot in intonational phonology

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aim

- to explore two notions of the foot in use in the intonational phonology literature
 - in the light of evidence from the intonational phonology of Egyptian Arabic

claim:

- there is a role for the 'metrical foot' (Hayes 1995) in EA intonational phonology
 - it is the most parsimonious way to capture the domain of peak alignment in EA pre-nuclear pitch accents (Hellmuth 2007)
- hence reassessment of the role of the 'accentual foot' (Abercrombie 1967)
 - practical question: what is the correct domain within which local variation in the F₀ contour should be taken into account, during development of a phonological analysis of intonation?

outline

- two kinds of feet:
 - the (fairly limited) role of the metrical foot in Autosegmental-Metrical Theory
 - the role of the accentual foot (in the IViE intonation transcription system)
- do we need both in EA?
 - evidence for the moraic trochee as the domain of peak alignment in pre-nuclear pitch accents
 - is there an alternative to the accentual foot as the domain which defines the distribution of pitch accents in EA? (yes)
- can we dispense with the accentual foot in analysis of EA intonation? (yes/no)



Egyptian Arabic (EA)

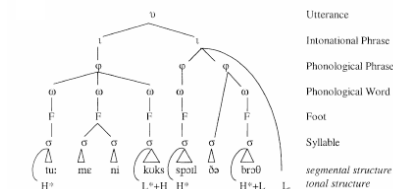
- the dialect of Arabic spoken in Cairo
 - and by educated people elsewhere in Egypt
 - data shown here were collected in Cairo
- EA phonology & syntax are well-described
 - basic word order: SVO Benmamoun 2000
 - metrical stress: head of rightmost moraic trochee Hayes 1995
- EA is a 'stress-accent' language
 - use of pitch is postlexical, conveys postlexical information
 - pitch movements are associated with stressed syllables

theoretical framework

(Ladd 1996)

Autosegmental-Metrical theory - intonation analysed as:

- a sequence of pitch targets
 - H or L (or bitonal combinations thereof)
- autosegmentally associated with prosodic structure
 - aka metrical structure: syllables, feet, words, phrases...

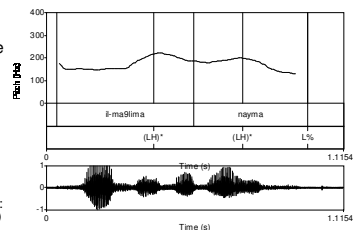


Gussenhoven 2002



Egyptian Arabic in AM theory..

- in this two-word utterance:
- both words have lexical stress on the penult syllable: [maʕlɪma] [naʕjma]
 - both stressed syllables additionally show a pitch movement: = a "pitch accent"



Autosegmental-Metrical framework: (Ladd 1996)

- H high target
- L low target
- * pitch accent
- % boundary tone

[maʕlɪma] the-landlady f. [naʕjma] sleeping
 "The boss (f) is asleep."

the 'metrical' foot

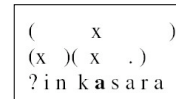
EA stress assignment:

a.	a final 'superheavy' syllable (CVCC or CVVC) is stressed	darab t ʔaʕma <b:l< b=""></b:l<>
b.	a penultimate heavy syllable (CVV or CVC) is stressed	katab ta kita rba
c.	if both final and antepenult are light syllables then either the penult or the antepenult is stressed, whichever is an even number of syllables from the first heavy syllable in the word or, if there are no heavy syllables in the word, from the beginning of the word.	mak ta ba kataba
d.	In disyllables the penult is stressed unless the final syllable is 'superheavy'.	raʔa: q a ʕat

the 'metrical' foot

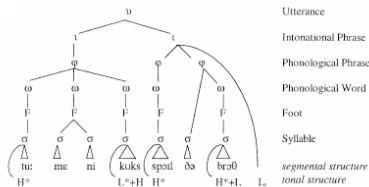
EA stress assignment (Hayes 1995, Metrical Stress Theory)

- moraic trochees built left to right
- word level End Rule Right
- consonant extrametricality
 - absolute ban on degenerate feet



the 'metrical' foot

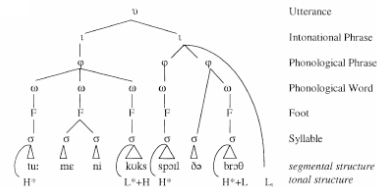
- beyond designation of which syllable is assigned primary prominence at the word level..
- ..limited role for the metrical foot in Autosegmental-Metrical theory



the 'metrical' foot

Pierrehumbert & Beckman (1988):

- association is 'central', to the head of the TBU
- "English permits at most one pitch accent per metrical foot" (ibid.)



the 'accentual' foot

- a domain containing an accented syllable plus all following unaccented syllables up to the next accented syllable (Abercrombie 1967)
 - used in intonational analysis of Egyptian pronunciation of Modern Standard Arabic (Rastegar-EIzarka 1997)
- used to define the "Implementation Domain" in the Intonational Variation in English (IViE) transcription system (Grabe et al 2001)
 - and parallel Intonational Variation Transcription System (IVTS) used for French (Post & Delais-Roussarie 2006)
- for transcription of local variations in the f0 contour for mapping to phonological categories on a separate tier

the 'accentual' foot

comparing intonational annotation systems:

- Tones and Break Indices (ToBI) (Beckman & Elam 1993)
 - phonological pitch targets ('tones') are labelled on a tier separate from other aspects of the transcription
 - "the tone and break index tiers represent the core prosodic analysis"
- The Intonational Variation in English (IViE) (Grabe et al 2001)
 - addition of a tier for the labelling of 'acoustic-phonetic structure'
 - "shape and alignment of f0 patterns relative to the location of (accented) strong syllables"
 - invaluable in the development of a phonological analysis
 - are these f0 shapes all instances of a single category (or not)?

the 'accentual' foot

Implementation Domain for English:

preaccentual syllable + accented syllable + following syllables up to next accented syllable

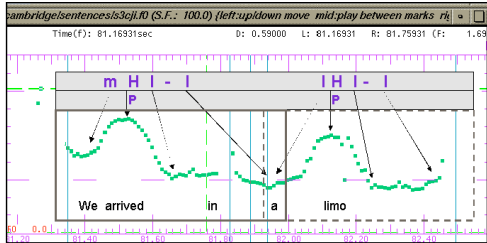


Image from: Grabe, Esther. 2001. The IVIE Labelling Guide. (Version 3.0). University of Cambridge. [p6.]

the 'accentual' foot

Implementation Domain for French:

postaccentual syllable + accented syllable + preceding syllables since last accented syllable

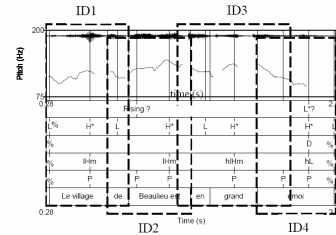


Image from: Post, Breejke & Elisabeth Delais-Roussarie. 2006. Transcribing intonational variation at different levels of analysis. In Hoffmann, F. & H. Mixdorff (eds.) Proceedings of Speech Prosody 2006. Dresden: TUD Press. Verlag der Wissenschaften GmbH. [p6.]

the 'accentual' foot

- so there is a cross-linguistic difference in the headedness of the accentual foot
 - left-headed (English) vs. right-headed (French)
 - “how an ID is defined in a specific language depends on the principles that govern the mapping between tonal events and segmental structure.” (Post & Delais-Roussarie (2006:2))
- the ID is a useful tool in the development of an intonational analysis
 - how do you determine the headedness of the foot in any particular language?

do we need both types of feet in intonational phonology?

evidence from EA:

- metrical foot > yes:
 - the moraic trochee is the domain of peak alignment in pre-nuclear pitch accents
- accentual foot > not needed?
 - there is an alternative domain which defines the distribution of pitch accents.. (the PWd)

the metrical foot in EA intonation

recent research on interpretation of tonal alignment properties of pre-nuclear (non-final) pitch accents?

- and of rising (LH) pre-nuclear accents in particular

- each of the tonal targets is 'segmentally anchored' to landmarks in the segmental string Arvaniti et al 1998
- syllable-initial L tone more stable than syllable-final H tone due to articulatory constraints Prieto & Torreira 2006
- intonational pitch accents are gestures associated with some tonal domain (stressed syllable, foot, word) Ladd 2006

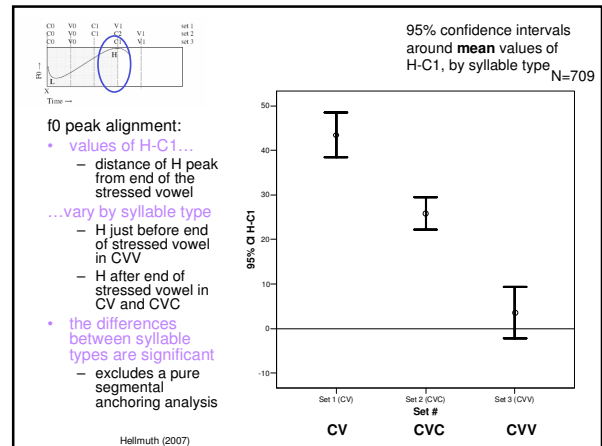
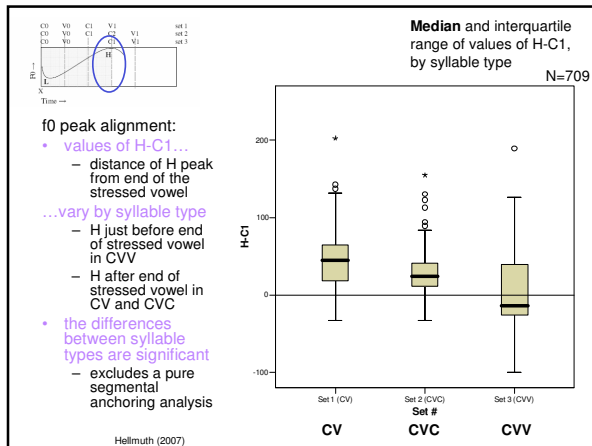
the metrical foot in EA intonation

EA intonation & stress:

- most common pre-nuclear pitch accent is rising Norlin 1989, Rifaat 1991
 - peak situated 'at or near the end of the stressed syllable'
- EA stress is assigned by means of **bimoraic trochaic feet** Hayes 1995 thus a stressed syllable may be either
 - a heavy closed **CVC** syllable
 - a heavy open **CVV** syllable
 - a light open **CV** syllable (CV.CV)

test for the domain of tonal alignment in EA > compare syllable types:

- if the **syllable** is the domain of tonal alignment
 - peak alignment will be the **same** in all three syllable types
- if the **foot** is the domain of tonal alignment
 - peak alignment will be **later** in light syllables (CV) than in heavy syllables (OVV and CVC)



the metrical foot in EA intonation

schematic summary across syllable types in EA:

CV	L		H			
	m	a	l	i	k	
CVC	L		H			
	m	a	n	g	a	
CVC	L		H			
	m	a	:	l	i	k
			μ	μ		

- alignment of H peaks inside the intervocalic consonant in CV.CV feet suggests that the tonal domain of the pitch accent gesture is the metrical foot (moraic trochee)
 - cf. patterns observed in Dutch (Ladd et al 2000)

the accentual foot in EA intonation

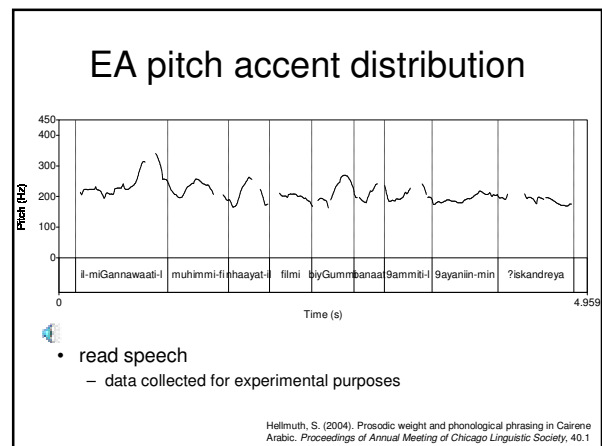
- is there an alternative to the accentual foot as the domain which defines the distribution of pitch accents in EA?
- in EA the culminative domain within which accents are distributed is the PWd (Hellmuth 2007b)
 - a domain in metrical structure

EA pitch accent distribution

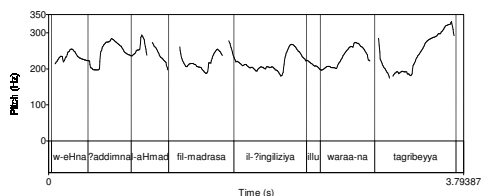
- over 95% of content words in EA are accented
 - borderline cases were counted as unaccented, so these counts represent the most conservative estimate, under the null hypothesis that EA accents every content word

	# content words	# unaccented content words	% accented content words
read narratives	1055	31	96.8%
re-told narratives	686	29	95.7%
Total:	1741	60	96.6%

Hellmuth, Sam. 2007b. The relationship between prosodic structure and pitch accent distribution: evidence from Egyptian Arabic. *The Linguistic Review*, 24(2), 289-314.



EA pitch accent distribution



- spontaneous speech
 - LDC Call Home corpus speech sample - telephone calls

CallHome Egyptian Arabic Speech Supplement LDC2002S37

EA pitch accent distribution

unaccented words in EA are not PWds:

- vowels in unaccented function words undergo Unstressed Vowel Shortening (USVS) Watson 2002
 - /'yajir/ 'except' > [yir] when unaccented
 - /'kan/ 'he was' > [ken] when unaccented
 - with raising of mid-vowels
- the culminative domain within which accents are distributed can be equated straightforwardly to a domain in metrical structure, namely the PWd
 - in EA if we forego assumption that feet are necessarily demarcative, headed at one edge, then we can dispense with the accentual foot and recognise the PWd instead

do we need both types of feet in intonational phonology?

- metrical foot = domain of alignment of the pre-nuclear tonal gesture
- accentual foot = an interaccentual interval
 - it is not an element of phonological structure relevant to tonal structure (as conceived in AM theory)
- nonetheless the accentual foot notion (in the form of the ID) has proved invaluable in the establishment of phonological categories
 - what is the right domain to use as ID (in EA)?

practical implications

- define ID as the domain within which accents are distributed in a particular language?
 - for EA = PWd
 - it becomes important to establish what this domain is, early on in the work of intonational description
- a non-language-specific definition of the ID
 - e.g. label tonal turning points + long plateaux in the RaP transcription system (Dilley & Brown 2005)
 - NB it is unwieldy to annotate all unaccented syllables either side of every peak (= overlapping domains)
- continue to use the accentual foot
 - how do we decide a priori whether the accentual foot is left- or right-headed in a particular language?

practical implications

staying with the accentual foot as ID:

- how do we decide a priori whether the accentual foot is left- or right-headed in a particular language?
- in EA I would want to say that it is left-headed
 - the shape of the f0 contour before the peak is stable whereas the shape after the peak is variable
 - varies with prosodic context: distance to next interval, presence vs. absence of a prosodic boundary etc
 - I don't assume that pitch accents are necessarily left-headed (which was an assumption of IVIE) [EA: L+H*]

practical implications

staying with the accentual foot as ID:

- what do I use as ID in new languages or dialects while I am deciding whether it is pre- or post-accentual material that is of most interest?
 - take an educated guess which is going to be the correct direction (left- vs. right-headed)?
- crucial to my own research
 - can I assume that all Arabic dialects are left-headed?
 - Arabic dialects vary in metrical foot type (trochaic-iambic)
 - no indication (as yet..) that accentual foot direction is related to metrical foot type