

An Initial Account of the Intonation of Emirati Arabic

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ABSTRACT

We conducted auditory and visual analyses of recordings of colloquial Emirati Arabic in order to develop an autosegmental-metrical account of the intonation. Based on our analyses, we propose an initial tonal inventory of two main pitch accents (i.e., H*, (LH)*), one downstepped variant (i.e., !H*), and four bitonal phrase accents (i.e., LL%, LH%, HL%, HH%), which mark the right edges of intonation phrases. The data suggest that speakers produce a pitch accent on every content word and can use pitch range compression to define the position of the perceptually most prominent pitch accent within a prosodic phrase. The data further suggest that speakers can initiate and complete compression within a prosodic phrase and that they can extend that compression across silent durations to subsequent phrases.

Keywords: Arabic, intonation, pitch range compression, prosody, spontaneous speech.

1. INTRODUCTION

This paper is the first to present an analysis of the intonation of colloquial Emirati Arabic (EA). It adds to a small, but growing, body of work on the intonation of different varieties of colloquial Arabic. We use an autosegmental-metrical (AM) approach (see [5]) and describe a system of tonal targets that are high or low with respect to one another and that vary in their alignments to text. We argue for an EA system that contains pitch accents (i.e., tonal targets aligned with syllables) and phrase accents (i.e., tonal targets aligned with the edges of higher levels of prosodic structure).

Systems of intonation are language specific, and it is clear that colloquial varieties of Arabic vary in their intonation. For example, according to [4], Cairene Arabic speakers produce a pitch accent on every content word and consistently use the same rising accent. Other key features include post-focal pitch compression and a single level of phrasing (i.e., the intonation phrase). In contrast, according to [2], Lebanese Arabic speakers produce several different pitch accents and use at

least two levels of prosodic phrasing. Even if future work unifies these apparent differences in prosodic phrasing and pitch compression, the pitch accent type differences are likely to be robust.

Our account incorporates aspects of [4] and [2]. As in Cairene, speakers accent every content word, use a single level of prosodic phrasing, and make use of pitch compression. In contrast to Cairene, however, EA resembles Lebanese in that speakers use a variety of pitch accents.

2. ANALYSIS

2.1. Corpus and approach

A cultural anthropologist, who is also a fluent, non-native speaker of colloquial Arabic, collected the speech sample in the city of al-'Ain in the United Arab Emirates: two native speakers of EA talking about topics of interest in an informal conversation. About one hour of speech was recorded in a quiet setting with a Sony PCM-M1 DAT recorder (sampling rate 48 kHz) and a unidirectional Sony ECM-MS907 condenser microphone. About 20 minutes of speech were analyzed.

Using Praat [1], we listened to utterances while observing a waveform, spectrogram, fundamental frequency (F0) contour, and time-aligned transcriptions. The two researchers who are fluent non-native speakers of colloquial Arabic marked the transcriptions with syllable and word boundaries, lexical stresses (marked with an "x"), and glosses. We searched for distinct F0 contours and then for multiple occurrences of those patterns.

As in [4] and [2], we have adopted notational conventions common to ToBI (tone and break indices) systems. We represent pitch accents with asterisks that indicate a tonal target aligning with a syllable. (Lexical stress in Arabic is predictable, and pitch accents generally align with those stressed syllables.) We represent intonation phrase boundaries with percent signs (%), which we use to mark a phrase's right edge.

We recognize our account likely contains gaps. Because we used conversational speech, EA could

contain elements that our speakers had no cause to produce. We might also have overlooked patterns that did not readily contrast with other contours or that were obscured by dysfluencies, overlaps in speech, or background noise.

2.2. Pitch accents

In this section we provide figures and utterances motivating particular pitch accents.

2.2.1. H*/!H* on every content word

Figures 1 and 2 contain examples of longer intonation phrases that vary audibly and visibly in slope. In each case the lexically stressed syllables of content words generally align with pitch peaks, suggesting high tonal targets. We attribute dips in the F0 contour to segmental perturbations (e.g., at the /d/ in *doora* in Figure 1) or to sag between high targets across intervening unstressed syllables.

Figure 1: H* pitch accent on every content word.

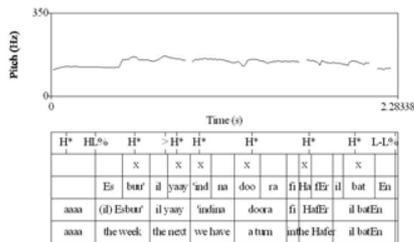
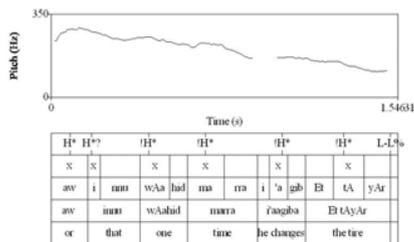


Figure 2: H*/!H* pitch accents in sloping contour.



We represent the flat contour as a series of H* tones and the sloping contour as a series of high tones downstepped (!H*) relative to preceding tones.¹ Figures 3 and 4 provide shorter examples of these flat and sloping contours in two utterances with similar stress patterns. Additional work is needed to show to what extent this apparent downstep is pragmatically and/or perceptually contrastive for *native* speakers of EA.

Figure 3: Example of H* H* sequence.

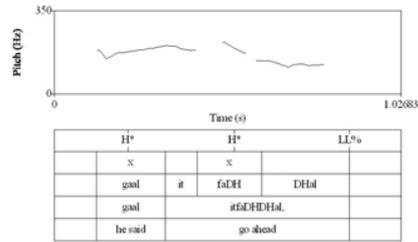
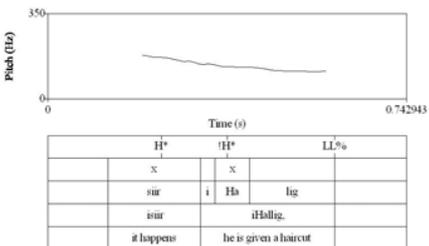


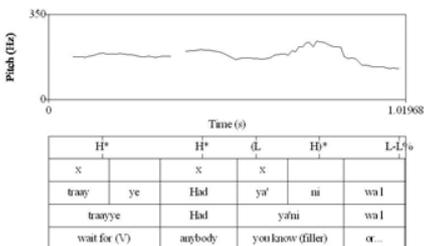
Figure 4: Example of H* !H* sequence.



2.2.2. (LH)*

Figures 5, 6, 7, and 9 contain examples of a perceptible fall and rise in pitch. In some cases, the F0 valley aligns with the stressed syllable (e.g., Figures 5 and 6). In other cases, the F0 peak aligns with the stressed syllable (e.g., Figures 7 and 9). Because we have no evidence as yet that these alignment differences are contrastive, we argue for a bitonal (LH)* pitch accent in which neither the low nor the high anchors to the stressed syllable (as opposed to having a L*+H occur with strong-weak alternations and L+H* with weak-strong).

Figure 5: First example of (LH)* pitch accent.



We note that the majority of our (LH)* tokens occur as the sole or final pitch accent in an intonation phrase ending with a flat (HL%) or rising (HH%) boundary, as in Figures 6 and 9. In

fact, it might not be impossible to argue that *ya'ni* in Figure 5 is also phrase final.

Figure 6: Second example of (LH)* pitch accent.

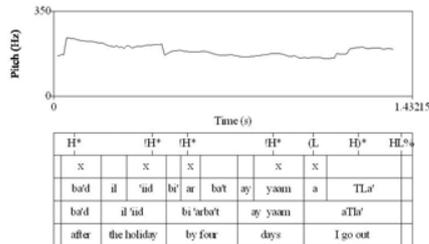


Figure 7 (in contrast with *na'am* in Figure 8) demonstrates that it is possible to find (LH)* in a falling intonation phrase (although *na'am* is both phrase initial and phrase final in this example).

Figure 7: Example of (LH)* LL% on *na'am*.

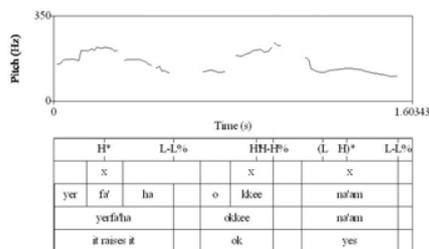
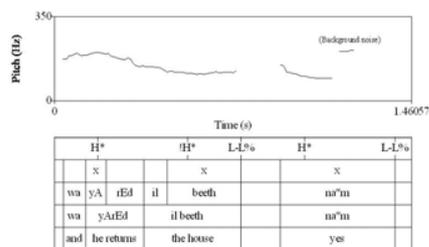


Figure 8: Example of H* LL% on *na'am*.

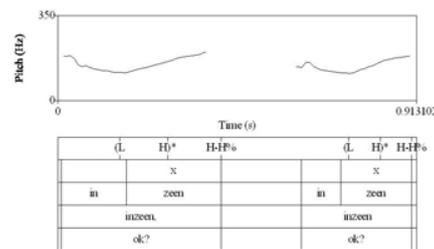


We realize that a phrase initial rising pitch accent (like *na'am* in Figure 7) is known to be ambiguous with H*, as the latter often involves a rise as well (e.g., Figure 8). A stronger (LH)* LL% example would involve a multisyllabic word with a weak-strong stress pattern. As shown in Figure 9, this alternation provides room for a clear fall from the middle of a speaker's pitch range to a low target before the rise to the high at the stressed syllable.

Additional data is needed to determine whether it is accidental that we have relatively few

examples of (LH)* LL% and no clear examples of phrase medial (LH)*. In addition, at this time, there are no incontrovertible examples of a downstepped variant. While there are several candidate utterances, they suffer from two complications. For some, the apparent F0 valley coincides with segments that consistently lower F0 (e.g., pharyngeals). For others, the apparent F0 valley coincides with unstressed syllables, which is a likely spot for a sag in F0 between high targets.

Figure 9: Fall to (LH)* at the beginning of a phrase.



2.3. Pitch compression

In the examples so far, the rightmost pitch accent in the phrase has been the accent perceived as the most perceptually salient in the phrase. However, the perceptually most salient pitch accent in Figure 10 occurs mid-phrase on the accent that aligns with the negative *ma*. In this case (and elsewhere in the corpus and other varieties of Arabic, see [4]), pitch compression immediately follows the most salient pitch accent, likely contributing to that percept. Note that compression does not seem confined to a given intonation phrase. Figure 11 exemplifies pitch compression that extends across a silent duration to the following intonation phrase.

We note that the pitch contour in Figure 11 might suggest a H*+L accent that triggers compression. However, we also raise the possibility that compression can occur at the beginning of utterances without a sharp fall. There are many examples similar to that in Figure 1 in which speakers produce utterance initial discourse particles or fillers in a pitch range that appears to be compressed relative to that which follows.

Additional work is needed to identify the function(s) of compression. We hypothesize that as in many languages speakers use compression for multiple discourse functions, including signaling narrow focus and generating higher-level discourse or narrative structure.

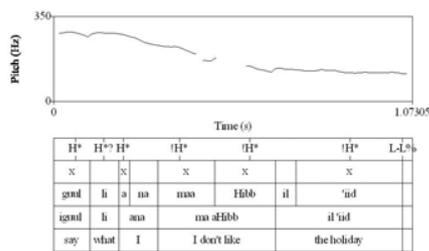
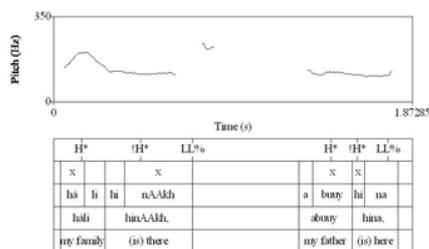
Figure 10: Most perceptually salient accent on *ma*.

Figure 11: Extended pitch compression.



2.4. Boundary tones

Figures 11 and 9 provide examples of intonation phrases separated by silent durations. Figure 1, however, demonstrates that silent gaps are not a necessary condition for perceptible boundaries. We note that the early HL% boundary in Figure 1, while perceptible, does not align with the rise in F0. The F0 stays low through the unstressed syllable, which is largely /s/.

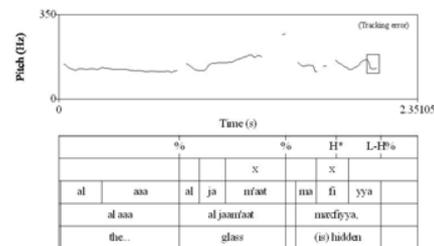
At this time, we propose one level of phrasing (i.e., the intonation phrase) and four bitonal phrase accents in order to (1) account for a demonstrated four-way contrast in boundary and (2) maintain a system that uses only high and low targets.²

Figure 8 (among others here) shows a fall from a high pitch accent to a low-low boundary tone (LL%). In contrast, Figure 9 shows a rise from the high in a (LH)* pitch accent to a high-high boundary tone (HH%). Figure 6 shows a flat contour (HL%) following a (LH)*. The low component of the boundary tone keeps the F0 from rising to the intonation boundary edge (as it would if HH%). Figure 12 shows a fall-rise sequence (LH%) following a high pitch accent.

An alternative account, which would require additional evidence, would separate the bitonal phrase boundaries into two independent levels of prosodic phrasing. However, because every

content word is accented in EA, we cannot motivate an intermediate level of phrasing with examples in which an intermediate phrase accent spreads leftward from the boundary tone to the final pitch accent (thereby controlling the F0 of intervening unaccented or deaccented words).

Figure 12: Example of LH%.



3. CONCLUSIONS

The data suggest that at a minimum EA intonation comprises high and rising pitch accents, one level of prosodic phrasing, and pitch compression. Future work involves identifying additional examples, investigating whether there is an additional level of prosodic phrasing, describing pragmatic functions, and documenting the sometimes dramatic effects in EA of segments and stress patterns on the F0 contour.

4. ACKNOWLEDGEMENTS

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5. REFERENCES

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¹ Note that the H*? in Figure 2 is located at a point of intonational ambiguity, namely, two pitch accents close together. It may or may not be present or downstepped.

² See [3] for a recent AM account that annotates tonal targets using three levels: High, Low, and Even.