LEXICAL TONE AND SENTENCE PROSODY IN THAI

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Background

In a true tone language, one in which, in principle, every syllable in the morpheme stock bears a distinctive tonal phoneme, the tones are characterized primarily by fundamental-frequency levels and contours. Since we also describe intonation mainly in terms of the fundamental frequency (F_0) of the voice, there seems to be a paradox involved in examining the relations between sentence prosody and word prosody in a tone language. As in other languages so also in tone languages is there the possibility of expressing attitudes or indicating certain aspects of syntactic structure by means of sentence intonation. The question arises as to whether the effects of this sentence intonation are strong enough to weaken or even destroy the phonetic integrity of lexical tones.

The citation form of a monosyllabic word may be viewed as bearing the ideal manifestation of a tone. Of course, except for the occasional one-word sentence, these ideal forms do not often occur in running speech, yet children in the culture probably learn new words this way, and so do adults in a foreign-language class. Once we have two or more tone-bearing syllables strung together, we expect perturbations through coarticulation. The final physical shaping of a tone is provided by the intonation on the utterance (Pike, 1948, 18-19).

The Tones of Thai

The ideal shapes of the tones of Standard Thai (Siamese) have been described elsewhere (Abramson, 1962; Erickson, 1974). It is useful to divide the five distinctive tones of the language into the "dynamic" class, comprising the falling and rising tones, and the "static" class, comprising the high, mid and low tones. The dynamic tones show rapid movements of F_0, while the static tones show rather slow movements which sometimes approximate levels. Of the three static tones it is the mid tone that is most likely to appear occasionally as a level. The high tone is more likely to be seen as a rise high in the voice range in contrast with the low rise of the rising tone. The low tone is likely to appear as a low fall in contrast with the high fall of the falling tone.

Two types of phonetic context perturb the ideal shapes of the tones. Voiceless initial consonants induce a higher start of the F_0 contour, while voiced initial consonants induce a lower start (Gandour, 1974; Erickson, 1974). This kind of perturbation seems to have little effect on the phonetic integrity of the five tones, although it may serve as a supplementary cue to the voicing state of the initial consonant. It has been argued by historical linguists (Li, 1977), with some perceptual support from recent experiments on Thai (Abramson and Erickson, 1978), that through the phonemicization of these perturbations, the tones of Proto-Tai increased from three to the present-day sets of five or more in the modern languages of the family.

The phonetic context that causes greater deviations from the ideal tonal shapes is that of neighboring tones. In a series of tones spoken without pauses, tonal coarticulation occurs. Although physiological studies of Thai tones (Erickson, 1976) have yet to be extended to sequences, we can infer from acoustic evidence (Abramson, 1979) that this kind of coarticulation is manifested through the overlap of the effects of motor commands for the control of the laryngeal tensions and aerodynamic forces used.

Two sequential effects must be discriminated from tonal coarticulation. First, certain unstressed CV syllables with short /ɑ/ which have low or high tones in citation form are normally toneless in running speech. Another view is that the high and low tones on these syllables are neutralized, and the resulting pitch is assigned to the mid tone. This conclusion is handy for transcription, but the physical evidence suggests instability with F_0 values dominated by the contours of the neighboring lexical tones. The other sequential effect to be excluded from consideration is tonal sandhi. The phonology of the language dictates that when certain kinds of morphemes are conjoined to form compound words, the lexical tone of one of the morphemes is replaced by another tone.

Sentence Intonation and Tones

As one listens to spoken Thai, whether it be an animated conversation or a phlegmatic technical explanation, it becomes clear that in addition to emotional states such linguistic features as

sentence accent and signs of major syntactic breakpoints can be expressed prosodically. The distinction between a statement and a question can also be expressed. In my present approach to the topic, I must lean mainly on my own extensive auditory but limited instrumental observations, as very few useful insights are found in the literature. It would be helpful if native Thai linguists or phoneticians gave more attention to the matter.

As a data base for such observations, as I am ready to make, I have used two kinds of speech material. One is a conversation between two Thai adults of about one minute in length, recorded by J. Marvin Brown for a textbook published by the American University Alumni Association Language Center in Bangkok, Thailand. The other is a monologue recorded by me of the dean of a faculty at a university in Bangkok; speaking for a bit more than a minute, he talks about a new academic program.

Computer-implemented analysis yielded displays of root-mean-square amplitude, wave forms, and F_0 contours. Cepstral analysis was used to extract the fundamental frequency. A sample set is shown in Fig. 1 for the female speaker in the dialogue. Here, by the way, can be seen an example of tonal coarticulation. The phrase /nâa bâan/ 'in front of the house' bears two falling tones. The F_0 of the first one does not fall as far as the second; this presumably facilitates the resetting of the larynx for the sharp rise and fall of the second falling tone.

To handle the non-emotive aspects of sentence prosody in Thai, my examination of the present corpus of utterances, reinforced by the arguments of Rudaravanija (1965), leads me to posit three terminal junctures: rising pitch, sustained pitch, and falling pitch. These junctures function at clause ends and sentence ends. They may also function wherever the speaker pauses. The presence of a juncture affects the phonetic shape of the lexical tone on the last one or two syllables. The rising and falling junctures are likely to appear at the end of a breath group. In earlier work (Abramson, 1962) I also posited two pitch registers, high and normal, as units for Thai intonation. I now doubt the relevance of such registers for the non-emotive aspects of sentence prosody in the language. Indeed, to capture emotive prosodic variation, a somewhat more elaborate scheme might be needed. Although, as shown by Noss (1972) and Thongkum (1976),

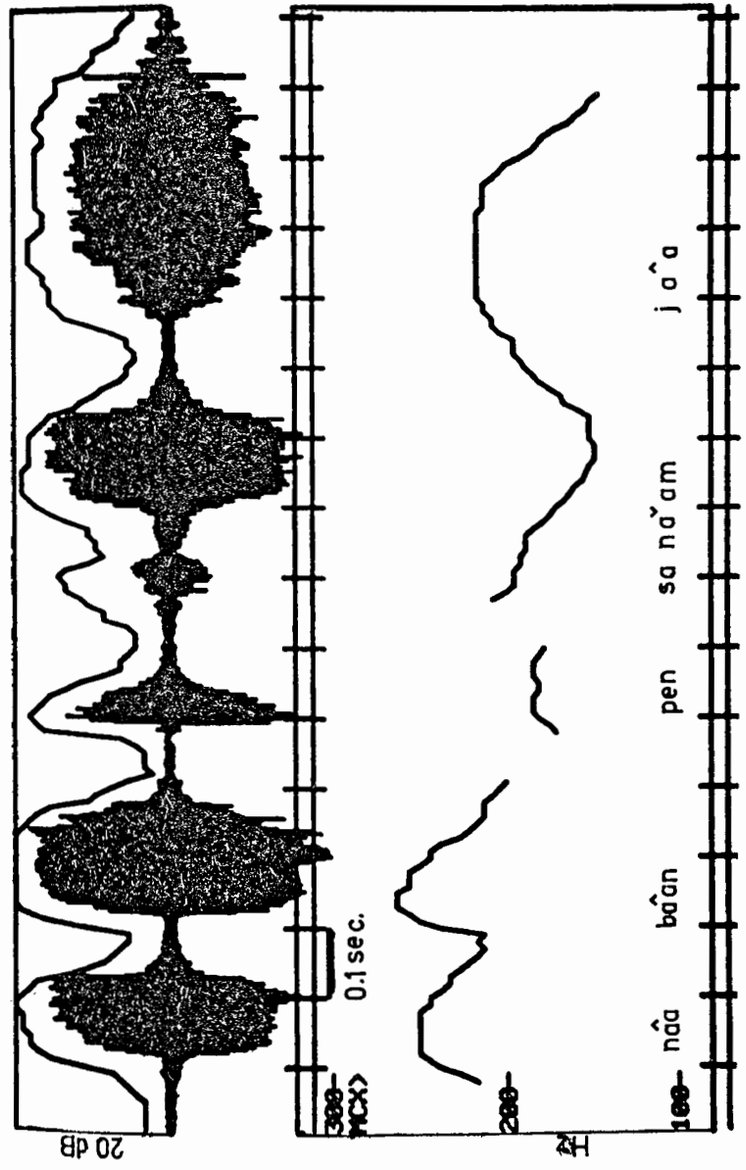

Fig. 1. From top to bottom: R.M.S. amplitude, wave form and fundamental frequency of a Thai woman's production of the sentence /nâa bâan pen sanǎam jâ/ 'There is a lawn in front of the house.'

rhythmic factors play a role in Thai sentence prosody, they are excluded here because of the scope set by the organizers of the Congress.

Henderson (1949) has argued that aside from the general melodic line of Thai intonation, the "sentence tone" as a whole is mainly determined by the speaker's choice of particles, most of them final particles. She describes seven such sentence tones. Without entering into the question of how many sentence tones there might be, I can at least say that these particles, which indicate, e.g., the sex of the speaker and something about the social relation between the speaker and the hearer, are prime carriers of the terminal junctures. Each particle as a lexical item has a tone of its own in citation form; this tone is usually predictable from the spelling. I doubt, however, that in running speech these "lexical" tones have any standing. The actual pitch imposed on a particle or, sometimes, a sequence of two particles, seems to be determined by the intonation of the whole sentence culminating in a terminal juncture. The resulting "tones" on these particles can sometimes be aligned with the lexical tones of Thai phonology but more often they are deviant; some linguists, apparently in the grip of the view that every Thai syllable must bear a phonemic tone, feel constrained to write each particle with one of the five tones.

In both colloquial and formal discourse, many a sentence contains no particles, so the terminal junctures appear on the final word of the clause or sentence. Fig. 1 shows such an effect. The falling tone on /jɑ̀ɑ/ 'grass' at the end of the sentence is considerably lower both at its high point and low point than the two falling tones at the beginning. Even the rising tone just before it on /sanɑ̀ːm/ 'field' does not rise to a point much higher than the immediately preceeding mid tone on /pen/ 'be'. With such a short utterance it is hard to decide whether we have a final falling juncture on the compound word for 'lawn' or a falling intonation contour on the whole sentence.

Sentence accent is manifested by one or more of the following factors: (1) lengthening of the syllable, (2) a tonal contour that approaches the form of the ideal tone, and (3) an increase in amplitude. In the sentence in Fig. 1 the final syllable appears to bear the sentence accent, using factors (1) and (2). In the phrase /nɑ̂ː bɑ̀ːn/ at the beginning of the sentence, the second syllable is stressed, using factors (1) and (3); the amplitude trace is flattened at the top of the available 20-dB range, indicating saturation.

The points made so far have been descriptions of gross F_0 contours. A problem in intonation analysis is how to present quantitative data that go beyond overall "tunes." The prosodic constructs of the linguist often elude the measuring devices of the phonetician. With the simple-minded analysis for non-emotive prosody into three terminal junctures as a framework, I have made an initial tabulation of frequency movements for such clear examples of terminal juncture as I could find in the corpus. To provide for reasonable comparability of speakers, I treated frequency shifts at terminal junctures as percentages of the voice range. The maximum and minimum F_0 values for each of the three speakers are given in Table 1. Although the speech in both samples was

Table 1

Voice Range in Hz

	Dialogue		Monologue
Speakers:	A*	B**	U.W.*
Spread:	130-290	90-235	85-160
Range:	160	145	75

*Woman **Man

calm, the narrower range for the monologue may not be due so much to the habits of that speaker as to the rather dispassionate and thoughtful nature of his discussion compared to the more animated dialogue.

The juncture of sustained pitch is generally found at syntactic breaks where the overall pitch of the voice neither rises nor falls before a brief pause; with or without a pause, the final syllable is prolonged. I have used this sustained pitch as a neutral reference from which to track the movements of the other two junctures. Examining both samples by ear and by eye, I accepted as valid tokens of the three junctures only those instances that were quite unambiguous. This cautious procedure yielded the small number of data in Table 2. The juncture of rising pitch signals surprise, doubt or a question. (Questions can also be marked by means of particles and other morphemes without terminal rising pitch.) The terminal fall appears at the ends of sentences

Table 2

Average Shift Through Voice Range for Terminal Pitch Junctures

Rising		Sustained		Falling	
N	%	N	%	N	%
6	30	14	0*	27	25

*Neutral reference point.

and some major clauses. The "shift" for the sustained pitch is set at 0% as a neutral reference level, while the other two junctures are entered as departures from that neutral level. The data are averaged across the three speakers. None of the tokens of these junctures happened to occur with the low lexical tone.

Even away from the junctures intonation has great effects on the realizations of the tonal phonemes. If the ideal forms of the tones have any psychological validity, then the forms in the sample of running speech have undergone severe distortion. A full account is beyond my reach here. At the same time, as I look at the contours and listen to the speech, I find preservation of the full system of five tones in running speech. That is, the usual linguistic scheme is not an artifact of the formal analysis of the linguist concentrating on citation forms only. Excluded from this generalization, however, must be all particles occurring at major syntactic breaks; they generally have their pitch determined by the sentence intonation without the involvement of lexical tones. Other frequently used function words, such as modals and pronouns, often undergo tonal replacement.

Conclusion

The phonemic tones and sentence prosodies of Thai interact in a rather complicated fashion. Three terminal pitch junctures, often occurring on particles, carry much of the intonation. Although the lexical tones are much influenced in their F_0 movements by sentence intonation, the contrasts between them are preserved except for certain small sets of morphemes. Sentence prosody allows for sentence accent. As in non-tonal languages, it is possible in Thai to use pitch junctures for the difference between statements and at least some kinds of questions.

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