Title: A Preliminary Study of Speech Rhythm in Akan/Twi
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Abstract: In phonological theory, the notion of rhythm is described as the appearance of alternating patterns of prominent elements, for example, alternating stressed syllables. However, metrical patterns are not so apparent in languages without stress or accent. In particular, how rhythm appears in tone languages without stress/accent is poorly understood. This study explores the rhythmic timing patterns of Akan/Twi, a West African tone language thought to be syllable-timed (Obeng, 1987), using the Speech Cycling Task (Cummins & Port, 1998; Port, 2003; Tajima & Port, 2003). In the Speech Cycling Task, speakers are asked to repeat a phrase several times along with a metronome. Prominent elements, such as stressed syllables in English or word-final syllables in Japanese, tend to occur at simple harmonic phases of 1/3, 1/2, and 2/3 of the fixed metronome period. These positions within the period are termed attractors and previous studies have shown that prominent syllables not only have a tendency to align in time with the attractors, but that these syllables also resist temporal displacement (Cummins, 1997; Tajima, 1998; Tajima, Zawaydeh, & Kitahara, 2001).

In this work, an experiment was devised in order to determine which syllables, if not every syllable, of a phrase can be considered prominent. This is empirically verifiable by checking which syllables exhibit the tendency to occur at simple harmonic phases, which were controlled by fixing the clicks of the metronome at positions of 1/3, 1/2, and 2/3 of the repetition period. Subjects were instructed to align the first syllable of the phrase with the first click of the metronome. Clicks also appeared within the repetition periods and were manipulated to occur at 1/2 of the period (a two-beat pattern) and 1/3 and 2/3 of the period (a waltz-like pattern). This task, thus, forces speakers to align prominent elements within the phrase with the clicks of the metronome, which are fixed to the simple harmonic phases. The data include four speakers who were asked to repeat a phrase eight times along with a metronome whose rate was fixed. The speech materials included 20 phrases ranging from 4-8 syllables in length and four tone melodies (H, L, HL, and LH). Tone is included as a condition since it is thought that H toned syllables may be more prominent (Beckman, 1986; Cumming, 2011; de Lacy, 1999).

Preliminary results show that subjects display entrainment between the clicks of the metronome and specific syllables (akin to stress-timing), rather than beat entrainment with all syllables. This is taken as evidence that not all of the syllables in an Akan phrase are equal with regards to prominence. Implications for the stress-timing/syllable-timing dichotomy and how tonal melodies affect rhythmic patterns are also discussed.
References