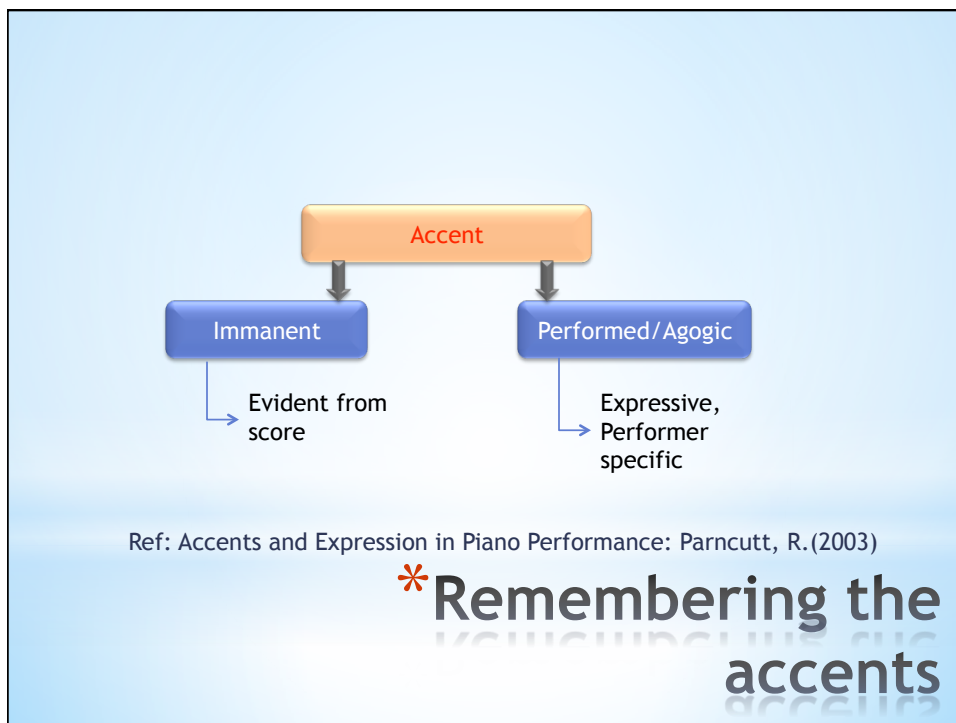


* Modeling Immanent Durational Accent in Musical Rhythm

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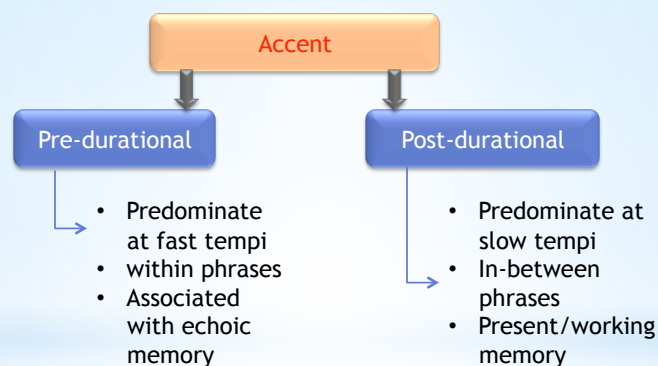
ISE 575 / EE 675
April 15, 2010



- * Research studies primarily concentrate on periodicity
- * Study of phase (*position within each period at which the downbeat is perceived*) attracts less attention
- * Phase ambiguity exists in music containing multiple instruments
 - * Listener shifting to a pulse intended by musician. Sloboda (1983)
- * Repetition of temporal patterns cannot help determine phase of pulse sensation.
 - * Phase determined by timing and salience of individual events. Handel, 1973; Lee, 1991; Lerdhal & Jackendoff, 1983; Steedman, 1977;

* Music perceived by listener & relevant studies

Aspect of phenomenal accent (time points of marked change in any of the perceived properties of sound)- [Durational Accent](#)



Durational accents combined with dynamics (loudness and timbre) helps to detect underlying pulses and their saliences

* Durational Accents

- * Depends on the IOIs that follows and preceded each onset
- * Does not depend on the physical or perceived duration of a tone
- * However, duration and legato are important in communication and disambiguation of metrical and grouping structures
 - * (e.g) [Brahm's third symphony](#)
 - * Longest tones longer than IOI
 - * Classic example to distinguish immanent accents and performed accents

* Durational Accent (contd.)

Durational Accent more significant and important than dynamic accent

- * Increase of 4dB in level of tone is required to produce dynamic accent that is strong enough to balance a durational accent
- * Young children reproduce temporal structures of musical rhythms more reliably than dynamic structures
- * Timing has greater effect in hearing than increase in loudness
- * Number of pulse- and meter-finding models have been developed that consider IOI but not loudness
- * Durational accents have greater effect on expressive timing and loudness than do melodic and metrical accents

* Accent as dynamic accent

- * Stress given to a note through prolonged duration rather than increasing dynamic stress
- * 4 kinds of agogic accent #
 - * Longer duration of note- half note among quarter notes
 - * Extended duration of a note within its full time value (without altering the tempo)
 - * Extended duration of a note with the effect of temporarily slowing down the tempo
 - * Delayed onset of a note
- * The delaying attracts attention of listener to the time points by heightening expectation

Ref: [http://en.wikipedia.org/wiki/Accent_\(music\)#Agogic_accents](http://en.wikipedia.org/wiki/Accent_(music)#Agogic_accents)

* Agogic Accent

- * Precede long IOI and marks downbeat
- * Dependency of pulse perception on pre-durational accent increases with tempo. (Parncutt, 1994)
- * Tendency of listeners to hear the downbeat preceding the longer IOI increases as tempo increases
 - * Pre-durational accent non-linearly related to IOI
 - * Thus, can be modeled by $f(\text{IOI}) = 1 - \exp(-\text{IOI}/T)$ w.r.t $T = 1\text{sec}$
- * By cognitive-psychological approach, pre-durational accent related to echoic memory (Massaro, 1970)
 - * Echoic memory ranges from 0.5 to 2 seconds
 - * Explains the reason why phenomenal accent of a rhythmic event depends on following IOI

* Pre-durational Accent

- * These accents mark the start of new phrase or end of phrases/groups
 - * Helps in drawing listeners attention to continuation of music
 - * Similar to break in speech at end of sentences
 - * May depend on the period of time during which the previous event was processed. Longer the duration, greater the shift of attention when it is interrupted
 - * Depends on attention- can be modeled in terms of working memory

* Post-durational Accent

- * No model has been developed using the parameters
- * The author only suggests combining the durational accent with changes in loudness and timbre, to be given as an input to a pulse-finding algorithm that operates “within the confines of the psychological present but also accounts for hysteresis”
- * The relationship between pre- and post- durational accents, as investigated by various authors, may also be modeled by exponential functions

* Modeling Durational Accent