Suprasegmentals

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Overview

What are suprasegmental features?

Suprasegmental features are superimposed on the syllables

What are the typical suprasegmental features?

- Tone
- Stress
- Intonation
- Rhythm
- Pauses

Overview

Suprasegmentals are relative:

- We can convey intonations with low and high voices
- We can stress syllables even as we are shouting

Plan

- Stress
- Rhythm
- Tone
- Intonation

Stress

Stress makes a syllable / word more prominent.

How?

Open Praat and record two words: ˈobject and obˈject

What are the differences?

Stress

- More air from the lungs
  - Intensity (amplitude)
  - Pitch (F0)
- Tenser vocal tract
  - Vowel quality (formants)
- Longer vowel duration

Usually stress is defined by a mixture of all the above cues

To find stressed syllables: say a word and tap when you fell like it

Russian language

- Potebnya's formula (1231) for intensity
- Unstressed vowels are reduced
- Vowels in the prosodic nucleus are longer
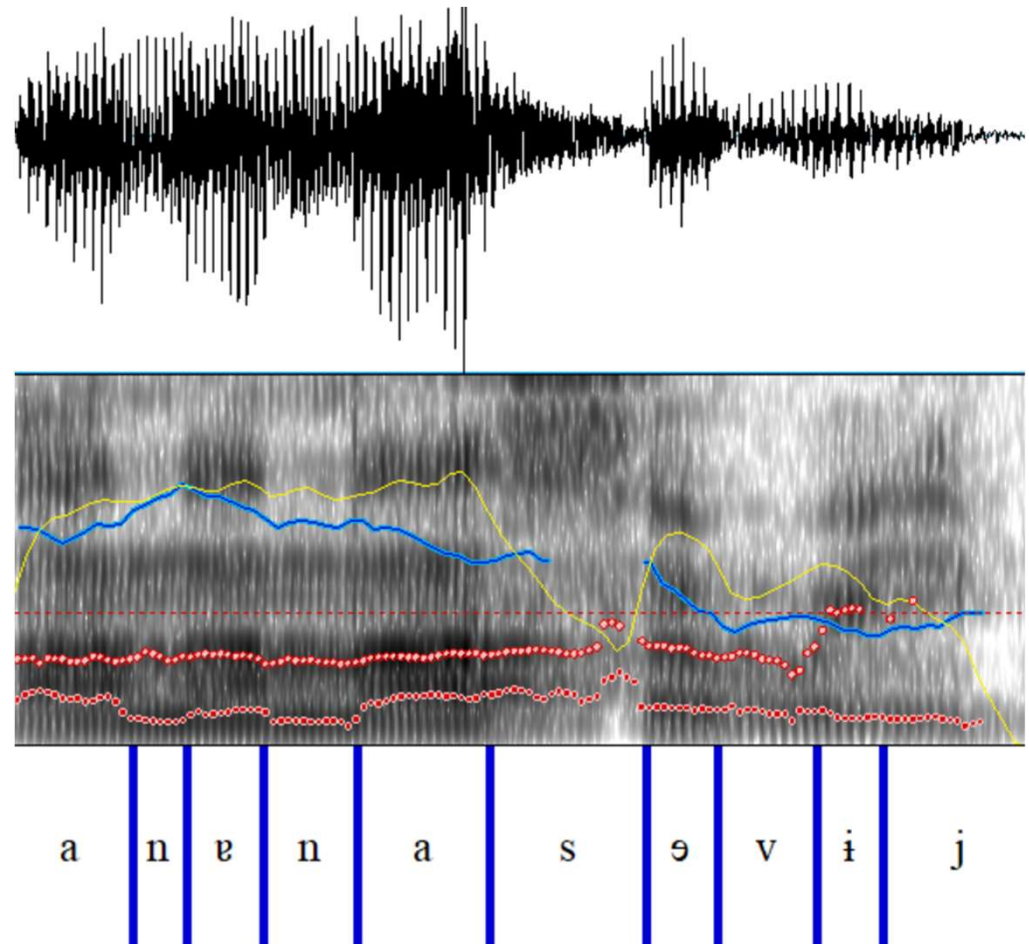- Pitch of stressed vowels may increase

Example

Anaˈnasovyj (pineapple, adj.)

Yellow line – intensity

Blue line – pitch

Red dots – formants

Which cue is more important?

English language?

Consider:

• Radio

• Cupcake

• Criticize

All of the cues are important: intensity, vowel quality, duration and pitch

Functions of stress

- Lexical stress (distinguish words): hot dog, hot-dog
- Prosodic stress (emphasize words): No, I need a *blue* pen!

Cross-linguistic data

Fixed word stress vs variable word stress

WALS:
- No fixed stress: 220
- Initial stress: 92
- Penultimate stress: 110
- Ultimate stress: 51
- Other: 29

Stress and rhythm

Unit of rhythm:

- Syllable
  - 'Syllable-timed' languages, e.g. French
- Foot
  - A stressed syllable and a number of unstressed ones
  - 'Stress-timed' languages, e.g. English or Russian

Unit durations are varied

But compare with musical rhythm and rubato

Rhythm, examples

seventy		large		menacing		dogs
four		terrible		black		elephants
four	un-	fortunate	de-	ceased		dogs
seventy	unsuc-	cessful		old	ad-	ministrators

If there are too many syllables, a foot is lengthened

Phonological isochrony: the speakers think that the speech is rhythmic, but phonetically it is not

Rhythm, examples

Additional evidence:

He had a ˈclarinet ˈsolo
He ˈplays the clariˈnet

Tone

Tone is defined by changes in F0.

Causes?

- Stretched vocal folds
- Increased airflow
- Phonation type (creaky voice)

Lexical tone

Open the Mandarin Chinese audio and textgrid in Praat

Describe the tone system of the language

How did you deduct it?

Mandarin Chinese tones

- Level:
  - T1, high level (55)

- Contour:
  - T2, high-rising (25)
  - T3, low falling-rising / dip (214)
  - T4, falling (51)

- It is considered that 5 levels are enough to describe most tonal systems of world languages
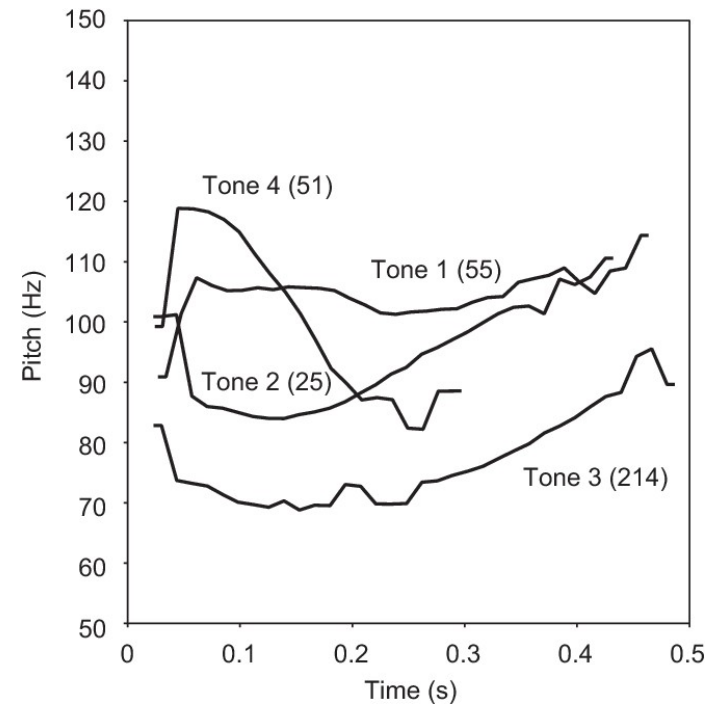
Cantonese tones

- 6 tones:
  - 3 level tones:
    - T1, high level
    - T3, mid level
    - T6, low level
  - 2 rising tones:
    - T2, high rising
    - T5, low rising
  - 1 falling tone:
    - T4, low falling
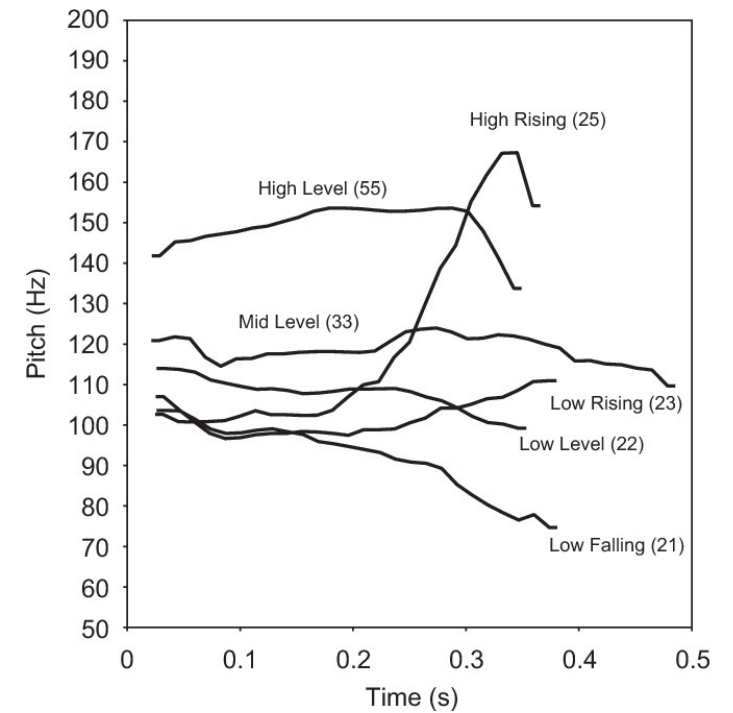
Properties of lexical tones

- Distinguish between morphemes, words, word forms
- Present in each syllable
    - In some languages particular tones may be forbidden in certain positions

Tone systems

- Register systems
  - 2-3 level tones
  - Usually the tones bear grammatical categories (tense, number, case etc.)
- Contour systems
  - Have at least one level tone
  - Exact frequencies are less important than the contours
  - Tones are mostly lexical

+ Additional phonations (e.g. breathy, creaky and stiff in Vietnamese)

Cross-linguistic data (WALS)

- No tones, 307 languages

- Simple tone system (2-way contrast), 132 languages

- Complex system, 88 languages

- Regional distribution
  - Almost all languages in Africa are tonal, mostly with simple systems
  - Complex tone systems are mostly found in East and Southeast Asia

Cross-linguistic data (WALS)
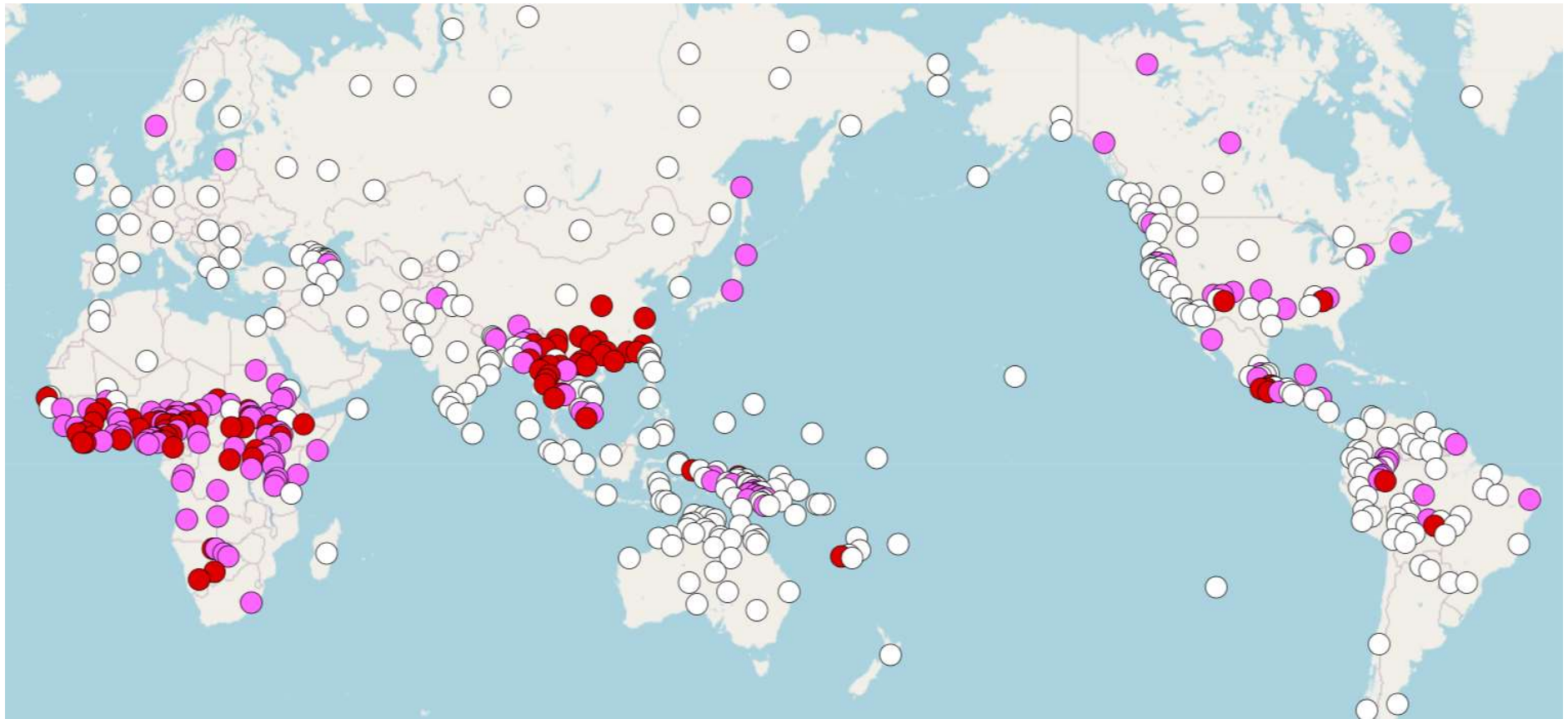
Assimilation / tone sandhi

- Mandarin Chinese:
  - [hao^{214}] + [leŋ^{214}] → [hao^{35} leŋ^{214}] ('very cold')
- Efik (Atlantic-Congo):
  - ké ùbóm → kûbóm ('in the canoe')
  - ké ùruà → kûruà ('in the market')

- If tones can assimilate, are there contour tones? Or are they mixtures of two or more level tones?
- If tones can change under influence of other tones, what is the inherent tone structure of a word?

Intonation

Pitch contours superimposed on top of word-based stress or tone

Has meaning
- Falling intonation usually marks completeness of a grammatical structure
- Rising intonation usually marks incompleteness, sometimes – questions

Provides discourse information
- Emphasizes the focus
- Reflect emotions (linguistics?)

Intonation

Compare:

"No, he *wrote* a book" vs "No, he wrote *a letter*"

Hierarchy of intonations

- Feet / syllables

- Nuclear tones / Intonation phrase

- Utterance

  - *Co-ordinating*
    1. [↘‖↘]   2. [↗‖↗]   3. [◝‖◝]

    Subordinating
    1. [↘‖↗]   2. [↗‖↘]   3. [↘‖◝]   4. [◝‖↘]

    "I missed the lecture, it's a pity" vs "I missed the lecture because of the train"

- Depending on emotions of the speaker the same utterance can have different average pitch and pitch variations

Units of intonation

- Points
  - Syllables or feet
  - How many points form a pattern?
  - How many points are there in a falling pattern?

- Movements
  - Points are incidental peaks creating by pitch
  - Are movements at syllable level considered intonational?

- Configurations / shapes
  - At which level should we analyze shapes? What if the pattern breaks?

Are you sure he's coming?   Are you sure he's coming?

Distinguishing intonation patterns

- Final pitch direction (boundary tones)
  - The main parameter
- Complexity of the movement (presence of direction or several directions)
  - The second main parameter
- Range of the movement (wide, narrow)
- Height of the movement (high, low)

Intonation and tone

Downdrift (contour tones)

Igbo (Atlantic-Congo):

```
L  H  L  H  H  H  H  L  H
      ‒
            ‒  ‒  ‒  ‒
‒                       ‒
   ‒
                  ‒
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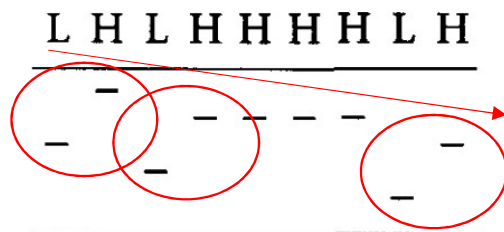
Ànyị̀ àgáwálá ńzùkó
'We have started to go to meetings'

Intonation and tone

Downdrift (contour tones)

Igbo (Atlantic-Congo):

Ànyí àgáwálá ńzùkó
'We have started to go to meetings'

Intonation and tone

Downstep (level tones)

Tiv (Atlantic-Congo):

H H H H

Í lú kwá gá
'It was not a leaf'

TOnes and Break Indices (TOBI)

- Open the intonation sound and textgrid in Praat
- Annotate the intonations

TOnes and Break Indices (TOBI)

- Annotation:
    - H - peak in F0
    - L - bottom in F0
    - * - prominent syllables (H*)
    - % - rising or falling boundary tones (L%)
    - ! - downstepped accents (!H)
    - 1 – break between words
    - 3 – break between intermediate phrases
    - 4 – break between intonational phrases

What's the point?

Kang (2010), perception of English produced by foreigners

- Wider pitch range > less accented
- Many stressed words > more accented
- Long pauses > more accented

Applications:

- Language teaching
- Speech recognition and synthesis

Wrap-up

Suprasegmentals are superimposed on the syllables

- Tone

- Stress

- Intonation

- Rhythm

- Pauses

Wrap-up

Phonetic correlates

- F0 changes

- Amplitude

- Duration

- Formant changes

Bibliography

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