Quantitative analysis of syllable properties in Serbian (and some other Slavic languages)

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Syllable

- no common accepted definition
  - "scholars ... found it convenient to refer to the syllable, while nobody had done much about defining it" (Haugen, The syllable in linguistic description, 1956)
  - "matters are hardly better now than they were then" (Cairns & Raimy, Handbook of Syllable, 2011, after citing Haugen)
  - "providing a precise definition of the syllable is not an easy task" (Crystal, A Dictionary of Linguistic and Phonetics, 2008)
  - "a unit of speech for which there is no satisfactory definition" (Ladefoged & Johnson, A Course in Phonetics, 2011)

Syllable structure

- nucleus – usually a vowel, sometimes a syllabic consonant
- onset – consonant(s) preceding the nucleus
- coda – consonant(s) following the nucleus
- examples:
  - vuk (wolf, Serbian)
    - v – onset, u – nucleus, k – coda
  - vlk (wolf, Slovak)
    - v – onset, l – nucleus (syllabic consonant), k – coda

Big question

- How to determine syllables, i.e., how to divide a word into syllables, if there is no established syllable definition?
- every vowel "creates" its "own" syllable, but what to do with intervocalic consonant(s)?
- Be – o – grad? Be – og – rad? Be – ogr – rad?

Two (relatively widely?) accepted syllabification principles

- maximal onset principle
  - keep syllables open, i.e., consider intervocalic consonant(s) as onsets so that a syllable ends with a vowel. . . but do not violate a sonority hierarchy
- sonority hierarchy principle
  - syllable nucleus constitutes a sonority peak of a syllable, i.e., sonority decreases towards both edges of a syllable
  - vowels > approximants > nasals > fricatives > affricates > stops

OK. . . but. . .

- even if one accepts these two principles, there remain some problems
- some words in some languages have syllables which are not possible to reconcile with the two principles
- example: rty (lips, Czech) – r is more sonorous that t, but this word is a monosyllable, so there are no possibilities to divide it

Our approach

- with respect to sonority, we distinguish only two classes of consonants (sonorants and others)
- we slightly modify the sonority hierarchy principle (we allow sonority plateaus, i.e. sequences of consonants with the same sonority)
- we keep syllables open unless they violate our version of sonority principle
- the list of sonorous consonants is language-specific, we take it from established linguistic sources

Bilateral Slovak-Serbian project

- official aim of the project - quantitative analysis of syllables in Russian, Serbian, and Slovak
- unofficially – more (perhaps all) Slavic languages
- state of the art – syllabification of Serbian, Croatian, and Ukrainian ready
- Serbian and Croatian – no diphthongs, syllabic consonant – r between two other consonants
- Ukrainian – no diphthongs, no syllabic consonants
- language material – parallel language corpus (Russian novel "Kak zakaljalas' stalj" – "How the steel was tempered" and its translations into 11 other Slavic languages) created by Emmerich Kelih

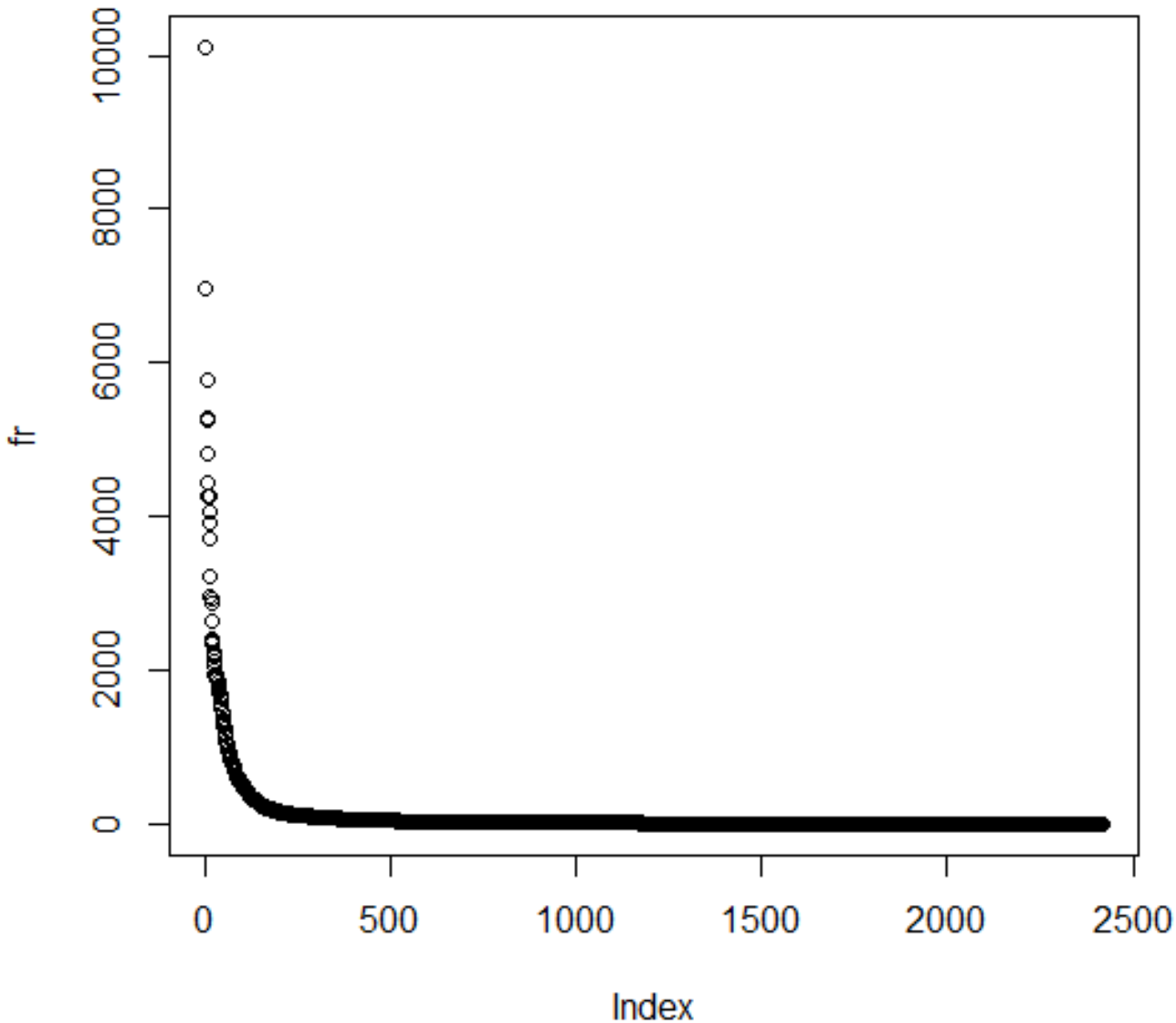
Some results

- rank – frequency distribution of syllables
- distribution of syllable length
- Strauss, Fan, Altmann (2008) - similar mathematical models as those for words (Zipf- and Poisson-like distributions)?
- typology of Slavic languages based on syllables frequencies?

Syllable frequencies in Serbian

1	10103	o
2	6970	je
3	5778	u
4	5291	na
5	5248	da
⋮		
2419	1	

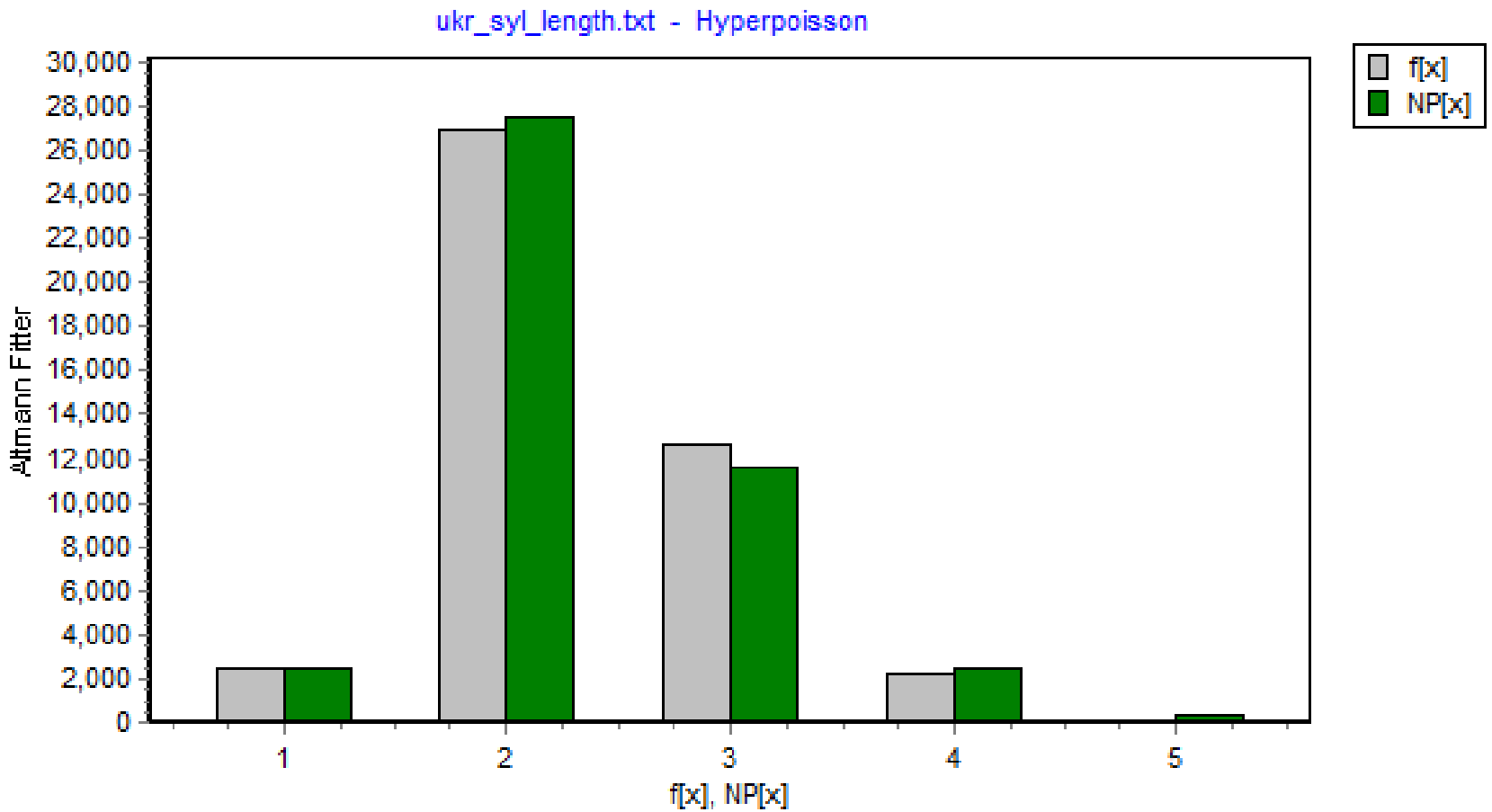
Syllable frequencies in Serbian



Distribution of syllable length

1	23505
2	153939
3	54554
4	6982
5	236
6	3

Syllable length



Least effort principle. . . in other words, we are lazy

- words: the higher frequency of a word, the shorter it is
- is it true also for syllables?

Relation between frequency and length of syllables

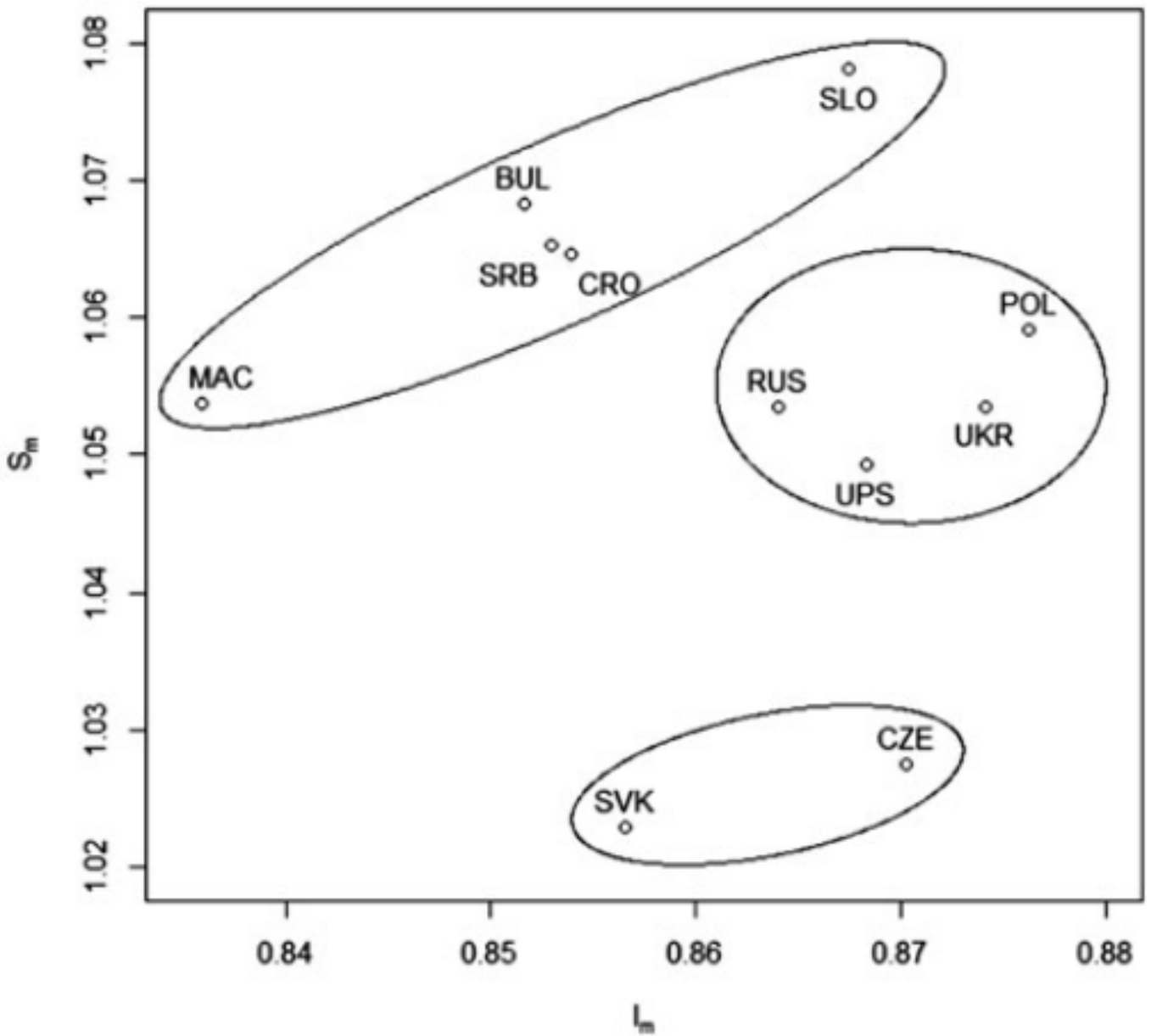
length and mean frequency

1	3917.5
2	785.4
3	37.5
4	9.7
5	6.4
6	1

Syllables pooled so that there are roughly 30000 of them in each group

1.6, 1.86, 2, 2, 2.13, 2.23, 2.84, 3.33

Data-based typology of Slavic languages (graphemes)



Data-based typology of Slavic languages (graphemes)

- Ord graph – uses ratios of mean, variance and skewness
- our modification (Koščová, Mačutek, Kelih 2016, JQL 23, 177-190) - these characteristics are replaced with indices of qualitative variation

Conclusions

- start of a systematic investigation of syllables in Slavic languages rank-frequency distribution – similar to word length syllable length distribution – similar to word length relation between frequency and length – similar to the one for words
- studies on typology based on syllable frequencies opened

Hvala na pažnji!

Thank you for your attention!