SPARSAR: a System for Poetry Automatic Rhythm and Style AnalyzeR

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Abstract

Any poem can be characterized by its rhythm which is also revealing of the poet's peculiar style. In turn, the poem's rhythm is based mainly on two elements: meter, that is distribution of stressed and unstressed syllables in the verse, presence of rhyming and other poetic devices like alliteration, assonance, consonance, enjambements, etc. which contribute to poetic form at stanza level.

Traditionally, poetic meter is visualized by a sequence of signs, typically a straight line is used to indicate vowels of stressed syllabes and a half circle is positioned on vowels of unstressed ones. The sequence of these sings makes up the foot and depending on number of feet one can speak of iambic, trochaic, anapestic, dactylic, etc. poetic style.

English poetry has been for centuries characterized by iambic pentameter, that is a sequence of five feet made of a couple of unstressed + stressed syllables. Modern English poetry on the contrary – after G.M.Hopkins – has adopted a variety of stanza schemes.

A poetic foot can be marked by a numerical sequence as for instance in [4] [5] who uses "0" for unstressed and "1" for stressed syllables to feed a connectionist model of poetic meter from a manually transcribed corpus. There he also tries to state the view that poets are characterized by their typical meter and rhythm, which work as their fingerprint.

We also agree with this view, however, we would like to be more specific on the notion of rhythm that we intend to purport. We do that in two ways: by considering stanzas as structural units in which rhyming – if exixtent - plays an essential role. Secondly and foremost, in our view, a prosodic acoustic view needs to be implemented as well, if any precise definition of rhythm and style is the goal. Syllables are not just any combination of sounds, and their internal structure is fundamental to the nature of the poetic rhythm that will ensue. This is partly amenable to the use and exploitation of poetic devices, which we also intend to highlight in our system. But what is paramount in our description of rhythm, is the use of the acoustic parameter of duration. The use of duration will allow our system to produce a model of a poetry reader that we intend to implement in the future by speech synthesis. In our demo we will show how poems can be characterized by the use of rhythmic and stylistic features in a highly revelatory manner, by comparing metrically similar poems of the same poet and of different poets.

To this aim we assume that syllable acoustic identity changes as a function of three parameters:

- internal structure in terms of onset and rhyme which is characterized by number consonants, consonant clusters, vowel or diphthong
- position in the word, whether beginning, end or middle
- primary stress, secondary stress or unstressed

These data have been collected in a database called VESD (Venice English Syllable Database) to be used in the Prosodic Module of SLIM, a system for prosodic self-learning activities. Syllables have been collected from WSJCAM, the Cambridge version of the continuous speech recognition corpus produced from the Wall Street Journal, distributed by the Linguistic Data Consortium (LDC). We worked on a subset of 4165 sentences, with 70,694 words which constitute half of the total number of words in the corpus amounting to 133,080. We ended up with 113,282 syllables and 287,734 phones. The final typology is made up of 44 phones, 4393 syllable types and 11,712 word types. From word-level and phoneme-level transcriptions we produced syllables automatically by means of a syllable parser. The result was then checked manually. This work has been presented elsewhere [1][2].

The analysis in SPARSAR starts by translating every poem into its phonetic form: we used the CMU Pronouncing Dictionary for North American English to translate words into phoneme sequences, augmented with words derived from work above – see also [6]. In a second pass we try to build syllables starting from longest possible phone sequences to shortest one. This is done heuristically trying to match pseudo syllables with our syllable list. Matching may fail and will then result in a new syllable which has not been previously met. We assume that any syllable inventory will be deficient, and will never be sufficient to cover the whole spectrum of syllables available in the English language.

For this reason, we introduced a number of phonological rules to account for any new syllable that may appear. Duration values are derived by comparison with phonologically closest ones – for this we use place, manner of articulation as parameters. We assign mean duration values in msecs to all syllables considering position and stress. We also take advantage of syntactic information computed separately to highlight chunks' heads as produced by our bottomup parser. In that case, stressed syllables takes maximum duration value.

In our demo we will show how poems can be chacterized by the use of rhythmic and stylistic features in a very revelatory manner, by comparing similar poems of the same poet and of different poets. The importance of metrical structure and of poetic rhyming devices is evaluated and also compared.

References

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