

CSE 30151 Course Project 12 - Syllable Counter & Haiku Generator

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Abstract

For this project, I wrote a syllable counter and a random Haiku generator in Python.

1 Relevance

This project is relevant to the class because I wrote a context-free grammar to recognize English of up to three syllables, as well as a context-free grammar to recognize Haiku poems, and I wrote a program to apply the grammar rules to determine the number of syllables in given words, as well as to randomly generate a Haiku poem (using the syllable rules).

2 Effort

I worked alone on this project; my work consisted of performing basic research on context-free grammars, writing the grammar for words and their syllables, writing the grammar for Haikus, writing the code to implement the Haiku generator, and writing the report and documentation. Overall, I spent 7 hours on this project.

3 Content

3.1 Words from Syllables – Grammar Overview

In order to write my grammar, I searched two relevant website sources as well as my knowledge from class to write a grammar to be used in this project. My use of the sources was primarily for writing the format and syntax of the language (*How Many Sentences 2016*). My grammar recognizes English words of up to three syllables, all of which consist of a collection of syllables. In any situation, the final syllable can slightly vary to include nuances such as silent "e's" at the end of a word, and other strange happenings. The grammar itself decomposes into three types of words. Additionally, I included a specific syllable format for the letter "y," which is only considered to be a vowel when surrounded by two consonants, or if it comes at the end of a word (*Phonics on the Web 2013*). Above all, it should be noted that consecutive vowels will always be

treated as a singular sound, and as such, words are often given slightly different syllable counts than we would pronounce them. The grammar is formalized in the following section.

3.2 Words from Syllables Context-Free Grammar

$$W \rightarrow F \mid SF \mid SSF$$

$$S \rightarrow CRVRC$$

$$S \rightarrow CyC$$

$$V \rightarrow U \mid U \in \{a,e,i,o,u\}$$

$$R \rightarrow RV \mid VR \mid \varepsilon$$

$$C \rightarrow (xC \mid Cx) \mid x \notin \{a,e,i,o,u\}$$

$$C \rightarrow \varepsilon$$

$$F \rightarrow SL$$

$$L \rightarrow le \mid les \mid ed \mid e$$

Key:

W = Words

S = Syllable

F = Final Syllable

R = Repeatable Syllable

V = Vowel

C = Consonant

L = Last Sequence

3.3 Haiku – Grammar Overview

In order to write my grammar, I searched one website (*HAIKU for PEOPLE 2001*) in order to ensure that I knew the proper structure for a Haiku poem, which is three lines of 5, 7, and 5 syllables, in that order. While there are more possibilities of breaking up syllables into different clauses than are listed formally below, I only worked with words of three or fewer syllables, and in addition, my program decomposes the clauses into sub-clauses as is listed. The grammar is formalized in the following section.

3.4 Haiku Context-Free Grammar

$$H \rightarrow 5 \ 7 \ 5$$

$$7 \rightarrow 1 \ 5 \ 1$$

7 → 2 5
7 → 2 5
7 → 3 3 1
7 → 3 1 3
7 → 1 33

5 → 3 2
5 → 2 3
5 → 1 3 1

3 → w | w has 3 syllables
3 → 2 1
3 → 1 2

2 → w | w has 2 syllables
2 → 1 1

1 → w | w has 1 syllable

Key:

H = Haiku

7 = 7-Syllable Clause

5 = 5-Syllable Clause

3 = 3-Syllable Clause

2 = 2-Syllable Clause

1 = 1-Syllable Clause

3.5 Program

For this project, I wrote one all-inclusive python file, GetSylly.py, that includes all project code. All directions and instructions for use are included in the README.md file zipped and included, as well as online (<http://github.com/nicholascjones/get-sylly/>). To the user, the basic structure of the program consists of a interactive menu that gives the user the option to quit, receive a haiku, or count the syllables in an entered word.

Functionally, the program consists of a while loop that runs the main structure of the program's menu, making calls to many different functions. The program's word data consists of four lists including one preliminary list of all words (which is read from a file, but later deleted), and lists of one, two, and three-syllable words. There is additionally a list (turned into a set) of vowels, which does not include the letter "y." The automaton-like behavior of the program comes through the composition of the SyllableCounter function (which determines the number of syllables in a word) and the isNSyllables functions (which determines if a word's syllable counts are accepted by a particular machine).

The SyllableCounter function works in a way that reflects the grammar that I wrote, iterating through characters and making judgments on syllables as such.

Using a C-style for-loop, the program scans through each character, searching for vowels (which add one to the syllable count, apart from a few exceptional cases, pointed out in the grammar). Other cases include checking for "le" in the final syllable, as well as ignoring any words that end with "e" (similar to certain epsilon-transitions in various NFA and PDA).

The "accept-states" of the automata are deployed through the `isOne`, `isTwo`, and `isThreeSyllables` functions, which uses the syllable count to either reject or accept words and apply them to a list, using a the `CountSyllables` function as an intermediary.

The haiku generator uses random integers to determine the clause structure of the poem, in terms of words given in the grammar (*The Python Foundation 2016*). These functions work recursively to break down into three-syllable, two-syllable, and one-syllable words.

4 Bibliography

Toyomasu, Kei Greig. "HAIKU for PEOPLE." HAIKU for PEOPLE. Toyomasu, 10 Jan. 2001. Web. 22 Mar. 2016.

→ Used for basic understanding of Haiku Grammar. and syntax

random — Generate pseudo-random numbers The Python Foundation, 19 February 2016

→ Used for reference on random variables in Python.

"Syllable Rules: How to Count Syllables." 5 Ways To Count Syllables. How Many Syllables, 2016. Web. 22 Mar. 2016.

→ Used for understanding of how to determine syllables "Syllable Rules: How to Count Syllables." 5 Ways To Count Syllables. How Many Syllables, 2016. Web. 22 Mar. 2016.

→ Used for understanding of how to determine syllables in a word
Owens, Kevin. "Syllable Rules (Phonics on the Web)." Syllable Rules (Phonics on the Web). Phonics on the Web, 2013. Web. 22 Mar. 2016..

→ Used for understanding of how to determine syllables in a word, but particularly how to handle the letter "y"

Price, E. C. "10000 Words." Mit.edu. Massachusetts Institute of Technology, n.d. Web. 22 Mar. 2016.

→ List of 10,000 commonly used English words compiled by an MIT professor. Used as my operative word list, and slightly censored.