Possessive Suffixes, Vowel Harmony and Final Obstruent Devoicing in Turkish

Turkish is an agglutinating language. Many rules come into play when we add suffixes to roots such as vowel harmony and final obstruent devoicing. In this project, I wrote a python program which allows users to insert a word and adds possessive suffix to the word according to the subject based on the rules of vowel harmony and final obstruent devoicing.

Rules

I will explain the rules according to the subject of the word.

- ***First singular possessive suffix (my):*** We add one of the suffixes (-ım, -im, -um, -üm) to the end of the word based on the last vowel in the root. We add -ım for a or ı; -im for e or i; -um for o or u; and -üm for ö or ü. E.g. “nefesim” (my breath). If the last letter of the root is a vowel, we do not add the vowel at the beginning of the suffix and add only -m. E.g. “masam” (my desk).
- ***Second singular possessive suffix (your):*** We add one of the suffixes (-(ı)n, -(i)n, -(u)n, -(ü)n) to the end of the word based on the last vowel in the root. We add -ın for a or ı; -in for e or i; -un for o or u; and -ün for ö or ü. E.g. “nefesin” (your breath). If the last letter of the root is a vowel, we do not add the vowel at the beginning of the suffix and add only -n. E.g. “masan” (your desk).
- ***Third singular possessive suffix (her, his, its):*** We add one of the suffixes (-ı, -i, -u, -ü) to the end of the word based on the last vowel in the root. We add -ı for a or ı; -i for e or i; -u for o or u; and -ü for ö or ü. E.g. “nefesi” (her breath). If the last letter of the root is a vowel, we add -s right before the suffix. E.g. “masası” (her desk).

- ***First plural possessive suffix (our):*** We add one of the suffixes (-(ı)mız, -(i)miz, -(u)muz, -(ü)müz) to the end of the word based on the last vowel in the root. We add -ımız for a or ı; -imiz for e or i; -umuz for o or u; and -ümüz for ö or ü. E.g. "nefesimiz" (our breath). If the last letter of the root is a vowel, we do not add the vowel at the beginning of the suffix. E.g. "masamız" (our desk).
- ***Second plural possessive suffix (your):*** We add one of the suffixes (-(ı)nız, -(i)niz, -(u)nuz, -(ü)nüz) to the end of the word based on the last vowel in the root. We add -ınız for a or ı; -iniz for e or i; -unuz for o or u; and -ünüz for ö or ü. E.g. "nefesiniz" (your breath). If the last letter of the root is a vowel, we do not add the vowel at the beginning of the suffix. E.g. "masanız" (your desk).
- ***Third plural possessive suffix (their):*** We add one of the suffixes (-ları, -leri) to the end of the word based on the last vowel in the root. We add -ları for a, ı, o, u; and -leri for e, i, ö, ü.

Other than this vowel harmony rule, we need to pay attention to final obstruent devoicing. When we add a suffix starting with a vowel, we need to turn strong consonants (p, ç, t, k) at the end of the root into weak consonants (b, c, d, ğ) in Turkish. P turns into b; ç into c; t into d; and k into ğ. For example, when we conjugate the word "nefes" (breath) according to the first singular, we say "nefesim" (my breath). However, when we conjugate the word "kitap" (book) according to the first singular, we say "kitabım" (my book) and turn the p at the end of the root into b.

Based on the rules of vowel harmony and final obstruent devoicing, I created a Python program which allows users to insert a word and adds possessive suffix to the word according to the subject. A similar logic is probably used in the translation softwares that we use in our daily life. However,

this program might be useful especially for those who learn Turkish as a second language. This is only for possessive suffixes, but we could add other suffixes and expand the project based on those vowel harmony and final obstruent devoicing rules. Especially, vowel harmony is at the core of Turkish suffixation.

Regarding the program that I developed, there are basically three parts. The first script is suffix_rules. Here, I used pynini library to create the rules. There are basically six rules according to the six subjects. In each of the rules in the script, I implemented the rules that I mentioned above. When we run this script, it creates a rules.far file, which I use for argument parsing and unit testing later on. The second script is argparse_file. Here, I used pynini and argparse libraries. It allows users to insert two arguments: the subject of the suffix with six options and the root word that they want to add the suffix to. The third script is unittest_with_far_file. Here, I am testing the program with six words based on six rules. I specifically picked six words which vary according to the rules above. “Nefes” (breath) and “nüfus” (population) are the roots that do not end with strong consonants but vary in vowel harmony. “Kitap” (book) and “melek” (angel) are the roots that end with strong consonants and vary in vowel harmony. Finally, “masa” (desk) and “bere” (barret) are the roots ending with vowels and vary in vowel harmony, as well.

The program passed all the 36 unit tests. I also tried testing lots of different words on terminal by using the arg_parse file. Actually, in the first versions, the program gave wrong results many times and I updated the rules accordingly. In the final version of the program, I have not experienced any wrong results. Though, there are some exceptions, which I couldn’t add as a rule to the program. There is the vowel deletion issue. For example, my program turns the word “beyin”

(brain) into “beyinim” (my brain) according to the first singular possessive suffix, but this is wrong. We should delete the last vowel of the root and it should be “beynim”. There are some words like this but those are exceptions in Turkish, but not general rules. So, my program does not include those exceptions.