Computational Morphology

Morphological Operations: Prosodic Circumscription

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Literature

- McCarthy, J. and Prince, A., 1990. „Foot and word in prosodic morphology: The Arabic broken plural.“ *Natural Language and Linguistic Theory* 8, 209-284.
- Roark, B. and Sproat, R., 2007. Computational Approach to Morphology and Syntax. New York, NY: Oxford University Press.

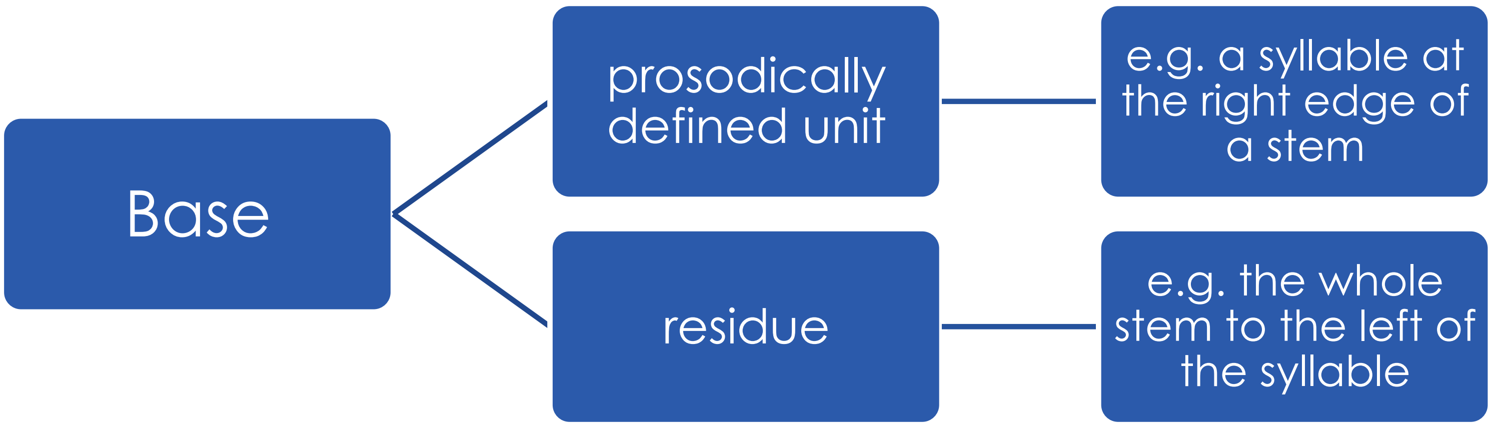
Prosodic Circumscription

- **Prosodic Circumscription of Domains**:

„The domain to which morphological operations apply may be circumscribed by prosodic criteria as well as by the more familiar morphological ones. In particular, the minimal word within a domain may be selected as the locus of morphological transformation in lieu of the whole domain.“

McCarthy and Prince (1990)

Prosodic Circumscription



The base (B) is factored into a prosodically defined unit (B:) concatenated (*) with residue (B/):

Concatenation

$$B = B: \;*\; B/$$

Base

Residue

Prosodically defined unit

Prosodic Circumscription

- **Prosodic morphological operations** may either apply to the prosodically defined unit *B:* or to the residue *B/*.
- Given an operation *O*, we can define operations *O:* and *O/* as follows:

  (1) O: = O(B:) * B/ [**positive circumscription**]

  (2) O/ = B: * O(B/) [**extrametricality**]

- In (1) we factor the base into *B:* and *B/*, apply *O* to *B:*, and reconstitute *O(B:)* with *B/*. We define B: as the prosodic domain to which operations apply.
- In (2) we factor the base, apply O to B/ and then reconstitute the result. We defined B: as prosodic domain to ignore and apply the operation to the residue.

Prosodic Circumscription

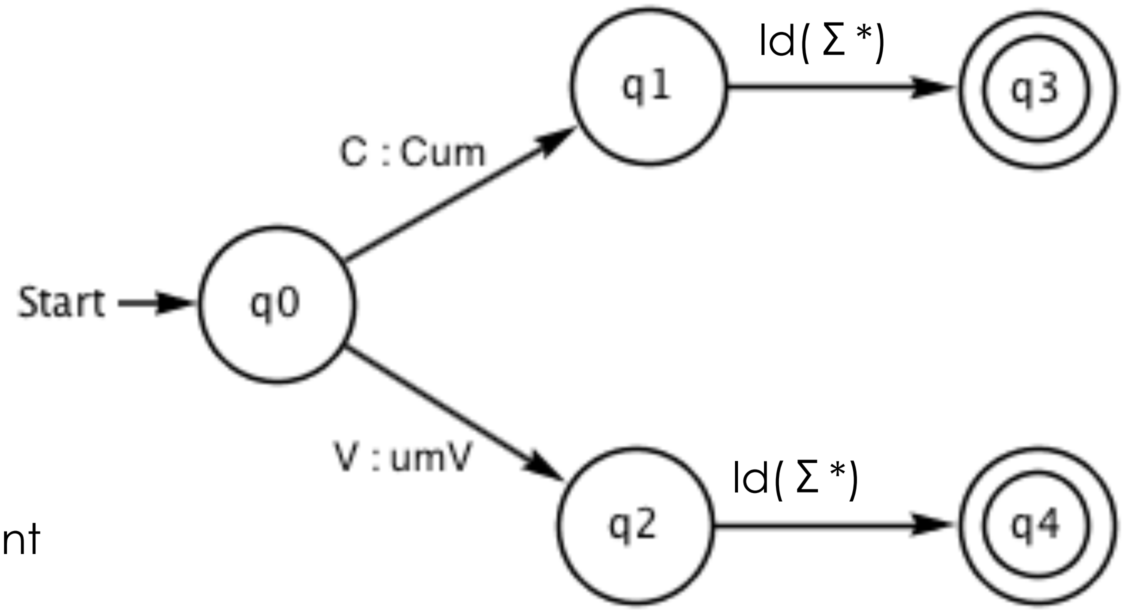
- **Positive circumscription** and **extrametricality** are common phenomena in morphology.
- An example for extrametricality is **infixation** in many Philippine languages – we ignore the first onset of a word, and attache the infix as a prefix to the reminder. **Example 1**:

tawag	| call
*t**<u>um</u>**awag*	| call (perfective)

- **Excercise 1**: draw a transducer where the affix *um* is placed either as an infix, like in the example above, when it proceedes after a consonant (**C**), or as an prefix, when the first letter of the infinite form is a vowel (**V**).

Prosodic Circumscription

- **Excercise 1:**



C – consonant
V – vowel
Id(Σ *) – regular language

Prosodic Circumscription

- As we can see in example 1, we can characterize the prosodic circumscription in terms of the finite-state operation of composition.
- The transducer **T** from example 1 can be defined as follows:

$$T = C?[\varepsilon : um]V\Sigma^*$$

- As for the example 1 (*t-um-awag*), we can characterize *-um-* either as prefixing to the residue (*-awag*), or as suffixing to the prosodically defined unit *t-*.

Prosodically Governed Concatenation

- An example of affixes with prosodic restrictions on their attachment are the English **comparative affix –*er*** and the **superlative affix –*est***. These affixes are restricted to bases that are **monosyllabic** or **disyllabic adjectives**. E.g.:

fat	fatter	fattest
yellow	yellower	yellowest
curious	*curiouser	*curiousest

- We can characterize the base to which the comparative affix attaches as follows:

B = C*VC*(VC*)?

Prosodically Governed Concatenation

- The comparative affix κ is characterized as follows:

$$\kappa = B[\varepsilon:er][+COMP]]$$

where B ist the base B = C*VC*(VC*)?

- Composing a base adjective *A* with κ would yield a non-null output Γ just in case the base *A* matches B:

$$\Gamma = A \circ \kappa$$

- More problematic are cases where the affix provides the template for the stem, insetad of selecting for stems that have certain prosodic forms (see exercise 2).

Prosodically Governed Concatenation

- **Exercise 2**: what are the affixation rules in the following example (for the template affixes)? Draw a transducer for -ʔaa affixation.

ROOT	Neutral affixes		Template affixes	
	-al	*-t*	*-inay*	*-ʔaa*
caw	caw-al	caw-t	caw-inay	cawaa-ʔaa-n
cuum	cuum-al	cuum-t	cum-inay	cumuu-ʔaa-n
hoyoo	hoyoo-al	hoyoo-t	hoy-inay	hoyoo-ʔaa-n
diiyl	diiylal	diiyl-t	diyl-inay	diyiil-ʔaa-n
ʔilk	ʔilk-al	ʔilk-t	ʔilk-inay	ʔiliik-ʔaa-n
hiwiit	hiwiit-al	hiwiit-t	hiwt-inay	hiwiit-ʔaa-n

Prosodically Governed Concatenation

- **Exercise 2**: the affix *–inay* requires the stem to match the template **CVC(C).** The template T for CVC(C) can be characterized as follows:

$$T_{CVC(C)} = CV[V : \varepsilon]^* C[V : \varepsilon]^* C?$$

  - ✓ only the first vowel ist preserved
  - ✓ any vowels after the second consonant are deleted

- Examples for composing $T_{CVC(C)}$ with particular stems:

$$\text{hoyoo} \circ T_{CVC(C)} = \text{hoy}$$

$$\text{hiwiit} \circ T_{CVC(C)} = \text{hiwt}$$

Prosodically Governed Concatenation

- **Exercise 2**: the affix -*ʔaa* requires the template **CVCVV(C).** The template T for CVCVV(C) can be characterized as follows:

$$T_{CVCVV(C)} = CV[V : \varepsilon]? \; C(V \cup [\varepsilon : V])(V \cup [\varepsilon : V])C?$$

  - ✓ forces the first V to match the vowel of the root
  - ✓ allows no second vowel in the root‘s first syllable
  - ✓ allows two vowels followed optionally by a consonant

Prosodically Governed Concatenation

- Simplified trandsucer for the suffix –ʔaa and template CVCVV(C) (only for the vowel o):