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References

Mongolian Syllable Structure

Jan-Olof Svantesson

Introduction
In this article, the syllable structure of standard Khalkha Mongolian is described and exemplified in some detail. The related problems of how Mongolian words are divided into syllables, and how epenthetic vowels are introduced are treated in Svantesson forthc.

The description is based on recordings and observations of Ulaanbaatar speakers. The semi-official orthographic dictionary by Damdinsürengiin & Osor 1983 has been used as an authoritative source of standard Khalkha forms, and the reverse alphabetical dictionaries by Vietze & Zenker 1976 and Bold 1976 have been especially useful for finding examples.

The phoneme system of standard Mongolian is given here for reference:

Vowels:
- i ə u əi
- u əi
- e ət e əi
- a ət a əi

Consonants:
- Labials p b m w
- Palatalized labials p' b' m' w'
- Dentals t d c [ts] z [dz] s ʃ [ʂ] r
- Palatalized dentals t' d' s ʃ [ʂ] r
- Alveopalatals ɛ [ɛ] ž [dz] ʃ [ʃ]
- Palatal ʃ
- Velars ɡ x ŋ
- Palatalized velars ɡ' x'
- Uvular ɡ

(Note that ʒ and ž denote the affricates [dz] and [dʒ], respectively.)

My analysis differs from what is usually given in Western sources (e.g. Poppe 1951, 1970, Street 1963, Beffa & Hamayon 1975), but is rather similar to the analysis of many Mongolian, Russian and Japanese writers (e.g. Todaeva 1951, Nadeljaev 1957, Sanžeev 1959, Coloo 1976, Möömöö
imperative, IRR irreal mood, NONP non-past, PL plural, PROG progressive, REFL reflexive, TERM terminal.

Syllable types
In this section I will exemplify all types of surface syllables that can occur in different positions in a word.

The number of possible syllable types is greatest in word-initial position, where long and short vowels contrast, and where syllables may or may not have an onset. Schwas do not occur in initial syllables.

(1) Word-initial syllable types

<table>
<thead>
<tr>
<th>CV:CCC</th>
<th>/jala/</th>
<th>[ja.la]</th>
<th>яла</th>
<th>‘fly’</th>
</tr>
</thead>
<tbody>
<tr>
<td>V:CCC</td>
<td>/ada/</td>
<td>[a.do]</td>
<td>адуу</td>
<td>‘horse’</td>
</tr>
<tr>
<td>CV:CCC</td>
<td>/to:la/</td>
<td>[to:la]</td>
<td>тулай</td>
<td>‘hare’</td>
</tr>
<tr>
<td>V:CCC</td>
<td>/arol/</td>
<td>[ar:ol]</td>
<td>арул</td>
<td>‘dried curds’</td>
</tr>
<tr>
<td>Vi:CCC</td>
<td>/ai:m/</td>
<td>[ai:m]</td>
<td>аймаг</td>
<td>‘district’</td>
</tr>
<tr>
<td>VC:CCC</td>
<td>/ulgr/</td>
<td>[ul:gr]</td>
<td>улгэр</td>
<td>‘story’</td>
</tr>
<tr>
<td>Vi:CCC</td>
<td>/oxai/</td>
<td>[oxai]</td>
<td>охорх</td>
<td>‘mine’</td>
</tr>
<tr>
<td>CVi:CCC</td>
<td>/nai:zor/</td>
<td>[nai:zor]</td>
<td>найзур</td>
<td>‘sprout’</td>
</tr>
<tr>
<td>Vi:CCC</td>
<td>/ail-tai/</td>
<td>[ail.tai]</td>
<td>айлаг</td>
<td>‘household-COM’</td>
</tr>
<tr>
<td>V:CCC</td>
<td>/arsi:/</td>
<td>[arsi:]</td>
<td>арсий</td>
<td>‘lion’</td>
</tr>
<tr>
<td>CV:CCC</td>
<td>/dawst-tai/</td>
<td>[dawst.tai]</td>
<td>давстай</td>
<td>‘salty-COM’</td>
</tr>
<tr>
<td>V:CCC</td>
<td>/ilst:te/</td>
<td>[ilst.te]</td>
<td>элстей</td>
<td>‘sandy-COM’</td>
</tr>
<tr>
<td>CV:CCC</td>
<td>/nurs-zeit/</td>
<td>[nurs:zeit]</td>
<td>нурсэтей</td>
<td>‘coal-miner-COM’</td>
</tr>
<tr>
<td>CVi:CCC</td>
<td>/noirt:s-tai/</td>
<td>[noirt:s.tai]</td>
<td>ноирстай</td>
<td>‘sleep-VERB-TERM-REFL’</td>
</tr>
</tbody>
</table>

A monosyllabic word can consist of any type of syllable that can be an initial syllable of a polysyllabic word, except that words of the type CV (where V is a short vowel) do not occur. (Some monosyllabic pronouns are...
written with an orthographic short vowel, e.g. əu <bi> ‘I’, ma <ta> ‘you’, but are nevertheless pronounced with a long vowel ([bi], [ta]) when found in focussed position.)

(2) Monosyllabic words

CV: /gu/ [gu] гуү ‘mare’
V: /ə/ [ə] оо ‘powder’
CVi /xi/ [xi] хүү ‘kin’
Vi /ai/ [ai] ай ‘category’
CVC /gu/ [gu] гуү ‘mare’
VCI /xu/ [xu] хүү ‘kin’
VIC /ai/ [ai] ай ‘category’
CVCC /daws/ [daws] давс ‘salt’
VCC /ard/ [ard] ард ‘people’
CVCC /gaams/ [gaams] гаамс ‘pipe’
VC /aiz/ [aiz] айз ‘spider’
CViC /maiis/ [maiis] майис ‘cypress’
ViC /ai/ [ai] ай ‘category’
CVCC /daws-t/ [daws-t] давст ‘salty’ (‘salt-ADJ’) 
VCC /ils-t/ [ils-t] илс ‘sandy’ (‘sand-ADJ’) 
CViCC /nurs-t/ [nurs-t] нүүрс ‘coal-miner’ (‘coal-AGENT’) 
VCC no examples found – probably accidental gap 
CViCC /maiis-t/ [maiis-t] майис ‘cypress-ADJ’
ViCC /aiis-t/ [aiis-t] айис ‘stocking-ADJ’

Non-initial syllables always begin with a consonant, and there is no short/long vowel contrast in them. The only difference between word-initial and word-final syllables is that a schwa cannot occur in absolute word-final position.

(3) Word-initial syllable types

CV /jala/ [ja.la] ялаа ‘fly’
CVi /toda/ [to.la] той ‘hare’
CVC /sag xor/ [sar.g xor] шамхуур ‘biscuit-stick’
CViC /xaraix/ [xa.rai.x] харийх ‘jump-PAST’
CaC /ulgi/ [u.lgi] улгэр ‘story’
CVCC /sana-rl-a/ [sa.nar.x.la] санаархлаа ‘intend-PAST’
CViCC /boozcai-rl-a/ [boz.gair.x.la] бузыайрхлаа ‘be haughty-PAST’
CaCCC /nolmst-t/ai/ [no.limst.tai] нулымэтт ‘tearful’ (‘tear-ADJ-COM’)
a coda, e.g. *canaa /san/ [sa.na] ‘thought’, xalxaxa /xalx-a/ [xal.xa] ‘shield–REFL’ (not *[san.a], *[xal.xa]). This kind of syllable division is regarded as uncontroversial in the phonological literature (see e.g. Kuryłowicz 1948:83, Kahn 1976:24, Selkirk 1982, Clements & Keyser 1983:37, Itô 1989). As for Mongolian, a rule that divides syllables in this way is given explicitly by Todaeva 1951:39–40, and can also be inferred from examples given in works by other native Mongolian scholars, for instance San'zeev 1959:18 and Cenggelti 1979:149. This syllable division is also supported by the fact, mentioned above and illustrated in (1) and (3), that the only consonant strings that can occur intervocally in surface forms are those that consist of a possible word-final surface consonant cluster plus one consonant which may occur word-initially.

Vowels never meet inside words. If a suffix beginning with a vowel (e.g. reflexive *-al-s/-el-s-a) is added to a word ending in a vowel, an epenthetic consonant, g or g depending on the vowel harmony class, is inserted between them:

(5) /ma/ [ma] ман ‘cattle’ reflexive: [ma.la] манаа
/sana/ [sa.na] санаа ‘thought’ [sa.na.ca] санаага
/xui/ [xui] хий ‘boy’ [xui.ge] хийгээ

Any consonant may be a surface onset, except ą. The velar nasal never appears as a syllable onset in monomorphemic words, and if it becomes an onset as the result of a morphological operation, it is changed to n:

(6) /xan/ [xan] хаан ‘Khan’
/xa'n-as/ [xa'n-as] хаанас ‘Khan-ABL’
/xui'/ [xui'] хий ‘girl’
/xuix-es/ [xui.'es] хийгээ ‘girl-ABL’

Rhymes
As seen in (1)–(4) above, the rhyme of a Mongolian surface syllable consists of a nucleus vowel (short, long, diphthong or schwa) which can be followed by a coda consisting of at most three consonants. In this section, the possible codas will be characterized in terms of a sonority scale.

Any single consonant except b and b' can be a coda. The historical explanation for these exceptions is that Old Mongolian b developed into w when preceded by a vowel, e.g. tabu > taw ‘five’, gobi > gow ‘desert’.

Two-consonant codas are exemplified in (7), in word-final and word-internal position. The examples of word-internal codas given here are formed by adding the comitative case suffix -tai ~ -toi ~ -te (which can be added to any uninflected noun or adjective).

(7)

| a. | /zims/ | [zims] | жимс ‘fruit’ | comitative: |
| /xuns/ | [xuns] | хунс ‘foodstuffs’ |
| /on's/ | [on's] | онс ‘spring’ |
| /copx/ | [copx] | цонх ‘window’ |
| /limb/ | [limb] | лимбэ ‘flute’ |
| /dond/ | [dond] | дунд ‘middle’ |
| b. | /ols/ | [ols] | улс ‘state’ |
| /talx/ | [talx] | талх ‘bread’ |
| /ar'x/ | [ar'x'] | архи ‘liquor’ |
| /ard/ | [ard] | ард ‘people’ |
| /ałdz/ | [ałdz] | аалз ‘spider’ |
| /arc/ | [arc] | аарц ‘curds’ |
| c. | /ujs/ | [ujs] | ус ‘time-PL’ |
| /sawx/ | [sawx] | савх ‘chopsticks’ |
| /sowd/ | [sowd] | сувд ‘pearl’ |
| /coj-d/ | [coj.d] | гоёд ‘elegant-DAT’ |

The two-consonant codas exemplified in (7) consist of a sonorant (nasal (7a), liquid (7b) or glide (7c)) followed by an obstruent, and are thus consistent with the well-known ‘sonority law’, saying that syllables generally have decreasing sonority from the vowel nucleus towards the edges (Whitney 1866, 1874, Sievers 1876:111 ff., Jespersen 1897–99:525; for a recent treatment, see Clements 1990 who also surveys older and newer literature on this subject).

Different authors give somewhat different versions of the sonority scale, and also differ as to the exact way of interpreting it. Clements (1990, 1992) maintains that a sonority scale which universally accounts for core syllabification is derivable from the major class features (cf. Basbøll 1977) and involves the four consonant classes obstruents (O), nasals (N), liquids (L) and glides (G), each being more sonorous than the preceding one (and less sonorous than the vowels): O<N<L<G(<V). As seen in (7), the combinations NO, LO and GO are possible codas. The other combinations of the four sonority classes are exemplified in (8). These do not form codas, and a schwa must be inserted between them to
make a well-formed syllable. (This assertion will be modified somewhat below.)

(8) OO /x'atd/ [x'a.tad] Хятад ‘China’
/otd/ [o.tad] утас ‘thread’
/oxt/ [o.ta.t] ортох ‘physician’
/mexs/ [me.xa.x] мөхөс ‘weak’
/caixs/ [gai.xa.x] гайхас ‘wonder’
/gids/ [gi.da.x] гадас ‘belly’

ON /dotn/ [do.ta.n] дотно ‘inside’
/ox't/ [o.x'a.t] охин ‘daughter’
/xart/ [xa.ta.t] хатан ‘queen’
/hotm/ [to.ta.m] тутам ‘each’

OL /saxl/ [sa.xa.l] сахал ‘beard’
/ažl/ [a.zh.l] жил ‘work’
/batr/ [ba.tar] батар ‘hero’
/oazr/ [oa.za.r] оараз ‘place’

OG /sidw/ [si.daw] содов ‘theme’
/tosw/ [to.ta.sw] тосов ‘plan’

NN /omn/ [o.man] омон ‘southern’
/unq/ [u.naq] унэн ‘truth’

NL /xamr/ [xa.ma.r] хамар ‘nose’
/onl/ [o.nal] онол ‘theory’
/tam’r/ [ta.ma.r] тамир ‘strength’
/unl/ [u.nal] улэр ‘smell’

NG /on-w/ [o.na.w] унав ‘fall-PAST’
/nim-w/ [ni.ma.w] нимэв ‘add-PAST’

LN /al’m/ [a.l'm] алым ‘apple’
/durm/ [du.ru.m] дүрэм ‘rule’
/šš/ [sš] олон ‘many’
/xum/ [xu.ru.m] хунэм ‘brown’

LL /gor’l/ [go.ro’l] гурил ‘flour’
/bolr/ [bo.lo’r] болор ‘crystal’
/girl/ [gi.ru’l] гарл ‘light’

LG /derw/ [do.ru’l] дерев ‘four’
/bor’w/ [bo.ro’l] борв ‘skin bag’
/gawl/ [ga.lw] галав ‘era’

The examples in (7) and (8) show that the three classes nasals, liquids and glides are treated as having the same sonority value in Mongolian syllabification, which can be described by using only two sonority classes (in addition to the vowels), obstruents and sonorants (S), and a correspondingly simpler sonority scale: O<S(<V).

Thus the codas obey a very strict form of the sonority law applicable at the surface level:

(9) Coda constraint: A string of (zero or more) consonants is a possible coda if and only if it has strictly decreasing sonority.

A consonant string may fulfill the coda constraint without actually occurring as a coda, but in that case it does not occur in underlying strings, either because of a segmental rule or because it is an accidental gap. For instance, a consonant preceding a palatalized consonant is always itself palatalized, so codas like *rx’ or never occur, although they are admitted by the coda constraint.

It can be noted that the length of the coda need not be specified, since it cannot be greater than the number of distinct sonority classes (cf. Steriade 1982:223). Thus there is no need to stipulate a syllable template (Selkirk 1982; Clements & Keyser 1983, etc.). (Three-consonant codas will be treated below.)

Voiced velar and uvular stops

The examples given so far do not involve the voiced velar and uvular stops ɡ, ɡ’ and ө (the class of these three sounds will be denoted F). Their behaviour is exemplified in (10). (As in (7), word-internal examples can be
constructed from uninflected nouns and adjectives by adding the comitative suffix.)

(10) ГО /sags/ [sags] carг ‘basket’
/bagd/ [bagd] bagги ‘teacher’
/bugd/ [bugd] bugд ‘all’
/жг/ [жг] жг ‘steep’
/таот/ [таот] таот ‘balcony’
/богд/ [богд] богд ‘holy’
/богд-d/ [богд d] богд ‘experienced-DAT’
/заг’s/ [заг’s] заг ‘let foal suckle another foal’s mother’

ГS /о-г-w/ [о.г.аw] огов ‘to give-PAST’
/сугд/ [сугд] сугд ‘whistle’
/аор/ [а.ор] аор ‘aloe’
/бог’n/ [бог’н] богн ‘short’

ОГ /ао/ [а.о] ао ‘cup’
/болд/ [болд] болд ‘gift’
/хадо/ [хадо] хадо ‘door’
/оног/ [оног] оног ‘foil’
/мон/ [мон] мон ‘gutter’

ГГ /сао/ [сао] сагар ‘buckwheat’
/сог’-g/ [сог’-g] сог ‘to canter-IMP’
/лгг/ [лгг] лёг ‘sieve’

These examples are compatible with the coda constraint provided that the voiced velar and uvular stops are counted as sonorants in Mongolian, although they are phonetically obstruents.

The decision to regard g, g’, o as sonorants minimizes the number of exceptions, but some still remain. One is the combination os, which does not form a coda, but requires a schwa, as in /sags/ [за.gас] зааг ‘fish’. The clusters gs and g’s are possible codas, however (see examples given above).

Other exceptions are the clusters ng, ng’, no, which are allowed as codas, although they violate the Mongolian sonority law where g, g’, o are regarded as sonorants (this place of articulation of the velar nasal is assimilated to a following obstruent):

(11) /монг/ [монг] монг ‘silver’
/анг’/ [анг’] анг ‘class’
/м’анг/ [м’анг] манга ‘thousand’

Fricative-stop codas

The clusters st, sc, xt, xc and xt’ occur as codas, although they consist of two obstruents and thus violate the sonority law as formulated above. Examples are given in (12), where word-internal examples are constructed mechanically by adding the comitative suffix, as in (7):

(12) /ус-т/ [уст] уст ‘hairy’ (‘hair-ADJ’)
/ус-т-te/ [уст.те] устёй ‘hairy’ (‘hairy-ADJ’)
/ос-ц’/ [осц’] уц ‘swimmer’ (‘water-AGENT’)
/ос-ц-таi/ [осц-таи] уцтаи ‘swimmer’ (‘water-ACTOR’)
/туи-т’/ [туи.таи] туйтаи ‘historical’ (‘history-ADJ’)
/тац’/ [тац’] тах ‘magpie’
/тац’-таi/ [тац’-таи] тахтаи ‘magpie’
/бок’-т/ [бок’-т] бокт ‘become tar-filled’ (‘tar-VERB’)

Although one might expect that the similar sequences xt’ and xc can form codas as well, I have found no examples that prove or disprove this. Presumably they are accidental gaps, since palatalized consonants have a fairly low frequency of occurrence.

It is not the case that all voiceless fricatives (s, с, x, x>) form coda clusters with voiceless coronal stops and affricates (t, т, c, d), since s and c do not form coda clusters of this type:

(13) *ст’о /хост’ [хост] (not *хост) хость ‘a kind of tree’
*с’о /нис-сге [нис-сге] (not *нис-сге) нисэгэ ‘to fly-COLL’
*к’о /хок’-с [хок’-с] (not *хок’-с) хок ‘indigo’ (‘blue’)
*сл’уу-сге [луу-сге] (not *луу-сге) луу ‘to lean against-COLL’

Thus, the dental and velar fricatives s and x form codas with the dental stop t and the alveopalatal affricate ç [tʃ], but not with the dental affricate c [ts].

Clusters of fricatives and stops (or affricates) with different voicing value do not form codas, but trigger epenthesis, e.g.
Three-consonant codas
Any sonorant followed by one of the clusters -st, -xc, -xt, xc, xτ may form a coda, and no other three-consonant codas occur. Examples (see also (1)- (4) above):

(15) *sd]e /usd/ [u,sad] ycъл ‘very’
*sd]e /uxsd/ [xu,sad] хъхэл ‘child’
*sz]e /uxz-2/ [xu,sa] хъэж ‘want-PROG’
*sz]e /ux-2/ [ux,sa] хъэж ‘die-PROG’

The only exceptions known to me are est and osc which are impossible as codas, and trigger epenthesis, as a consequence of the fact, mentioned above, diat as is an impossible coda: /zacs-c/ [za.Gssc] са́цэ ‘fisherman’ (‘fish-ACTOR’); cf. /zaos/ [za.oas] саó ‘fish’.

Conclusion
Mongolian syllable structure is governed by the facts that a syllable onset is unmarked, containing one consonant, and that the form of the coda is determined by the sonority law, saying that codas must have decreasing sonority according to a sonority scale with only two classes: obstruents and sonorants (including voiced velar/uvular stops). There is thus no need for syllable templates.

There are some exceptions to this simple characterization of Mongolian syllables, in particular the three-consonant codas which involve a sonorant and certain fricative-stop combinations. A possible way to cope with these is to retain the coda constraint (9), and assume that fricatives and stops/affricates have different sonority value. This approach allows some non-occurring codas which have to be filtered out (cf. Svantesson forthcoming).

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