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Metrical pattern in Noakhali Bangla: An OT account

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Abstract
Noakhali Bangla (NKB), an eastern dialect of Bangla spoken in Tripura (India) and Bangladesh, has prosodic properties as listed below:
a) every content word is a prosodic word; b) binary trochees are constructed from left-to-right; c) strict iterative footing is not allowed; d) rhythm is ternary: every third syllable, after the initial prominence, is assigned stress; e) in three and six syllable words the rightmost syllable remains unfooted; f) in four syllable words the two right most syllables remain unfooted; g) in five syllable words a second foot is constructed aligned with the right edge of the word; h) primary stress is mandatorily assigned to the left most syllable; i) maximum size of a word with light (CV) syllables is of six syllables; and with CVC the size is four syllables; j) there is no quantity distinction among syllables: CV, CVC, CVV, CVVC are all Light'
Within the dispensation of Optimality Theory, the entire story of the NKB metrics can be captured in terms of the following
a) For CV sequences the projected constraint hierarchy is:
GrWd=PrWd, FT-BIN, *[σV, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ >> ALL-FT-L, DEP-μ-IO
b) For sequences of containing CVC, CVV, CVVC with or without CV the grammar is:
GrWd=PrWd, FT-BIN, *[σV, NUCLEUS, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ >> ALL-FT-L, DEP-μ-IO >> *C]σ
Ternary rhythm is a marked phenomenon in prosody across the world. Invocation of *Lapse (in its varied incarnations) is well known in literature, though well challenged as well. Keeping the controversy at bay, the study offers a straight forward account of the phenomenon with binary trochees dispersed by one upbeat, even as rhythmicity is not forfeited. Appropriate ranking of universal constraints does the miracle.

Keywords: ternary rhythm, optimality theory, constraint hierarchy, prosody

1. Introduction

Noakhali Dialect of Bangla or NKB is spoken in the southern part of the Indian state of Tripura and the Noakhali district of Bangladesh. It is a cliché that non-standard varieties suffer from academic and associated discriminations. NKB is no exception. There are however some descriptive accounts of, let us say, the language available though they are very difficult to come by. No attempt has been made so far to explore and analyse the metrical pattern of NKB. In the present study a formal documentation of the stress distribution pattern within words of various size in NKB has been made and it is followed by offering an explanation of its prosodic properties. For the latter, the author follows the non-processual mode of grammar proposed by Optimality Theory (OT) (McCarthy and Prince 1993, Prince and Smolensky 1993) [11]. Prosody of representative words of the system is analysed in terms of ranked constraints invoked from universal repertoire.

As for its distinct prosodic features it is noted that NKB like Tripura Bangla (Das 2001) [1] has a ternary rhythm with binary feet (trochees) iterated from the left to right. Every third syllable after the initial prominence is stressed. In three syllable words the final syllable goes unparsed. So do the last two syllables in four syllables. In pentasyllables the two final syllables constitute a second trochee with secondary stress. The two feet are separated by an up-beat in the middle and the last syllable remains unfooted. Same is the picture in cases where larger syllables of CVC or CVV or CVVC type are included. This is a strong piece of evidence that NKB discards quantity distinction and hence no stress shift is attested: all syllables are light whether of types V, CV, CVC, CVV, CVVC.

In stress placement the morphological properties of the syllable such as root vs. affix is also ignored. An OT grammar of NKB metrics has been projected to provide a principled account of all these.
§2 offers the data for one to six syllables of CV type. §3 introduces the relevant constraints and in §4 an OT grammar is constructed bit by bit. §5 does the same for sequences having larger syllables though *not heavy* in NKB. §6 winds up the findings.

2. Data: Sequences of CV syllables

1. Monosyllables: CV → (L) → (σ́)

'physique' 'sheet of paper'
'leg' 'chopper'

2. Disyllables: CV.CV → (LL) → (σ́σ)

.d̪u 'gourd' .su 'arum'
˝.d̪u 'knee' .sa 'broom'

3. Trisyllables: CV.CV.CV → (LL)L → (σ́σ)σ

.ra.li 'corns of sugar/molasses'
.d̪.li 'a type of medicinal herb'
. .ni 'treat to new matrimonial guests'
.d̪.ma 'dullard'

4. Quadra syllables: CV.CV.CV.CV → (LL)LL → (σ́σ)σσ

.ri.mo.ʃi 'sluggishness'
.d̪.mo.ni 'herb type'
.ra.sa.li 'erratic behaviour'
.la.ba.t̪i 'rural picnic'

5. Pentasyllables: CV.CV.CV.CV.CV → (LL)L(LL) → (σ́σ)σ(σ̀σ)

.t̪.zu.g̀.t̪a 'competition'
.ma.lɔ.ɔ̀.na 'criticism'
.ra.zɔ.k̀.t̪a 'anarchy'
.ri.βɛ.ʃ̀.na 'distribution'

6. Hexasyllables: CV.CV.CV.CV.CV.CV → (LL)L(LL)L (σ́σ)σ(σ̀σ)σ

.mɔ.nɔ.z̀u.gi.t̪a 'inattentiveness'

3. OT Constraints

In stress languages all content words (noun, verb, adjective and adverbs) must be a Prosodic Word. The latter must contain a foot as its head and every foot must have a stressed syllable as its head as stipulated by Prosodic hierarchy (7) below. (Selkirk 1980, McCarthy and Prince 1986).

(7) Hierarchy

Prosodic

PrWd	Prosodic Word
Ft	Foot
σ	Syllable
μ	Mora

This is dictated by the need to capture the principle of culminativity in terms of an OT constraint. The constraint is formulated as (8) below.

8. GrWd=PrWd

A grammatical word must be a prosodic word. (Kager 1999: 152) [2]

Universally, every grammatical word is a prosodic word and prosodic word contains minimally a foot. A powerful cross-linguistic preference in stress languages is rhythm or regular alternation of strong and weak syllables. In metrical phonology such alternating patterns are interpreted as the grouping of syllables into rhythmic units or feet. To fulfil this fundamental rhythmic requirement every foot must be binary as defined by the constraint below.

9. FT-BIN

Feet are binary under moraic or syllabic analysis. (Kager 1999: 300) [1]

A foot must contain either two moras as in a heavy (H) monosyllable, or in (LL) or two light syllables (σσ). A key function of FT-BIN is to exclude a degenerate foot (L) which is strongly ruled out in many languages. FT-BIN also ensures the fulfilment of minimal word condition.

Of the two items, say syllables within a foot, either the initial or the final one is stressed. When the initial syllable bears stress, the foot is called a trochee. Converse, when the second syllable is prominent the result is an iamb.

10. Trochee

Within a foot, every '*' is followed by a '.'
(Vijver 1998: 6) [13]

A foot – whether a trochee or iamb – is ideally constituted of two syllables in its syllabic analysis. That is, all syllables within a prosodic word are incorporated or 'parsed' by foot. For this the OT grammar invokes the following universal constraint:

11. Parse-σ

'Syllables are parsed by feet'. (Kager 1999:153) [5]

Across languages it is observed that the foot bearing the primary stress (i.e., the head foot) within a prosodic word is

commonly aligned with the left or the right edge of the word. In OT system a pair of constraints are proposed to represent the issue in grammar.

12. Align-LEFT (ALIGN-L)
Align (PrWd-L, Ft-L) (Elenbaas and Kager 1999: 292) [5]

13. Align-RIGHT (ALIGN-R)
Align (PrWd-R, Ft-R)

These constraints based on Prince and Smolensky (1993) [11] are 'peak aligning' constraints. In a language where the head foot is a trochee the most prominent syllable stands aligned with the left edge of the word. Converse is the picture in a language where the head foot is an iamb aligned right with the prosodic word[1].
In a language, for instance Noakhali Bangla (NKB), successive feet are not allowed. To address this issue an OT constraint is invoked stated as below.

14. *FTFT
Feet must not be adjacent. (Kager 1994) [4]

Let us see how these constraints interact to account for the emergence of the optimal prosodic forms in the light syllable sequences in NKB.

4. OT grammar for NKB metrics
4.1 Select data

15.
a. d̪a(σ́) 'chopper'
b. .su (σ́σ) 'arum'
c. .dɔ.ma(σ́σ)σ 'dullard'
d. .ra.sa.li (σ́σ)σσ 'erratic behaviour'
e. .ti.zu.g̀.t̪a(σ́σ)σ(σ̀σ) 'competition'
f. .mɔ.nɔ.zu.gi.t̪a (σ́σ)σ(σ̀σ)σ 'inattentiveness'

The general facts of NKB metrics for light syllables are
1. every content word is a prosodic word;
2. binary trochees are constructed from left-to-right;
3. iterative/successive footing is not allowed;
4. rhythm is ternary: every third syllable after the initial prominence is assigned stress;
5. in three and six syllable words the right most syllable remains unfooted;
6. in four syllable words the two right most syllables remain unfooted;
7. in five syllable words a second foot is constructed aligned with the right edge of the word;
8. primary stress is mandatorily assigned to the left most syllable;
9. maximum size of a word with light syllables is of six syllables.

To capture these properties in OT discourse the relevant constraints are GrWd=PrWd, FT-BIN, TROCHEE, ALIGN-L, *FTFT and PARSE-σ. Except PARSE-σ all other constraints remain undominated in the ranking. Hence the OT grammar stands as in (16). Let us begin the computation with three syllable words.

16. GrWd=PrWd, FT-BIN, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ

17. bɛ.d̪ɔ.ma → (bɛ́.d̪ɔ).

.d̪ɔ.	GrWd= PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-σ
a. ☞ (b.ɔ).						*
b.ɛ.(́.a)				*!		*
c. (b.ɔ).(̀()		*!	*		*	
d. (b.ɔ).			*!			*
e.b.ɔ.	*!					***

In (17) candidate (b) incurs a fatal violation of ALIGN-L by failing to place the primary stress on the left most syllable and leaving it unfooted. (c) is judged suboptimal for constructing successive feet in violation of the high ranked constraint *FTFT. Moreover, the second foot is built on an (L) a degenerate foot in violation of FT-BIN and TROCHEE. NKB does not allow foot degeneracy, though not discussed here. By contrast, (a) wins out by having obeyed all the undominated constraints. That the last syllable is left unfooted invites violation of PARSE-σ. But this does not harm the selection of the optimal output since the constraint is lowest in ranking. Violation of this faithfulness constraint is necessitated to satisfy the high-ranking foot wellformedness constraints.
Let us now turn to projecting the OT grammar for a four-syllabic word with the same constraint ranking.

18. a.ra.sa.li → (á.ra).sa.li

.ra.sa.	GrWd= PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-σ
a. ☞ (á.ra).sa.						**
b. (a.a).(̀.i)					*!	
c. a.(́.a).				*!		**
d. a.ra.(s.i)				*!*		**
e. a.ra.sa.	*!					****
f. (́.a.a).		*!	*			*

(18b) violates *FTFT by constructing two successive feet and hence is not selected. (c) disobeys ALIGN-L as the left most syllable is left unmetrified and hence ruled out. (d) violates the alignment constraint twice while one violation mark is enough to fetch the negative verdict. The bottom line of the story is therefore (18a) is adjudged the most harmonic by the parallel ranking of markedness and faithfulness constraints.
In a five-syllable word also the prosodic grammar proposed here proves its mettle.

19. ho.t̪.zu.gi.t̪a → (h́.i).zu.(̀i.t̪)

.i.zu.gi.	GrWd= PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-σ
a. ☞ (h.i).zu.(̀.a)						*
b. (́.i).(z.i).t̪a					*!	*
c. ho.(t.u).(g.a)				*!	*	*
d. (́.i).z.i.t̪a						**!*
e.o.u. i.	*!					*****
f. (h.i.u).gi.(̀()		*!*	**			*

[1]Another pair of alignment constraint under the umbrella term EDGEMOST (qua Prince and Smolensky 1993) are also proposed: LEFTMOST and RIGHTMOST. However, let us keep those aside here.

Some more interesting developments crop up in (19). Candidate (f) fails in regard to FT-BIN: the first foot has three syllables and the second has one. (e) runs counter to GrWd=PrWd as no metrification takes place. This is a fatal violation! In consequence PARSE-σ is violated five times as against the optimal allowance of one violation. (d) is an interesting case: it succeeds in satisfying all the undominated constraints but fails to do so to the lowest ranked faithfulness constraint PARSE-σ. Compared to the optimal candidate (a) it incurs two extra violation marks in respect of this constraint. Hence it is judged suboptimal. It is a unique property of OT grammar that if the high ranked constraints fail to do the proper evaluation of a potential output candidate, the lower ranked constraints can come into play and give the appropriate verdict. (c) incurs fatal violation of the alignment constraint ALIGN-L and hence gets discarded. Violation of *FTFT and PARSE-σ only worsen the case. (19a) therefore is evaluated as the winner or the optimal candidate.

Now a big challenge awaits us. A hex asyllabic word is metrified as (σ́σ)σ(σ̀σ)σ. Two syllables are left unfooted. Let us have a first-hand experience of its evaluation process by (16).

20. ɔ.mɔ.nɔ.zu.gi.t̪a → (ɔ́.mɔ).nɔ.(z̀u.gi).

.mɔ.nɔ.zu.gi.	GrWd=PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-σ
a. ☞ (.ɔ́).ɔ.(u.i).						**
b. (ɔ.ɔ).(n.u).(.à)					*!*	
c. ɔ.(m.ɔ).u.(.̀t)				*!		**
d. ☞ (ɔ.ɔ).ɔ.u.(.̀a)						**
e. ɔ.ɔ.ɔ.u.i.t̪a	*!					******
f. (ɔ́).ɔ.(z̀.).(a)			*!*			**

This time the grammar projected so far fails to yield the attested output. Candidates (b, c, e, f) are ruled out because of incurring fatal violation of at least one undominated constraint each. (f) in particular constructs iambs instead of trochees which is not allowed in NKB. The tussle is between (a) and (d). Both perform uniformly and hence have equal claims for optimal status. But this is contrary to the facts of the language. TWO SUCCESSIVE UNFOOTED SYLLABLES ARE NOT ALLOWED since rhythmicity is perturbed.

A solution to this problem necessitates invocation of another alignment constraint stated below.

21. ALL-FOOT-X (ALL-FT-L/R)

'The edge X of every foot coincides with the edge X of some PrWd.'

(McCarthy & Prince 1993, Prince and Smolensky 1993) [11]

This is an independently motivated edge-oriented alignment constraint where X refers to either the left or right edge of a word. This constraint keeps the inter-feet distance within the permissible limit requiring all feet to be as close as possible to the designated edge of the PrWd. In NKB the X stands for left i.e., L and hence the virtual constraint is ALL-FT-L.

In a word with multiple feet ensuring rhythmic alternation, any foot other than the initial one will compulsorily violate this constraint. In NKB this constraint cannot remain undominated precisely because of the need for rhythmic iteration. It must be dominated by PARSE-σ to enforce multiple feet per word. But though dominated, ALL-FT-L exerts its influence in a subtler way by restricting the optimal candidate from violating it more than minimally. That is, this candidate has all its feet as close as possible to the left edge of the PrWd, measured by number of syllables distancing every foot from the left edge of the word. So, the constraint ranking needed to predict the ternary alternation is a six-syllable word in NKB is as in (22) below.

22. GrWd=PrWd, FT-BIN, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ >> ALL-FT-L

23. ɔ.mɔ.nɔ.zu.gi.t̪a → (ɔ́.mɔ).nɔ.(z̀.gi).

.mɔ.nɔ.zu.gi.	GrWd=PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-σ	ALL-FT-L
a. ☞ (ɔ.ɔ).nɔ.(u.i).						**	***
b. (ɔ.ɔ).(n.u).(.à)					*!*		** ****
c. ɔ.(.ɔ́).zu.(.̀a)				*!		**	* ****
d. (ɔ.m).nɔ.zu.(.̀a)						**	****!
e. ɔ.mɔ.nɔ.zu.gi.	*!					******	
f. (ɔ.m).nɔ.(z̀.).			*!*			**	***

ALL-FT-L, a gradient constraint, rules out (d) since the latter incurs one more violation mark compared to the optimal candidate (a). The second foot stands four syllables away from the left edge of the word in (d), and three syllables in (a).

In all the tableaus above we have constructed and tested out an OT grammar for accounting for the metrical patterns in words of three to six light syllables. It is the same ranking relation of the relevant universal constraints that successfully yields the attested optimal outputs in NKB. In course of the journey, it has been demonstrated as to how to rationalize the selection of the appropriate constraints and rank them so that the most harmonic output emerges defeating all rivals in the fray.

Let us now turn to monosyllables and disyllables of NKB. All disyllabic words constitute a trochee irrespective of the types of the 'quantity' of the syllables: (HL) or (HH) or (LH) or (LL) = (σ̀.σ). It is amazing that the same grammar

remains invincible. For instance, look at the following tableau for a disyllabic word of (LL) type.

24. ko.su → (k.u) 'arum'

ko.su	GrWd=PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-σ	ALL-FT-L
a. ☞ (.u)							
b. (k.)			*!				
c. ().()		*!*	**		*		*
d. k.	*!					**	

Except (24a) all other candidates incur one or more violation marks in respect of the undominated constraints and all turn out to be suboptimal. (a) by contrast obeys all the constraints and so wins the race. A word of caution however! In OT all constraints are violable though violation *is* minimal and optimal candidates need not satisfy all the constraints. In the present limited portion of the overall hierarchy of OT grammar, (a) remains 'ideal' and hence 'perfect'. However, when cast in the total algorithm of ranked constraints certain violation marks will definitely crop up. This will not jeopardise its optimal status however.
In fine, we extend the grammar to words of monosyllabic type repeated from (1).

25. CV → (L) → (σ)
'physique' ṭa'sheet of paper'
'leg' ḍa'chopper'

In the foregoing discussion it has been stated that NKB does not allow degenerate foot constructed on a single light syllable with a single mora. That will violate two high-ranking prosodic constraints FT-BIN, TROCHEE. To satisfy both these constraints NKB, in consonance with cross linguistic practice (cf. Tripura Bangla (Das 2001) [1], SCB (Ghosh 1996) [3] among others) resort to phonetic lengthening of the root vowel so as to ensure a bimoraic structure at the surface. In consequence, demands of word minimality is also met in addition to those of FT-BIN, and TROCHEE. This is illustrated below.

26.
→ [gaː] 'physique' → [ṭaː] 'sheet of paper'
→ [ɸaː] 'leg' → [ḍaː]'chopper'

Moraic lengthening of the underlying vowel is preferred in NKB though not exclusive of other means.[2] For NKB words like these an anti-epenthesis constraint DEP-μ-IO needs to be invoked.

27. DEP-μ-IO
Output moras have input correspondents.
(McCarthy and Prince 1995)

Being a faithfulness (Correspondence) constraint, it militates against insertion of any new segment, here a vowel resulting in the insertion of mora. But this has to be ranked very low -- below markedness constraints which force insertion. The anti-degenerate constraint FT-BIN and TROCHEE must dominate DEP-μ-IO in the overall hierarchy. For clarity and comprehensiveness, we continue with the ranking developed so far for larger words:

28. GrWd=PrWd, FT-BIN, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ >> ALL-FT-L, DEP-μ-IO

The ranking relation between ALL-FT-L and DEP-μ-IO is indeterminate as of now. The efficacy of the projected OT grammar to select the optimal candidate is shown below.

29. ḍa → (ḍa)

	GrWd= PrWd	FT-BIN	Trochee	Align-L	*Ftft	Parse-Σ	ALL-FT-L	DEP-μ-IO
a. ☞ (d)								*
b. (d)		*!	*					
c.	*!					*		

The candidate (29a) fulfils binary foot requirement and, in the process, minimum word condition too. Rest of the high ranked constraints are vacuously satisfied. The lowest ranked DEP-μ-IO needs to be violated under pressure from the stronger constraints. So (a) emerges victorious in the competition. Exclusion of (b) and (c) is self-explanatory.
Vowel lengthening on surface is also attested in respect of diphthongs such as in
'well' rua'bamboo/wood for thatch'
'where' k^hoi 'burst rice'
'gourd' zau'gruelled rice' etc.

This a crucial piece of evidence that the moraic value of a diphthong is monomoraic: vowel length is not phonemic and a diphthong is not bimoraic.
To wind up the journey, let us now have a look at NKB monosyllables like the following.

30.

NKB	SB/SCB/TB		NKB	SB/SCB/TB	
ṭẽa	ṭaka	'money'	ḍẽa	ḍɛka	'calf'
sia	cika	'rat type'	ʃoi	ʃok^{h}i	'fem. friend of woman'
bia	bije	'marriage'	loa	loha	'iron'
roa	ropa	'plant transplanting'	bẽa	bãka	'curved'
mua	muk^{h}a	'mother's sister's husband'	hia	piʃa	'father's sister's husband'
bai	baʃi	'stale'	gõi	g^{h}oʃi	'dried cow dung'
boa	boba	'dumb'	dia	diʃa	'common sense'
hãi	ʃami	'husband'	gãi	gaṛi	'car'

As the corresponding SCB/Sadhu Bangla/TB words in the right columns show all these NKB monosyllables with diphthongs were disyllabic once. In course of time through deletion[3] of the onset consonant in the unstressed second

[2] The additional mora is often inserted in CVC bases by epenthesis of a vowel at the right edge: CVC → CVC.CV e.g., cak → sak.ka 'dry lump of earth', gĩiṭ → giṭ.ṭa/gɪṭ.ṭʊ 'knot', aṭ → aːṭ/ aʃ.ṭɔ 'eight' etc. *[σV forces gemination across syllable boundary.

[3]Deletion of onset of the second syllable in a trochee of (CV.CV) type is characteristic of Tripura Bangla as well and for detailed discussion consult (Das 2001).

syllable the two vowels came to be adjacent. Now, do they unite to form a diphthong or do they stand distinct across syllable boundary? And is the word metrified as disyllabic? Let us explore the options one by one.

Let us assume that the vowel of the second syllable continues to surface in the output because of its moraic value. Without its mora the word will fail to get parsed in respect of FT-BIN, TROCHEE, and above all word minimality. Each of the above words is therefore a disyllabic trochee prosodically. In such a case, certain crucial problems crop up:

1. the second syllable goes onsetless in (CV.V) and this is universally dispreferred;
2. if (CV.CV) is assumed to be the UR of the NKB words, the issue of onset deletion followed by supplying a dummy onset in the form of a glide posits a big challenge;
3. these intermediate steps of deletion and substitution enforce a derivational grammar contrary to the non-processual mechanism of OT raking the fume of opacity; and finally
4. synchronic NKB does not provide any evidence for assuming (CV.CV) as the underlying form.

In fact, OT strongly argues against any attempt at assuming an input which is redundantly *deviant* from the output by the premise of Lexicon Optimization (Prince and Smolensky 1993) [11]. Kager (1999:33) [5] interprets this as

> "It has been proposed that in the absence of empirical evidence for one input form over another, the input should be selected that is closest to the output,…..That is, whenever the learner has no evidence (from surface forms) to postulate a specific diverging lexical form, (s)he will assume that the input is identical to the surface form. In terms of constraint violations, this strategy has the advantage of minimizing the violation of faithfulness, as compared to any other hypothetical inputs producing the same output. This strategy is called Lexicon Optimization…"

Alternatively, let us assume that the two vowels unite forming a diphthong. It definitely stands to reason to argue in favour of such a union. Phonetically it is difficult to keep two successive vowels apart though across syllable boundary. Advantage of this stand is that the risk of a marked structure with an onsetless second syllable disappears. However, the resultant form falls short of the second mora needed for its surviving as a moraic foot. Solution to this impasse has already been successfully proposed above in the form of phonetic lengthening: CV → CV: (cf. 26). Let us resort to the same route for the NKB words in (30).

The relevant constraint ranking is the same as (28). However, another universal constraint upholding the need for onset for syllables has to be invoked to debar a syllable having no onset consonant. This is ranked amongst the undominated constraints for NKB.

31. ONSET
*[σV
'Syllables must have onsets.' (Kager 1999) [5]

The final OT grammar therefore stands as (32).

32. GrWd=PrWd, FT-BIN, *[σV, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ >> ALL-FT-L, DEP-μ-IO

The lengthening of the underlying vowel is phonetically realized on the first part of the diphthong.

33. sia → ()

	GrWd=PrWd	FT-BIN	*[σV	Trochee	Align-L	*FTFT	Parse-σ	ALL-FT-L	DEP-μ-IO
a. ☞ (a)									*
b. (s.)			*!						*
c. (.)			*!						
d. ().()		*!*		**		*		*	
e.	*!						*		

Disyllabic contestants (33b-c) turn out suboptimal due to having an onsetless syllable each. Disyllabic parsing is debarred thus. Suboptimality of (d) and (e) is self-explanatory. Mora insertion violates the lowest ranked anti-insertion faithfulness constraint DEP-μ-IO. It is a strategic violation to satisfy the higher constraints.

5. Sequences having 'heavy'[4] syllables

5.1 Data

34. Monosyllables: CVC → (H) = (L) → (σ́)

'drum' ṭák 'rack'
'nose' ˜k 'curve'

A CVC syllable stands distinct from CVs discussed so far in having a coda. Across language there is a tendency to delete a coda although this trend cannot debar/ignore the presence of coda. This duality can be captured in terms of an OT markedness constraint No-Coda. Being violable by nature and yielding to variable ranking this anti-coda constraint cooperates in evaluating the optimal candidate in words having CVC type syllables.

35. No-Coda
*C]σ ('Syllables are open.') (Kager 1999: 94) [5]
or Syllables must not have coda.

Another constraint need be invoked to negotiate with a split structure like CV.C born off an input CVC posing to be a potential candidate for optimal status.

36. Nucleus
Every syllable must have a nucleus.
A bare C cannot form a syllable by itself. The well-formedness constraint NUCLEUS sees to it that such an illicit syllable is excluded during evaluation. This is an undominated constraint. The ranking order of the two new constraints is as in (37) -- the reformulated constraint hierarchy for NKB.

[4] All syllables are light (L) in NKB. Vowel length and coda moracity is unattested. Diphthongs are also monomoraic. In consonance with the standard practice naming longer syllables as 'heavy' the word is used here tentatively. As will be argued shortly, it has no implication for syllable weight. To put the point succinctly across, the mechanisms of (H) = (L), (HH) = (LL), (HL) = (LL), (LH) = (LL), (LL)H = (LL)L etc. are used subsequently.

37. GrWd=PrWd, FT-BIN, *[σV, NUCLEUS, TROCHEE, ALIGN-L, *FTFT >> PARSE-σ >> ALL-FT-L, DEP-μ-IO >> *C]σ

na → (náːk)

	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (́)										*	*
b. (́.k)				*!						*	
c. (́.k)		*!		*							
d.	*!								*		

The lengthening of the base vowel is necessitated by bimoracity requirement of an optimal output and it is a phonetic expansion. This need for vowel lengthening is a crucial piece of evidence in favour of non-moracity of the coda consonant in NKB. Despite having a lengthened vowel with two moras (b) is ruled out by NUCLEUS: a lone C fails to form a syllable. (c) is suboptimal as it fatally violates FT-BIN since the vowel in the first syllable is monomoraic. Failure of (d) is obvious. So, (a) wins the race despite its violating the lowest ranked anti-coda constraint *C]σ.

38. Disyllables

38a. CVC.CVC → (HH) = (LL) → (σ́σ)

.m'expression of anger by biting teeth'ɔ.d'type of sweets'

.d'darkness' .d'monkey'

It is amazing that the same constraint ranking successfully yields the optimal outputs in all the disyllables. Consider the following.

38b. ban.d̪ɔr → (bán.d̪ɔr)

ban.d̪ɔr	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (n.r)											* *
b. (b).(d)		*!*					*				* *
c. (b.r)					*!						
e. b.	*!							**			

38c. CVC.CV → (HL) = (LL) → (σ́σ)

.ga 'swearing' kúi.ca'eel'

.ga 'idle, non-honorific' h.ʃa'bland'

38d. kir.ga → (ki.ga)

kir.ga	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (kír.ga)											*
b. (kír).(gà)		*!*			* *		*		*		*
c. (kir.gá)					*!						*
d. kir.ga	*!							**			
e. (kír).ga		*!						*			*
f. (kíːr).ga								*!		*	*

38e. CV.CVC → (LH) = (LL) → (σ́σ)

.sha'bad beginning' .t̪ 'crooked fellow'

.rai'axe' mɔ . 'death'

38f. boi.t̪al → (bói.t̪al)

.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (b.a)											*
b. (i)(t̪l)		*!*			* *		*		*		*
c. (b.l)					*!						*
d. b.(l)		*!			*	*		*	*		*
e. (i).		*!						*			*
f. (o).								*!		*	*

39. Trisyllables

In respect of trisyllables to the projected OT grammar proves its efficacy.

39a. CV.CV.CVC → (LL)H = (LL)L → (σ́σ)σ

.ʃa.mɔ 'request' .la.mɔ 'abnormal behaviour'

.ra.mɔ 'repair' .da.rɔ 'ordinary'

39b. mɛ.ra.mɔt̪ → (mɛ́.ra).mɔt̪

.ra.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (́.a).								*			*
b. (m.a).(d̪)		*!			*		*		**		*
c. (ḿ.).					*!			*			*
d. m.(r.m)						*!		*	*		*
e. m.r.	*!							***			*
f. (m.r̪)		*!			*						*

39c. CVC.CVC.CVC → (LH)H = (LL)L → (σ́σ)σ
.ʃb.d̪ ‘not alert’ .nb. ‘without practice’ ̪ɔ.ka ‘no necessity’ .di. ‘bad habit’

39d. bɔ.d̪oib.baʃ → (bɔ́.d̪oib).baʃ

.ib.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	ALIGN-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (b.b).								*			**
b. (́.b).(àʃ)		*!			*		*		**		**
c. (b.b).baʃ					*!			*			**
d. bɔ.(d.ʃ)						*!		*	*		**
e. b.d.	*!							***			**
f. (b.d.b)		*!			*						**

39e. CVC.CVC.CVC → (HH)H = (LL)L → (σ́σ)σ
.rk.kɔn‘preservation’ ɔ.tr.b ‘inner garments’ ̪t.d̪a‘disappearance’

39f. ʃɔŋ.rɔk.kɔn → (ʃŋ.ɔk).kɔn

.rk.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (ʃ.k).								*			***
b. (ŋ.k).(k̊n)		*!			*		*		**		***
c. (ʃ.r).kɔn					*!			*			***
d. (.)(.)						*!		*	*		***
e. ʃ.rɔ.	*!							***			***
f. (ŋ.k.k)		*!			*						***

39g. CVC.CVC.CV → (HH)L = (LL)L → (σ́σ)σ
.p̪.t̪i ‘wealth’ .gl.la ‘beaten thoroughly’ .co.ga ‘a dirty person’ k^ha.in.na ‘provoking itching’

39h. gul.guil.la → (gúl.guil).la

.gul.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	PARSE-σ	ALL-FT-L	DEP-μ-IO	*C]σ
a. ☞ (g.l).la								*			**
b. (g.l).(à)		*!			*		*		**		**
c. (l.l).la					*!			*			**
d. g.(l.a)						*!		*	*		**
e. g.il.la	*!							***			**
f. (g.l.a)		*!			*						**

39i. CVC.CV.CV → (HL)L = (LL)L → (σ́σ)σ
.ga.ni ‘agonizing’ s .ra.ni‘shouting’ .bi.d̪a ‘sitting idle at home’ .na.ʃi‘naughtiness’

39j. k^hɔn.na.ʃi → (k^hɔ́n.na).ʃi

.na.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	ALIGN-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (n.n).								*			*
b. (n.a).(ʿ)		*!			*		*		**		*
c. (k.n).					*!			*			*
d. k.(́.i)						*!		*	*		*
e.n.a.	*!							***			*
f. (k.a.ʃ)		*!			*						*

39k. CVC.CV.CVC → (HL)H = (LL)L → (σ́σ)σ
.mɔ.kar‘blacksmith’ d̪.mɔ.gɔʈ ‘strike’

39l. d̪ɔr.mɔ.gɔʈ → (d̪ɔ́r.mɔ).gɔʈ

.mɔ.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (d.m).								*			**
b. (d.ɔ).(ɔʈ)		*!			*		*		**		**
c. (r.́).					*!			*			**
d. d.(́.ʈ)						*!		*	*		**
e. d.mɔ.	*!							***			**
f. (d.ɔ.ʈ)		*!			*						**

39m. CV.CVC.CV → (LH)L = (LL)L → (σ́σ) σ
.ʃn.tɔ ‘spring’ ´.k̪.d ‘good food’ .mɔ.t̪ɔ‘sleeping’ ɔ.ig.gɔ‘ineligible’
39n. ɔ.zoig.gɔ → (ɔ́.ig).gɔ

.zg.	GrWd=PrWd	FT-IN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (ɔ.g).								*			*
b. (ɔ.g).( )		*!			*		*		**		*
c. (ɔ.g).					*!			*			*
d. ɔ.(g.g)						*!		*	*		*
e. ɔ.z.	*!							***			*
f. (ɔ́.g.ɔ)		*!			*						*

40. Quadra-syllables
Sequences having four syllables follow suit: in each case below the OT grammar appropriately evaluates the optimal output.
40a. CVC.CV.CV.CV → (HL)LL = (LL)LL → (σ́σ)σσ

.ɔ.ɔ.la ‘bitter gourd’ b.a.d.l ‘type of ant’
.̪.a.ni ‘prostitute (slang)’ k.u.a.i ‘wood pecker’
40b. t̪it̪.kɔ.rɔ.la → (t̪ít̪.kɔ).rɔ.la

.kɔ.rɔ.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (.k̪).ɔ.								**			*
b. (t.ɔ).(r̆.a)							*!		**		*
c. (t́.).ɔ.					*!			**			*
d.t.(k.ɔ).						*!		**	*		*
e.̪.ɔ.(́.l)						*!*		**	**		*
f. (t.k.ɔ).		*!			*			*			*
g. .ɔ.ɔ.	*!							****			*

40c. CV.CVC.CV.CV → (LH)LL = (LL)LL → (σ́σ)σσ
.ʃb.bɔ.t̪a‘non-civilizedness’
40d. ɔ.ʃb.bɔ.ta → (ɔ.b).bɔ.

.ʃo.bɔ.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (́.b).ɔ.								**			*
b. (ɔ.b).(ɓ.a)							*!		**		*
c. (ɔ.b).ɔ.					*!			**			*
d. ɔ.(b.ɔ).						*!		**	*		*
e. ɔ.ib.(́.a)						*!*		**	**		*
f. (́.b.b).		*!			*			*			*
g.ɔ.b.ɔ.	*!							****			*

40e. CV.CV.CVC.CVC → (LL)HL = (LL)LL → (σ́σ)σσ
.ri.t̪.t̪n ‘change’ ´.rɔ.m̪.dn ‘hand shake’
40f. ho.ri.bɔt̪.t̪ɔn → (ho.ri).bɔt̪.t̪ɔn

.ri.t̪.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (́.i).bɔ.								**			**
b. (h.i).(ɓt.n)							*!		**		**
c. (ó.)̪..					*!			**			**
d. h.(r̪.).						*!		**	*		**
e. h.r.(.n)						*!*		**	**		**
f. (́.i̪.).		*!			*			*			**
g. .r.b.	*!							****			**

40g. CVC.CV.CVC.CVC → (HL)HH = (LL)LL → (σ́σ) σσ
.ɟɔ.βk.kɔn ‘observation’
40h. ho.ɟɔ.βɛk.kɔn → (iɟ.ɟɔ).βɛk.

.ɟɔ.βk.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (ɟ.ɔ).k.								**			***
b. (h.ɔ).(ɛ̀k.n)							*!		**		***
c. (h.ɟ).k.					*!			**			***
d. h.(ɟ.β).						*!		**	*		***
e. h.ɔ.(β.n)						*!*		**	**		***
f. (h.ɔ.k).		*!			*			*			***
g. h.ɟ.β.	*!							****			***

40i. CV.CVC.CVC.CV → LHHL = (LL)LL → (σ́σ)σσ
. . . 'ominous' u.k.n.n 'ominous/ implying evil'

40j. ɔ.lk.kn.na → (ɔ́.lk).koin.

.lk.kn.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	ALL-FT-L	DEP-μ-IO	*C]σ
a. ☞ (ɔ.k).n.								**			**
b. (ɔ.l).(k̀i.a)							*!		**		**
c. (ɔ.k).in.					*!			**			**
d. ɔ.(l.k).						*!		**	*		**
e. ɔ.l.(n.a)						*!*		**	**		**
f. (ɔ.l.k).		*!			*			*			**
g.ɔ.ɔ.o.	*!							****			**

40k. CV.CV.CVC.CV → LLHL → (σ́σ)σσ
.sɛ.ḍn.na 'irrelevant/ boastful'
.kɔ.in.na 'not intending to do/ unaccomplished'
.bu.in.na 'ununderstood/ not possible to be understood'

40l. á.sɛ.in.na → (á.sɛ).ḍain.

.sɛ.ḍa.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (a.ɛ).ḍ.								**			*
b. (́.s).(ḍn.a)							*!		**		*
c. (á).ḍ.					*!			**			*
d.a.(s.n).						*!		**	*		*
e.a.ɛ.(ḍ.n)						*!*		**	**		*
f. (a.s.n).		*!			*			*			*
g. .s.ḍ.	*!							****			*

40m. V.CV.CV.CVC → (LL)LH = (LL)LL → (σ́σ)σσ
.mɔ.nɔ.zog 'inattentiveness'

40n. ɔ.mɔ.nɔ.zog → (ɔ́.mɔ).nɔ.

.ɔ.ɔ.	GrWd=PrWd	FT-BIN	*[σV	Nucleus	Trochee	Align-L	*FTFT	Parse-σ	All-FT-L	DEP-μ-IO	*C]σ
a. ☞ (ɔ.ɔ).n.								**			*
b. (ɔ.ɔ).(ɔ̀ .o)							*!		**		*
c. (ɔ.m).ɔ.					*!			**			*
d. ɔ.(́.ɔ).						*!		**	*		*
e.ɔ.ɔ.(́.g)						*!*		**	**		*
f. (ɔ.ɔ.n).		*!			*			*			*
g.ɔ.m.ɔ.	*!							****			*

All the constraints have been retained in the hierarchy even though they stand indifferent and/or vacuously satisfied. The aim behind this is to capture the comprehensiveness of hierarchy of constraints in producing the optimal outputs in NKB.

6. Summary

The article provides an OT account of the metrical facts of NKB. Ternary rhythm has been accounted for in terms of binary trochees constructed iteratively left-to-right with stress and up-beats placed in prosodically determined positions. All syllables are light whether of types V, CV, CVC, CVV, CVVC. The most prominent syllable along with its host -- the head foot -- is invariably aligned with left edge of the prosodic word because of the undominated status of ALIGN-L. These general principles and parameters are converted into universal constraints. Evaluation of the optimal output from potential candidates for an input is demonstrated with parallel interaction of the relevant constraints ranked in a language specific hierarchy. Tableaus have been presented to illustrate the mode of evaluation. Illustrations have been given for words of light

syllables, 'heavy' syllables and light-'heavy' combinations for NKB -- to use the canonical terminology -- even though all types of syllables are virtually light.

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