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Optimising Classical Arabic metra

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Abstract

This paper aims to identify the markedness constraints and constraint rankings responsible for limiting the Classical Arabic metra to a unique group of eight. To that end, the proposed account assumes the same basic principles and devices cross-linguistically utilised for the analysis of word-stress in natural languages. Mainly, constraints interpreting boundedness, headedness, quantity-sensitivity, exhaustivity, and extrametricality are formalised and ranked to assess constituency and metrical parsing. In particular, requirements on binarity applying on different levels of the metrical structure will demarcate the maximality and minimality boundaries for constituent moraicity and eventually define the domain for the metron. Other requirements on constituent headedness will distinguish the first seven of the eight metra as most harmonious. Like Sanskrit or Ancient Greek, Classical Arabic metre is basically considered to be quantitative, where weight mostly regulates the mapping to strong positions. Crucially, such mapping is established through a set of constraints unravelling the intrinsic prominence associated with the form of the uneven iamb, which features in the first seven metra, ruling out any implausible candidates that are possibly configured within that binarity domain. On another dimension, head verse foot non-finality, or more generally non-peripherality, coupled with final light syllable extrametricality create the environment for optimising the eighth metron, the final syllable of which is light.

Keywords: binarity; Classical Arabic; metron; non-finality; uneven iamb.

1. Introduction

The wide range of rhythmic variation in Classical Arabic poetry is only the outcome of the different manifestations of a well-defined and simple set of canonical metres. The relatively limited number of metra, from which such identifiable canonical (abstract) metres are composed, is worthy of investigation. Any prosodic study of Classical Arabic metre will inevitably attempt to analyse some or all of these metra as they are considered to be the only templates available to license the consonant-vowel sequences in any metre of Classical Arabic poetry. Arguably, a basic grammar of Classical Arabic metrics will only allow the realisation, or optimisation, of these unique metra.

This paper aims to identify the markedness constraints and constraint rankings that will eventually render the unique and very limited set of Classical Arabic metra as the most harmonious, and prosodically plausible, among all other possible candidates. Within the constraint-based framework of optimality theory (Prince & Smolensky, 2004 [1993]; McCarthy & Prince, 1993a, 1993b), a specific set of relatively ranked markedness constraints will spell out all requirements needed to achieve that objective. The proposed account assumes the same basic principles and devices employed, cross-linguistically, for the analysis of word-stress in natural languages. The discussion will primarily focus on binarity requirements on different levels of the metrical structure, prominence relations identified in different constituents, and syllabic extrametricality.

The paper is organised as follows. In section 2, the unique set of Classical Arabic metra is identified as the main building blocks of all metres. The section also briefly explains the prosodic units used in traditional analyses of Classical Arabic metre. Section 3 presents a basic constraint-based analysis of syllabification, as consonant-vowel sequences in those metra are parsed into the two main syllable types reoccurring in Classical Arabic. The basic arguments and discussion are given in section 4. It is divided into three subsections on binarity, prominence, and extrametricality. Collectively, these subsections clarify how the proposed account limits the options to those simple Classical Arabic metra.

2. Classical Arabic metra

Classical Arabic poetry has always been in the forefront of major studies on poetic metre. To name but a few, generative and constraint-based accounts of Classical Arabic metre include Maling, 1973; Prince, 1989; Schuh, 1996; Golston & Riad, 1997; Bohas et al., 2006; Fabb & Halle, 2008; Paoli, 2009; Schuh, 2011; Golston & Riad, 2016. These works and those of almost all Arab prosodists are mainly based on, or in some cases critical responses to, the findings and theoretical analyses of Al-Khalil ibn Ahmad al-Farahidi, an 8th century CE prosodist who has always been considered as the founder of the science of Arabic poetic metrics.

Classical Arabic poetry is classified into a number of canonical metres, sixteen in total, from which variant surface classical verses are derived. The table below demonstrates how these metres are distributed over the five main circles, a theory initially developed by Al-Khalil. This basic circle classification of Classical Arabic metre is still considered fundamental in most metrical accounts of Classical Arabic poetry.

(1) The sixteen canonical metres of Classical Arabic poetry[1]

CIRCLE	METRE	HEMISTICH (A HALF LINE OF VERSE)
1	Tawil	faʕuulun - mafaaʕiilun - faʕuulun - mafaaʕiilun
	Madid	faaʕillaatun - faaʕilun - faaʕilaatun
	Basit	mustafʕilun - faaʕilun - mustafʕilun - faaʕilun
2	Wafir	mufaaʕalatun - mufaaʕalatun - mufaaʕalatun
	Kamil	mutafaaʕilun - mutafaaʕilun - mutafaaʕilun
3	Hazaj	mafaaʕiilun - mafaaʕiilun
	Rajaz	mustafʕilun - mustafʕilun - mustafʕilun
	Ramal	faaʕilaatun - faaʕilaatun - faaʕilaatun
4	Sari	mustafʕilun - mustafʕilun - mafʕuulaatu
	Munsarih	mustafʕilun - mafʕuulaatu - mustafʕilun
	Xafif	faaʕilaatun - mustafʕilun - faaʕilaatun
	Mudari	mafaaʕiilun - faaʕilaatun
	Muqtadab	mafʕuulaatu - mustafʕilun
	Mujtath	mustafʕilun - faaʕilaatun
5	Mutaqarib	faʕuulun - faʕuulun - faʕuulun - faʕuulun
	Mutadarak	faaʕilun - faaʕilun - faaʕilun - faaʕilun

Each of the sixteen metres listed in (1) above is categorised by a hemistich, which represents half a line of verse. In turn, a hemistich contains two to four mnemonic words, which are normally recognised as metra and are utilised to distinguish consonant-vowel sequences. As noted by most prosodists working on Arabic metre, and as shown in (1) above,

1 In the literature on Classical Arabic metrics, there exists no consensus on the transliterations of the names of all sixteen canonical metres. The proposed ones are only simplified versions.

only eight unique metra are identified from the sixteen metres. These are listed below, with their consonant-vowel sequences:

(2) The eight unique metra for Classical Arabic poetry

METRA	CONSONANT-VOWEL SEQUENCES
faʕuulun	CVCVVCVC
faaʕilun	CVVCVCVC
mafaaʕiilun	CVCVVCVVCVC
mustafʕilun	CVCCVCCVCVC
faaʕilaatun	CVVCVCVVCVC
mufaaʕalatun	CVCVVCVCVCVC
mutafaaʕilun	CVCVCVVCVCVC
mafʕuulaatu	CVCCVVCVVCV

It is this group of eight unique metra that this paper is about. Specifically, the details of the analysis should eventually render a particular parsing of these and only these most harmonious among a larger set of all possible candidates[2]. Before going into that, nonetheless, it will be logical to consider how such consonant-vowel sequences are analysed in most traditional accounts of Classical Arabic metre.

Two basic prosodic units are traditionally employed when parsing each metron. One is normally called the *peg* (*watad*), and the other is known as the *cord* (*sabab*). Each of these measuring units has two variants, as shown below. As clarified in the section on syllabification below, the distinction between CVV and CVC sequences is irrelevant, at least for the variations in quantity. Hence, the X will either be interpreted as a coda-consonant or as the second timing slot of a long vowel. The notation mainly follows Prince (1989):

2 It should be noted, however, that a total of sixty-seven verse-patterns are derived from the sixteen canonical abstract metres of Classical Arabic poetry. In these verse-patterns, metra in general (and hemistich-final metra in particular) undergo a number of transformations that may at times radically change their underlying forms. Such transformed surface metra might not always uphold all the generalisations (discussed below) that apply to the eight unique metra. Interestingly, some of these ultimate surface manifestations, which are not tackled in this paper, are ruled out by the proposed account. This asymmetry could be reconciled in a stratal analysis.

(3)

i.	Pegs:	a. P	=	CVCVX
		b. Q	=	CVXCV
ii.	Cords:	a. K	=	CVX
		b. L	=	CVCV

Parsing the consonant-vowel sequences of the eight unique metra into such prosodic units will produce the following possible peg-cord configurations:

(4)

METRA	CONSONANT-VOWEL SEQUENCES	PEG-CORD SEQUENCES
faʕuulun	CVCVVCVC	PK
faaʕilun	CVVCVCVC	KP or QK
mafaaʕiilun	CVCVVCVVCVC	PKK
mustafʕilun	CVCCVCCVCVC	KKP or KQK
faaʕilaatun	CVVCVCVVCVC	KPK or QKK
mufaaʕalatun	CVCVVCVCVCVC	PLK
mutafaaʕilun	CVCVCVVCVCVC	LKP or LQK
mafʕuulaatu	CVCCVVCVVCV	KKQ

Any exhaustive parsing of the eight metra into such prosodic units as the ones presented in (3) above will reveal a number of distributional characteristics of those consonant-vowel sequences. As noted in almost all prosodic studies of Classical Arabic poetry, the most obvious of these distributional characteristics is that each metron comprises a peg and one or two cords. The most noticeable observation concerning the pegs is the persistent prominence of the P peg, in particular, which reoccurs in almost all metra, with only one single exception in mafʕuulaatu, where the peg is a Q. In addition to that single case where the only possible peg is a Q, only parsing variants could possibly contain Q pegs. As for cords though, the K cord is a basic element of each and every possible parsing above, at least once. On the other hand, the L cord only occurs with two metra, mufaaʕalatun and mutafaaʕilun.

What (4) above also shows is that possible parsing variation is depicted in four out of the eight consonant-vowel sequences. In these four cases, a medial CV sequence (underlined in (4) above) is preceded and followed by CVX sequences. When that CV is parsed with the following CVX, a KP sequence surfaces. Otherwise, the sequence is a QK when the CV is parsed with the preceding CVX. It is worth mentioning that traditional accounts of Classical Arabic metre only consider two out of the four variants that involve parsing a CV with a preceding CVX, namely KQK and QKK. This seems to be a consequence of Al-Khalil's circles theory, a point not to be taken further in this paper.

The basic observation of one peg plus one or two cords per metron could be generalised to generate other possibly configured combinations. This should demonstrate how the attested configurations in (4) are distributed, eliminating parsing variants for that purpose. Generally, the combinations in (5 i and ii) below satisfy that distributional condition (1 peg + 1 or 2 cords), yet all the ones that are shaded must be excluded from that simple list of the eight canonical forms of Classical Arabic metra.

(5) (i)

P/Q	K	L
P -	PK (CVCVV) (CVC)	PL (CVCVX) (CVCV)
- P	KP (CVV) (CVCVC)	LP (CVCV) (CVCVX)
Q -	QK (CVXCV) (CVX)	QL (CVXCV) (CVCV)
- Q	KQ (CVX) (CVXCV)	LQ (CVCV) (CVXCV)

(ii)

P/Q	K K	K L	L K	L L
P - -	PKK (CVCVV) (CVV) (CVC)	PKL (CVCVX) (CVX) (CVCV)	PLK (CVCVV) (CVCV) (CVC)	PLL (CVCVX) (CVCV) (CVCV)
- - P	KKP (CVC) (CVC) (CVCVC)	KLP (CVX) (CVCV) (CVCVX)	LKP (CVCV) (CVV) (CVCVC)	LLP (CVCV) (CVCV) (CVCVX)
- P -	KPK (CVV) (CVCVV) (CVC)	KPL (CVX) (CVCVX) (CVCV)	LPK (CVCV) (CVCVX) (CVX)	LPL (CVCV) (CVCVX) (CVCV)
Q - -	QKK (CVVCV) (CVV) (CVC)	QKL (CVXCV) (CVX) (CVCV)	QLK (CVXCV) (CVCV) (CVX)	QLL (CVXCV) (CVCV) (CVCV)
- - Q	KKQ (CVC) (CVV) (CVVCV)	KLQ (CVX) (CVCV) (CVXCV)	LKQ (CVCV) (CVX) (CVXCV)	LLQ (CVCV) (CVCV) (CVXCV)
- Q -	KQK (CVC) (CVCCV) (CVC)	KQL (CVX) (CVXCV) (CVCV)	LQK (CVCV) (CVXCV) (CVX)	LQL (CVCV) (CVXCV) (CVCV)

All these observations will be revisited and thoroughly considered in section four below, where the process of metrifying the consonant-vowel sequences of the eight unique Classical Arabic metra is discussed in more detail. To facilitate that, though, section three summarises the constraints and constraint rankings required to syllabify such consonant-vowel sequences.

3. Syllabification

Syllabification should not be treated differently in metre than in language. Basically, the metra will be regarded as words of the language and consequently accommodate the basic syllable inventory. In general, it has always been agreed that the syllable inventory for Arabic comprises light and heavy syllables as the two main types (Brame, 1970; Al-Ani & May, 1978; Broselow, 1979; McCarthy, 1979; Selkirk, 1981; among others). The light syllable has a simple vowel in the nucleus preceded by a simple consonant in the onset. In addition to that, a heavy syllable has a coda consonant or another timing slot rendering a long vowel. The two main syllable types are listed below[3]:

(6) Main syllable types in Arabic

i.	Light	CV
ii.	Heavy	CVC or CVV

This simple inventory of the main syllable types in Arabic shows that onsets are always required, codas are allowed (but not required), and syllable margins (onsets and codas) are never complex. Applying these requirements to the consonant-vowel sequences of the eight unique metra should result in the syllabification below[4]:

(7)

	METRA	SYLLABIFICATION
a.	faʕuulun	CV.CVV.CVC L H H
b.	faaʕilun	CVV.CV.CVC H L H
c.	mafaaʕiilun	CV.CVV.CVV.CVC L H H H

3 It should be noted that superheavy syllables of the form CVXC are not normally considered in the analysis of any of the sixteen abstract metres of Classical Arabic poetry.

4 The convention in quantitative metrics research is to indicate heavy and light syllables using Hs and Ls (or macrons and breves). The CVs and CVXs are used throughout to highlight syllable structure.

d.	mustafʕilun	CVC.CVC.CV.CVC H H L H
e.	faaʕilaatun	CVV.CV.CVV.CVC H L H H
f.	mufaaʕalatun	CV.CVV.CV.CV.CVC L H L L H
g.	mutafaaʕilun	CV.CV.CVV.CV.CVC L L H L H
h.	mafʕuulaatu	CVC.CVV.CVV.CV H H H L

Within the constraint-based framework of optimality theory (Prince & Smolensky, 2004 [1993]; McCarthy & Prince, 1993a, 1993b), such requirements on syllable structure might be interpreted into the following constraint ranking:

(8) *COMPLEX, ONSET >> NOCODA

*COMPLEX: No more than one C may associate with any syllable margin.

ONSET: Syllables must have onsets.

NOCODA: Syllables must not have codas.

Taking the metron /mustafʕilun/ as an example, the tableau below shows how the constraint ranking in (8) above is able to identify [CVC.CVC.CV.CVC] as the most harmonious syllabification:

(9)

/mustafʕilun/ /CVCCVCCVCVC/	*COMPLEX	ONSET	NOCODA
a. ☞ CVC.CVC.CV.CVC			***
b. CV.CCV.CCV.CVC	*!*		*
c. CVCC.VC.CV.CVC	*!	*	***

Any attempt to reduce the violations of the low ranked constraint NOCODA, like in the case of (9b), will inevitably violate the undominated constraint *COMPLEX. The candidate (9c) is included to show how equally fatal a violation of the constraint ONSET is[5].

5 It is assumed that both MAX-IO and DEP-IO dominate NOCODA to rule out any candidates that satisfy the latter constraint by deletion or epenthesis, respectively.

The following section, where the main arguments are presented, takes on the challenge of parsing those syllables in (7) above into higher prosodic units with the objective of limiting the possible forms to only those eight unique metra attested in Classical Arabic poetry.

4. Metrification

In this main section, metrification (i.e. parsing syllables into higher metrical structure) will be designated as the process that specifically limits the repertoire of Classical Arabic metra to the eight unique consonant-vowel sequences given in (2), and syllabified in (7) above. For that to be demonstrated, however, a more detailed analysis of some of the observations referred to above is in order. In particular, the fact that each metron is made up of a peg and one or two cords is key to most of the discussion in this section. For example, it delimits the moraicity of metra, knowing that a syllabified peg (whether P or Q) is always trimoraic and a syllabified cord (K or L) is basically bimoraic.

(10) Metron moraicity

Allowed moraicity	**Disallowed moraicity**
a. 5 morae (metron = 5μ) one peg and one cord	c. 4 morae or less (metron ≤ 4μ)
	d. 6 morae (metron = 6μ)
b. 7 morae (metron = 7μ) one peg and two cords	e. 8 morae or more (metron ≥ 8μ)

This relatively limited domain of moraicity demarcates the boundaries within which metra may be realised. In addition to that, the possible distributional configurations of pegs and cords in that domain are not all considered to be plausible metra. For example, a sequence like CVXCVXCV should be syllabified and eventually parsed into a K cord (CVX) and a Q peg (CVX.CV), which will jointly constitute a 5μ metron. This metron, however, is not listed as one of the eight unique metra of Classical Arabic poetry. Other examples of disallowed metra within the moraicity domain, detailed in (10 b) in particular, are all 7μ metra that comprise any peg (P or Q) with two L cords, in whatever order possible.

These and other issues are discussed in the following three subsections on binarity, prominence, and extrametricality. The objective is to show how a grammar of Classical Arabic metre, constraints and constraint rankings, should only allow that list of eight unique metra to represent all sixteen metres of Classical Arabic poetry, ruling out any other candidates, whether they exist within or are external to the moraicity domain defined above.

4.1. Binarity

Drawing on Prince (1989) in general and more specifically on the analytical approach of prosodic metrics proposed by Golston & Riad (1997), the discussion in this subsection presents binarity as a central metrification principle of Classical Arabic metre. Mainly, the principle of binarity is put forward as the crucial defining element of all hierarchical relations of metrical structure. For that to be presented in more detail, however, it is essential to assume a well-defined metrical structure that depicts the different levels and the dominance relations holding between them. Adopting the general metrical structure in Prince (1989) or Golston & Riad (2000), with some modification, the proposed hierarchical dominance is described as follows:

(11) Metrical structure

Metron	D
	|
Verse feet	VF
	|
Metrical positions	MP
	|
Syllables	σ

The assumption is that lower-level constituents (σ, MP, or VF) are exhaustively parsed into immediately higher-level constituents. Therefore, all syllables are parsed into metrical positions, all metrical positions are parsed into verse feet, and all verse feet are parsed into some metron. In terms of OT constraints, this exhaustive parsing is assessed by a constraint like Exhaustivity, initially formalised in Selkirk (1995).

(12) Exhaustivity

Exh(X): Each constituent of the type X – 1 is immediately dominated by some constituent of the type X[6].

Having proposed a model for the hierarchy of metrical structure in (11) and having identified the driving force behind exhaustive parsing, $E_{XH(X)}$, the discussion shifts to the binarity requirements on metrification. In that regard, binarity is utilised to identify moraic maximality and minimality in a metron. This will be applied to the various levels of the metrical hierarchy, starting with the MP and moving upwards.

6 The constraint on exhaustivity may arguably be decomposed into the more local constraints Exh(σ), Exh(MP), Exh(VF), and Exh(MT) that respectively assess parsing segments, syllables, metrical positions, and verse feet into higher constituents.

For metrical positions (MPs), the proposed account aims to equate them to the prosodic measuring units of traditional Classical Arabic metre, the peg and the cord. As presented above, pegs are always disyllabic (P: CV.CVX or Q: CVX.CV) while cords are always bimoraic (K: CVX or L: CV.CV). This range of possible parsing configurations is predominantly attributed to a constraint on the binarity of metrical positions, MP-BIN.

(13) Metrical Position - Binarity

MP-Bin: Metrical positions are maximally disyllabic and minimally bimoraic.

Nonetheless, to maintain faithful correspondence to the peg/cord prosodic units, it is necessary to rule out any parsing into metrical positions licensing two heavy syllables. Although this is obviously sanctioned by MP-BIN, it corresponds to no peg or cord. Thus, an independently motivated local *CLASH constraint, as the one presented below, is required (cf. Golston & Riad, 1997):

(14) *Clash-MP: Metrical positions with adjacent prominent/heavy syllables are prohibited.

Together, MP-Bin and *Clash-MP will restrict the inventory of possible metrical positions to only those which correspond to the two pegs and the two cords.

(15) Possible MPs

Disyllabic	**Bimoraic**
CV.CVX	CVX
CVX.CV	CV.CV

In the tableaux in (16) below, the constraints introduced thus far will assess parsing syllables into metrical positions. This parsing process is indicated in a candidate by enclosing syllables in parentheses. Such candidates will be evaluated for exhaustive parsing, maximal and minimal binarity, and for avoiding clashing metrical positions. As no particular constraint ranking is proposed, Exh(X), MP-Bin, and *Clash-MP are not relatively ranked in the tableaux, which is indicated by the dotted lines separating them.

(16) (i)

/CVCVXCVXCVX/	Exh(X)	MP-Bin	*Clash-MP
a. ☞ (CV.CVX) (CVX) (CVX)			
b. (CV.CVX) (CVX.CVX)			*!
c. (CV) (CVX) (CVX) (CVX)		*!	
d. CV (CVX) (CVX) (CVX)	*! σ		

(ii)

/CVCVXCVCVCVX/	Exh(X)	MP-Bin	*Clash-MP
a. ☞ (CV.CVX) (CV.CV) (CVX)			
b. (CV.CVX.CV) (CV.CVX)		*!	
c. (CV.CVX.CV.CV.CVX)		*!	
d. CV.CVX.CV.CV.CVX	*! σσσσσ		

The candidates (16 i a) and (16 ii a) are the most harmonious, each in its respective tableau. In both, syllables are exhaustively parsed into metrical positions, hence satisfying Exh(X). Conversely, other candidates fatally violate this constraint by containing unparsed syllables, once in (16 i d) and five times in (16 ii d). Another feature that contributes to the harmony of the two winning candidates is their adherence to the binarity requirements on metrical positions. Each metrical position in the two candidates is either disyllabic as (CV.CVX) and (CV.CV) or bimoraic as (CVX) and (CV.CV). Obviously, this does not apply to (16 i c), (16 ii b), and (16 ii c), where a metrical position is either monomoraic, trisyllabic, or comprising up to five syllables, respectively. Finally, the two optimal candidates have no clashing metrical positions, as the case with (16 i b) that has the metrical position *(CVX.CVX).

It should be noted, however, that assessing some of the logically possible candidates for an input that has a consonant-vowel sequence like /CVXCVCVX/ will reveal an issue that requires some attention. The tableau in (17) below should clarify that.

(17)

/CVXCVCVX/	Exh(X)	MP-Bin	*Clash-MP
a. ? (CVX) (CV.CVX)			
b. ? (CVX.CV) (CVX)			

Apparently, the two candidates (17 a and b) are equally harmonious. All syllables in the two candidates are parsed into metrical positions that satisfy the binarity requirement and are never clashing. For this and other equally challenging issues, subsequent discussion (in §4.2) will reconsider the inventory of possible metrical positions in (15) above to identify an independent rhythmic motivation, rather than the peg/cord rationale, eventually ruling out any (CVX.CV) metrical positions.

Moving higher in the metrical structure, the proposed account also defines constituency on the basis of binarity. Maximally, verse feet are allowed to contain two metrical positions.

This requirement on possible parsing configurations of verse feet is also attributed to a binarity constraint, VF-BIN.

(18) Verse Foot - Binarity

VF-Bin: A verse foot maximally dominates two metrical positions.

This binarity constraint only identifies the external boundaries of a verse foot. It is not expected to limit the list of possible verse feet to just those needed to realise the eight unique Classical Arabic metra. Within the boundaries of up to two metrical positions, this constraint sanctions an array of combinations of metrical positions, most of which are supposedly ruled out by other constraints or constraint rankings, as clarified in subsequent discussion. More specifically, each and every verse foot in (19) below satisfies the constraint VF-BIN. Nevertheless, only those that are not shaded will be allowed to represent Classical Arabic metra; the rest will eventually be filtered out by the grammar, as discussed in (§4.2). (The process of parsing metrical positions into verse feet is indicated in a candidate by enclosing metrical positions in square brackets.)

(19) VF-Bin Satisfiers

[(CV.CVX)]	[(CVX.CV)]	[(CV.CV)]	[(CVX)]
[(CV.CVX) (CV.CVX)]	[(CVX.CV) (CV.CVX)]	[(CV.CV) (CV.CVX)]	[(CVX) (CV.CVX)]
[(CV.CVX) (CVX.CV)]	[(CVX.CV) (CVX.CV)]	[(CV.CV) (CVX.CV)]	[(CVX) (CVX.CV)]
[(CV.CVX) (CV.CV)]	[(CVX.CV) (CV.CV)]	[(CV.CV) (CV.CV)]	[(CVX) (CV.CV)]
[(CV.CVX) (CVX)]	[(CVX.CV) (CVX)]	[(CV.CV) (CVX)]	[(CVX) (CVX)]

As for the metron, the proposed account presents the constraint M_T-B_{IN}, that ultimately favours binarity, maximally and minimally, in a metron.

(20) Metron-Binarity

Mt-Bin: A metron, maximally and minimally, dominates two verse feet.

Basically, the proposed binarity requirements could be summarised as follows (cf. Golston & Riad, 1997):

(21) Binarity

Statement	**Constraint**
- MP (maximally) = 2 syllables, (minimally) = 2 morae	MP-Bin
- VF (maximally) = 2 metrical positions	VF-Bin
- M_T (maximally & minimally) = 2 verse feet	Mt-Bin

4.2. Prominence

Having identified, and eventually defined, the binarity requirements for constituency, on the three levels of metrical positions, verse feet, and metra, the proposed account is able to exclude any potential representation of a Classical Arabic metron that falls short of that binarity domain or extends beyond it. The objective now is to show how the grammar of Classical Arabic metre is capable of blocking all unattested binarity satisfiers. In that regard, constituency headedness, or prominence, plays a vital role. Specifically, designating a particular consonant-vowel sequence as a dominant metrical position, and ultimately assigning it headedness of the entire metron will achieve some uniformity among a limited number of possible options and consequently help to rule out all others.

To utilise this uniformity of prominence relations that hold on different levels of the metrical structure, it is better to put aside for the moment the eighth metron /mafʕuulaatu/, syllabified in (7 h) above as [CVC.CVV.CVV.CV]. That particular metron will be discussed in detail later in (§4.3). As for all remaining (seven) metra, it should be helpful to initially highlight three basic observations about their syllabic configurations. The first such observation concerns the distribution of those rhythmically dominant heavy (CVX) syllables. Each of the seven metra contains two or three heavy syllables, one of which is always final. Secondly, a single light (CV) syllable, or a sequence of two, is necessarily followed, and sometimes also preceded, by a heavy syllable, so light syllables are never final. Thirdly, a sequence of light syllables is limited to a maximum of two. Evaluating these observations in light of the binarity statements presented above should logically lead to imposing a condition on verse feet, rendering it necessary that each terminates in a heavy syllable. To interpret a similar condition on verse feet (prosodic words) of Tashlhiyt Berber songs, Riad (2017) presented a markedness constraint that militates against verse feet ending in a nonheavy syllable. Such a constraint may be formalised as follows (cf. Final Length in Golston & Riad, 2005):

(22) VF-Final H: A verse foot ends in a heavy syllable.

When assessed by the constraint VF-Final H, two thirds of the shaded (potentially unattested) VF-Bin Satisfiers will be ruled out.

(23)

[(CV.CVX)]	[(CVX.CV)] ***VF-Final H**	[(CV.CV)] ***VF-Final H**	[(CVX)]
[(CV.CVX) (CV.CVX)]	[(CVX.CV) (CV.CVX)]	[(CV.CV) (CV.CVX)]	[(CVX) (CV.CVX)]
[(CV.CVX) (CVX.CV)] ***VF-Final H**	[(CVX.CV) (CVX.CV)] ***VF-Final H**	[(CV.CV) (CVX.CV)] ***VF-Final H**	[(CVX) (CVX.CV)] ***VF-Final H**
[(CV.CVX) (CV.CV)] ***VF-FINAL H**	[(CVX.CV) (CV.CV)] ***VF-Final H**	[(CV.CV) (CV.CV)] ***VF-Final H**	[(CVX) (CV.CV)] ***VF-Final H**
[(CV.CVX) (CVX)]	[(CVX.CV) (CVX)]	[(CV.CV) (CVX)]	[(CVX) (CVX)]

Each VF-Final H violator is a verse foot that ends in a light syllable, underlined in (23). These constitute half of all possible MP-Bin and VF-Bin satisfiers, i.e. verse feet made up of maximally two metrical positions, which themselves are minimally bimoraic and maximally disyllabic. The other half comprises the group of arguably attested verse feet (not shaded) and a group of other potentially unattested verse feet, the ones that may not possibly represent Classical Arabic metra (the five shaded VF-Final H satisfiers).

Two of the five remaining unattested verse feet share a particular metrical position, [(CVX.CV) (CV.CVX)] and [(CVX.CV) (CVX)]. As referred to earlier, metrical positions of this Q form should be ruled out from the inventory of plausible metrical positions for Classical Arabic metra. They are rarely available as the only possible option for parsing, in only one of the eight cases. On the other hand, a P form metrical position (CV.CVX), which corresponds to the sequence of the uneven iamb, is present in each of the remaining seven metra. Consequently, the proposed account must assume that metrical positions are right-headed; hence, the constraint Rh-Type=I (Prince & Smolensky, 2004 [1993]) is ranked undominated. At the same time, it must also filter out all candidates with any metrical position of the form (CVX.CV).

The constraint RhHrm, presented in Prince & Smolensky (2004 [1993]), could achieve the desired effect by disfavouring the cross-linguistically highly marked foot shape (**CVX**.CV), normally designated as the uneven trochee. This constraint is basically formulated to assess metrical positions, as follows:

(24) Rhythmic-Harmony

RhHrm: $*(HL)_{MP}$ – Any metrical position that corresponds to the uneven trochee is disallowed[7].

It should be noted that six of the ten unattested verse feet in (23) that were ruled out by VF-Final H are also RhHrm violators. These are shown below:

7 The constraint Rh-Contour, formalised in Kager (1999), could achieve the same effect by favouring the cross-linguistically more harmonious foot shapes (CV.**CVX**), (**CVX**), and (**CV**.CV) over the disfavoured shapes (**CVX**.CV) and (CV.**CV**). This constraint is basically saying that each member of the former less marked group ends in a strong-weak moraic contour, assuming that the first mora in a heavy syllable is strong. This does not apply to the other two more marked foot shapes. When assessing metrical positions for Classical Arabic metra, this constraint will prohibit the undesirable (**CVX**.CV) sequences, but will also ban the well-formed even iamb (CV.**CV**). In that regard, the constraint Rh-Contour will render (**CV**.CV) more harmonious than (CV.**CV**).

(25) VF-Final H and RhHrm violators

FEET	VF-Final H	RhHrm
[(CVX.CV) (CV.CVX)]	✓	*(CVX.CV)
[(CVX.CV) (CVX)]	✓	*(CVX.CV)
[(CVX.CV)]	*...CV)]	*(CVX.CV)
[(CVX.CV) (CVX.CV)]	*...CV)]	**(CVX.CV)
[(CV.CVX) (CVX.CV)]	*...CV)]	*(CVX.CV)
[(CV.CV) (CVX.CV)]	*...CV)]	*(CVX.CV)
[(CVX) (CVX.CV)]	*...CV)]	*(CVX.CV)
[(CVX.CV) (CV.CV)]	*...CV)]	*(CVX.CV)
[(CV.CVX) (CV.CV)]	*...CV)]	✓
[(CV.CV)]	*...CV)]	✓
[(CV.CV) (CV.CV)]	*...CV)]	✓
[(CVX) (CV.CV)]	*...CV)]	✓

It might be argued that this excessive overlap between the extensions of the two constraints is redundant. The only justification for this redundancy is that each of the two constraints assesses a different level of the metrical structure, the verse foot and the metrical position. Thus, both are required.

The discussion now turns to another unattested verse foot and identifies the constraint that will militate against it. This VF-Bin satisfier is [(CV.CVX) (CV.CVX)]. What is peculiar about this ill-formed verse foot is the manifestation of two uneven iambs [(L.H) (L.H)]. This state of affairs is not demonstrated by any of the eight unique Classical Arabic metra. None of the attested consonant-vowel sequences, therein, may possibly be parsed into more than one uneven iamb. This maximum is also the minimum in seven out of the eight unique metra, as noted above, indicating the prominent status of that uneven iambic sequence. As noted in Prince (1989), this maximality and minimality of the uneven iamb (the P peg) is attributed to its intrinsic prominence that culminates all the way to the top of the metrical tree, which requires a head but essentially allows no more than one.

The proposed account for Classical Arabic metre will capitalise on this view and ultimately considers the uneven iamb as the most preferred head for the entire metron. This should mainly derive from the foot typology that nominates the (L.**H**) as the canonical and most favoured shape of the iamb, if compared to (L.**L**) or (**H**), as argued in Hayes (1995). Initially, nonetheless, this account assumes the argument that obligatorily associates branching with prominence (Hayes, 1981; Hammond, 1986). Specifically, constituent headedness is justified only when the dominant node dominates a branching one. Consequently, this association is possibly interpreted by the pair of statements below (cf. the pair of stress-related constraints WEIGHT-TO-STRESS (Prince, 1990) and its counterpart STRESS-TO-WEIGHT):

(26) a. Branching-to-Headedness (A branching node is obligatorily dominated by the head.)

b. Headedness-to-Branching (The head obligatorily dominates a branching node.)

The association between metrical strength and prominence is generally assumed in metrical analyses. In Hayes et al. (2012), stress is matched to metrical positions by employing the pair of constraints *STRESS IN W and *STRESSLESS IN S, which respectively rule out stressed syllables in metrically weak positions and unstressed syllables in metrically strong positions. In Ryan (2017), strong metrical positions are related to stressed syllables and to heavy syllables utilising the biconditional constraints STRONG⇔STRESS and STRONG⇔HEAVY. Also, Hayes & Schuh (2019) formalise the same association with the constraints STRONG IS LONG and LONG IS STRONG to promote strong grid columns that initiate heavy syllables and heavy syllables that are initiated in strong grid columns.

Each of the two statements in (26) could be formalised as a constraint. For the time being, (26 a) will suffice to account for the absence of any metron with more than one uneven iamb, from the inventory for Classical Arabic metre. Nonetheless, subsequent discussion will demonstrate the need for a constraint that penalises a head which does not dominate a branching node[8]. Assuming the conditional mapping proposed in Ryan (2017), the statement in (26 a) is formalised as a constraint localised to metrical positions, evaluating their association to metron headedness, as follows:

(27) BR-TO-HD: A branching metrical position must be dominated by the head of the metron.

Generally, such a constraint will filter out any candidate with a branching metrical position that is not the head of the metron. In that regard, sanctioned metrical positions for Classical Arabic metra should potentially be assessed accordingly as all are considered to be branching: (CV.CVX) and (CV.CV) each dominates two syllables, and (CVX) dominates a branching rime. Nevertheless, only one metrical position in any Classical Arabic metron should be allowed to qualify for headedness and eventually satisfy a constraint of this nature since there must be one and only one head per metron, as formalised below.

8 A set of “branchingness constraints” are formalised in Torres-Tamarit & Hermans (2017) to assess this branching-headedness relation.

The way around this disfavoured outcome is by decomposing BR-TO-HD into its basic building blocks. Assuming ternary weight distinctions for stress assignment, Ryan (2020) proposes the generic constraint VV-TO-STRESS, which promotes stress on a VV, and the more specific constraint VV-TO-MAIN penalising any candidate where the VV is not assigned primary stress. Applying the same logic, more specific constraints, each localised to a certain metrical position, could be ranked relatively differently in the constraint hierarchy. Collectively, they should achieve the overall effect of BR-TO-HD. For the attested metrical positions in Classical Arabic metra, such constraints might be listed as follows:

(28) a. LH-TO-HD: A metrical position (L**H**) must be dominated by the head of the metron.

b. LL-TO-HD: A metrical position (L**L**) must be dominated by the head of the metron.

c. H-TO-HD: A metrical position (**H**) must be dominated by the head of the metron.

Logically, the naturalness of the rhythmic shape must decide the relative ranking of these individual constraints. Thus, the constraint promoting the least marked iamb, the uneven iamb (L**H**), should be ranked topmost. In essence, this agrees with the constraint UNEVEN-IAMB proposed by Kager (1999) to favour (L**H**) over (L**L**) or (**H**).

In light of all this, the ill-formed VF-BIN satisfier [(CV.CVX) (CV.CVX)] will be ruled out by LH-TO-HD no matter which of the two metrical positions is assigned as the head. To prohibit any possibility of having more than one head in a verse foot in order not to violate LH-TO-HD, the proposed account will rank undominated the constraint MONOHEADEDNESS, formalised in Crowhurst (1996), which is violated by any prosodic constituent that licenses more than one unique head. The tableau below shows how a verse foot with more than one uneven iamb is rendered impossible (verse foot headedness is indicated in boldface):

(29)

/CVCVXCVCVX/	MONOHEADEDNESS	LH-TO-HD
a. [(**CV.CVX**) (CV.CVX)]		*!
b. [(CV.CVX) (**CV.CVX**)]		*!
c. [(**CV.CVX**) (**CV.CVX**)]	*!	

The last two unattested VF-BIN satisfiers to be filtered out are [(CVX) (CV.CVX)] and [(CV.CV) (CV.CVX)]. These two candidate verse feet share two basic features. Each comprises two metrical positions the final of which corresponds to the uneven iamb (CV.CVX). The constraint that will eventually block these and similar verse feet is one that defines prominence/headedness on the level of verse feet. It is an alignment constraint (McCarthy & Prince, 1993a; Prince & Smolensky, 2004 [1993]) and it could be formalised as follows:

(30) ALIGN-VFHD-L: Align (H-MP, Left, VF, Left)

The head MP is leftmost in the VF.

This constraint is basically stating that the left edge of the most prominent metrical position in a verse foot is necessarily aligned with the left edge of that verse foot. The tableau below demonstrates how the two ill-formed verse feet above are banned:

(31)

(i) /CVXCVCVX/	ALIGN-VFHD-L	LH-TO-HD
a. [(**CVX**) (CV.CVX)]		*!
b. [(CVX) (**CV.CVX**)]	*!	

(ii) /CVCVCVCVX/	ALIGN-VFHD-L	LH-TO-HD
a. [(**CV.CV**) (CV.CVX)]		*!
b. [(CV.CV) (**CV.CVX**)]	*!	

None of the candidates in (31) could possibly satisfy both ALIGN-VFHD-L and LH-TO-HD. Conversely, the well-formed verse foot [(**CV.CVX**) (CVX)] does. Its head metrical position is left aligned with the verse foot, satisfying ALIGN-VFHD-L, and the uneven iamb is assigned headedness, to uphold the constraint LH-TO-HD.

It is plausible to say now that all possibly configured but potentially unattested verse feet are filtered out by the proposed constraints. This is clarified in the table below, where only one constraint is highlighted as the fundamental reason for the ban:

(32)

[(CV.CVX)]	[(CVX.CV)] ***VF-FINAL H**	[(CV.CV)] ***VF-FINAL H**	[(CVX)]
[(CV.CVX) (CV.CVX)] ***LH-TO-HD**	[(CVX.CV) (CV.CVX)] ***RHHRM**	[(CV.CV) (CV.CVX)] ***ALIGN-VFHD-L**	[(CVX) (CV.CVX)] ***ALIGN-VFHD-L**
[(CV.CVX) (CVX.CV)] ***VF-FINAL H**	[(CVX.CV) (CVX.CV)] ***VF-FINAL H**	[(CV.CV) (CVX.CV)] ***VF-FINAL H**	[(CVX) (CVX.CV)] ***VF-FINAL H**
[(CV.CVX) (CV.CV)] ***VF-FINAL H**	[(CVX.CV) (CV.CV)] ***VF-FINAL H**	[(CV.CV) (CV.CV)] ***VF-FINAL H**	[(CVX) (CV.CV)] ***VF-FINAL H**
[(CV.CVX) (CVX)]	[(CVX.CV) (CVX)] ***RHHRM**	[(CV.CV) (CVX)]	[(CVX) (CVX)]

To recapitulate, all constraints on metrification introduced so far are listed in (33) below, as constraints on binarity, headedness, and on general markedness:

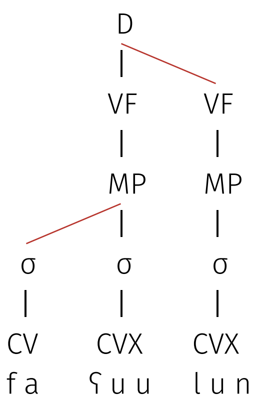
(33)

MP-Bin	Rh-Type=I	Exh(X)
VF-Bin	LH-to-Hd	*Clash-MP
Mt-Bin	Monoheadedness	VF-Final H
	Align-VFHd-L	RhHrm

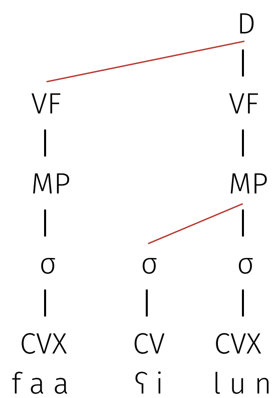
With such constraints in mind, the tree diagrams below represent the first seven of the unique Classical Arabic metra. In essence, these tree diagrams are in agreement with the hierarchical and relational structures proposed in Prince (1989) for P, K, and L sequences in Classical Arabic metre.

(34)

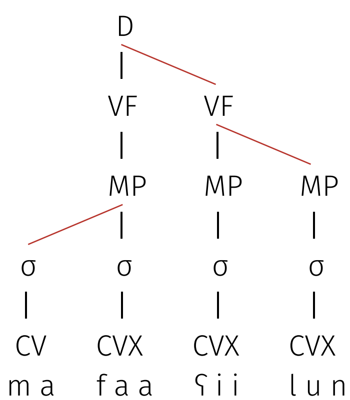
a. PK



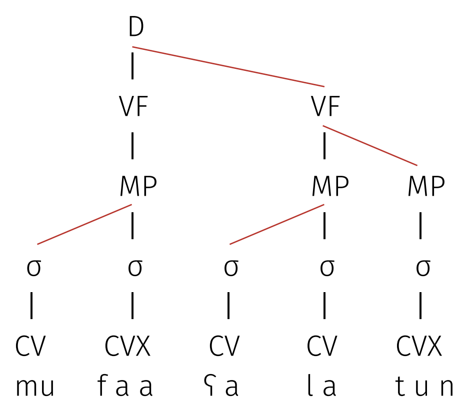
b. KP



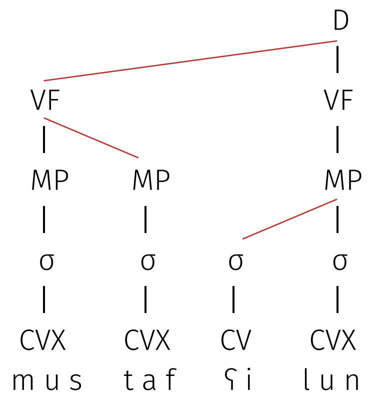
c. PKK



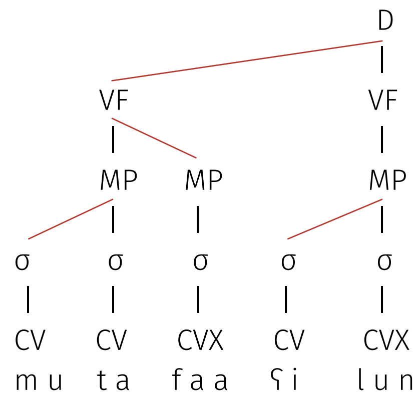
d. PLK



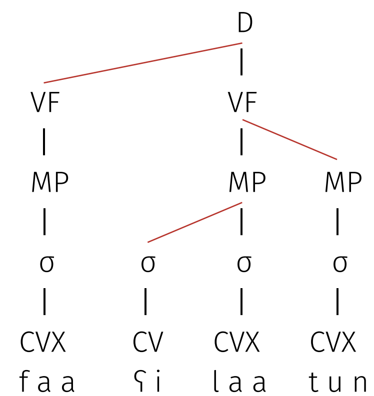
e. KKP



f. LKP



g. KPK



The tree diagrams in (34) show a number of characteristics about Classical Arabic metra. Every metron comprises two verse feet, each of which dominates one or two metrical positions that license two syllables maximally and two morae minimally. Also, each verse foot terminates in a heavy syllable. The most prominent metrical position in each metron always corresponds to an uneven iamb and is uniformly aligned with the left edge of the head verse foot. The iambic parsing does place the head syllable within each metrical position at the right edge.

After limiting the attested foot forms to those five that violate no constraint(s) in (32), the discussion progresses now to limiting the possible combinations of two verse feet to the ones required for structuring the seven metra in (34). These seven plausible combinations of two verse feet occupy the unshaded cells among all Mt-Bin satisfiers in (35):

(35) Mt-Bin satisfiers

(a) [(CV.CVX)] + [---]	(b) [(CV.CVX) (CVX)] + [---]
[(CV.CVX)] [(CV.CVX)]	[(CV.CVX) (CVX)] [(CV.CVX)]

[(CV.CVX)] [(CV.CVX) (CVX)]	[(CV.CVX) (CVX)] [(CV.CVX) (CVX)]
[(CV.CVX)] [(CVX)]	[(CV.CVX) (CVX)] [(CVX)]
[(CV.CVX)] [(CV.CV) (CVX)]	[(CV.CVX) (CVX)] [(CV.CV) (CVX)]
[(CV.CVX)] [(CVX) (CVX)]	[(CV.CVX) (CVX)] [(CVX) (CVX)]

(c) [(CVX)] + [---]	(d) [(CV.CV) (CVX)] + [---]
[(CVX)] [(CV.CVX)]	[(CV.CV) (CVX)] [(CV.CVX)]
[(CVX)] [(CV.CVX) (CVX)]	[(CV.CV) (CVX)] [(CV.CVX) (CVX)]
[(CVX)] [(CVX)]	[(CV.CV) (CVX)] [(CVX)]
[(CVX)] [(CV.CV) (CVX)]	[(CV.CV) (CVX)] [(CV.CV) (CVX)]
[(CVX)] [(CVX) (CVX)]	[(CV.CV) (CVX)] [(CVX) (CVX)]

(e) [(CVX) (CVX)] + [---]
[(CVX) (CVX)] [(CV.CVX)]
[(CVX) (CVX)] [(CV.CVX) (CVX)]
[(CVX) (CVX)] [(CVX)]
[(CVX) (CVX)] [(CV.CV) (CVX)]
[(CVX) (CVX)] [(CVX) (CVX)]

Again, the proposed account must show how such implausible foot combinations, the shaded ones in (35), are ruled out by constraints and constraint rankings. This, however, may not be required for the third footing in (35 b), which is only an alternative footing of the same consonant-vowel sequence in (34 c). In Prince (1989), this ambiguity is mentioned and distributional evidence is presented for different Classical Arabic metres (tawil and wafir versus hazaj in particular).

To exclude the first two metron configurations in (35 a) and the first two in (35 b), the proposed account will again call on the constraint LH-TO-HD. Each of these ill-formed combinations contains two metrical positions of the form (CV.CVX). This means that one of these intrinsically prominent metrical positions will certainly violate LH-TO-HD as it is blocked by the other from culminating to the head position of the entire metron.

Examining some of the other implausible candidates in (35) reveals a characteristic that is not attested in any Classical Arabic metron in (34), where the number of metrical positions in any metron is minimally two and maximally three. Although sanctioned by the general requirements on binarity, none of the unique Classical Arabic metra contains four metrical positions. Nine of the shaded cells in (35) contain four metrical positions: three in (35 b), including one already ruled out by LH-TO-HD, three in (35 d), and three in (35 e). To block such candidates, the proposed account assumes the undominated ranking of a constraint against more than one branching foot per metron[9].

(36) VERSE FOOT - BRANCHING

VF-BR: No more than one VF is allowed to dominate more than one MP.

Consequently, any implausible candidates containing four metrical positions, like [(CV.CVX) (CVX)] [(CV.CV) (CVX)] or [(CV.CVX) (CVX)] [(CVX) (CVX)], will incur a fatal violation of the constraint VF-BR.

There are five remaining implausible candidates (three in 35 c: [(CVX)] [(CVX)] - [(CVX)] [(CV.CV)(CVX)] - [(CVX)] [(CVX)(CVX)], one in 35 d: [(CV.CV)(CVX)] [(CVX)], and one in 35 e: [(CVX)(CVX)] [(CVX)]). They share one specific quality; none of them has the sufficient consonant-vowel sequence required for parsing the (CV.CVX) metrical position, the uneven iamb. Although each satisfies M_T-B_{IN} by virtue of having two verse feet, none contains that intrinsically prominent metrical position, as defined thus far. Consequently, filtering them out will not incur any violation of the undominated LH-TO-HD.

The proposed account will block such candidates by assuming conjoined bracketing and prominence matching, in the sense of Hayes et al. (2012). Specifically, the constraint that will eventually militate against the five remaining implausible candidates is a local conjunction (Smolensky, 1995) of an alignment (or rather non-alignment) constraint and a prominence-matching constraint. This proposed constraint is a local conjunction that disfavours peripheral head verse feet when their head metrical positions are not uneven iambs. In other words, the free distribution of uneven iambs, initially, medially, and finally, does not apply to other metrical positions when assigned headedness of the metron; the distribution of these other metrical positions is only confined to medial positions. This follows logically from the privileged status of the uneven iamb, being the most rhythmically favoured shape of the iamb. Such desired effect could be achieved by conjoining the NON-PERIPHERALITY constraint in (37 a) (Hulst, 1999; Roca & Al-Ageli, 1999) with the HEADEDNESS-TO-BRANCHING constraint in (37 b), which promotes the opposite direction of matching when compared with (28 a) above.

9 Golston (1998) accounts for the fact that Middle English alliterative verse has seven, rather than eight, metrical positions for the line by assuming that the third or fourth verse foot is necessarily non-branching. This results in a violation of strict binarity, specifically of the constraint W_DB_{IN} as it assesses a catalectic position.

(37) Local conjunction: NON-PRPH&HD-TO-LH

a. NON-PRPH: The head verse foot of the metron is not peripheral in the metron[10].

b. HD-TO-LH: The head of the metron must dominate a metrical position (L**H**).

Being a local conjunction, the constraint NON-PRPH&HD-TO-LH is only violated when both constraints NON-PRPH and HD-TO-LH are violated in a certain candidate. Also, it will always be assumed that the constraint NON-PRPH&HD-TO-LH outranks any one of the two conjoined constraints.

As indicated above, the requirement on non-peripherality will ultimately be imposed on the head verse foot when it is not an uneven iamb. As binarity limits the number of verse feet to two per metron, each of the five remaining implausible candidates will violate this non-peripherality requirement whether the head foot is initial or final. Also, each will violate the prominence-matching requirement as none has the uneven iamb as its head metrical position. The result is violating the local conjunction NON-PRPH&HD-TO-LH. This proposal that involves the local conjunction will also be utilised in (§4.3) for the purpose of optimising the eighth unique metron, and consequently justified even further for Classical Arabic metre.

Clearly, NON-PRPH&HD-TO-LH is not violated in any of the attested Classical Arabic metra in (34). Each of the first seven metra has an uneven iamb as its most prominent metrical position, crucially satisfying HD-TO-LH, a conjunct of NON-PRPH&HD-TO-LH. Those metra also satisfy LH-TO-HD and every other undominated constraints in (33). The consequence of that is the undominated ranking of NON-PRPH&HD-TO-LH.

Thus far, there was no pressing need for a constraint that militates against unheadedness in a constituent. That is due to LH-TO-HD, which promotes (LH) to the head position of the metron. Now, however, the proposed account is expected to assess candidates that vacuously satisfy LH-TO-HD, as they contain no CV.CVX sequences. Consequently, it is in order to assume the undominated ranking of a constraint like HEADEDNESS (Selkirk, 1995).

(38) HEADEDNESS

HEAD(X): Each constituent of the type X immediately dominates some constituent of the type X – 1.

10 Abstracting away from edge markedness (Hayes, 1995) should in principle allow for extending the effects of something like non-finality (Prince & Smolensky, 2004 [1993]) to assess initial, as well as final, edges. In that regard, Golston (1998) proposed both constraints NONFINAL and NONINITIAL. However, it should be noted that Kager (2012) presents a different view disfavouring non-initiality.

The tableau below demonstrates how the proposed account will rule out any parsing candidate of the sequence /CVXCVXCVX/ (metron headedness is indicated in boldface):

(39)

/CVXCVXCVX/	NON-PRPH&HD-TO-LH	HEAD(X)
a. [(**CVX**) (CVX)] [(CVX)]	*!	
b. [(CVX) (CVX)] [(**CVX**)]	*!	
c. [(CVX)] [(**CVX**) (CVX)]	*!	
d. [(CVX)] [(CVX) (CVX)]		*!

None of the first three candidates has the uneven iamb as its most prominent metrical position. In addition, the head verse foot is always peripheral in these candidates, initial in (39 a) and final in both (39 b) and (39 c). A candidate like (39 d) is ruled out for lack of headedness.

As shown with verse feet above, the table below explains how the proposed account is able to rule out all implausible metra (in the shaded cells).

(40)

(a) [(CV.CVX)] + [---]	(b) [(CV.CVX) (CVX)] + [---]
[(CV.CVX)] [(CV.CVX)] ***LH-TO-HD**	[(CV.CVX) (CVX)] [(CV.CVX)] ***LH-TO-HD**
[(CV.CVX)] [(CV.CVX) (CVX)] ***LH-TO-HD**	[(CV.CVX) (CVX)] [(CV.CVX) (CVX)] ***LH-TO-HD**
[(CV.CVX)] [(CVX)]	[(CV.CVX) (CVX)] [(CVX)] Variant Parsing
[(CV.CVX)] [(CV.CV) (CVX)]	[(CV.CVX) (CVX)] [(CV.CV) (CVX)] ***VF-BR**
[(CV.CVX)] [(CVX) (CVX)]	[(CV.CVX) (CVX)] [(CVX) (CVX)] ***VF-BR**
(c) [(CVX)] + [---]	(d) [(CV.CV) (CVX)] + [---]
[(CVX)] [(CV.CVX)]	[(CV.CV) (CVX)] [(CV.CVX)]
[(CVX)] [(CV.CVX) (CVX)]	[(CV.CV) (CVX)] [(CV.CVX) (CVX)] ***VF-BR**
[(CVX)] [(CVX)] ***NON-PRPH&HD-TO-LH**	[(CV.CV) (CVX)] [(CVX)] ***NON-PRPH&HD-TO-LH**

[(CVX)] [(CV.CV) (CVX)] *Non-Prph&Hd-to-LH	[(CV.CV) (CVX)] [(CV.CV) (CVX)] *VF-Br
[(CVX)] [(CVX) (CVX)] *Non-Prph&Hd-to-LH	[(CV.CV) (CVX)] [(CVX) (CVX)] *VF-Br
(e) [(CVX) (CVX)] + [---]	
[(CVX) (CVX)] [(CV.CVX)]	
[(CVX) (CVX)] [(CV.CVX) (CVX)] *VF-Br	
[(CVX) (CVX)] [(CVX)] *Non-Prph&Hd-to-LH	
[(CVX) (CVX)] [(CV.CV) (CVX)] *VF-Br	
[(CVX) (CVX)] [(CVX) (CVX)] *VF-Br	

Through maintaining the different prominence relations discussed in this subsection, the proposed account was able to exclude all possibly configured but prosodically implausible verse feet and metra for Classical Arabic metre. Up till this point, however, the focus was mainly on the first seven of the eight unique metra. In what follows, the eighth metron, which is rather distinctive when compared to the other seven, is discussed in more detail.

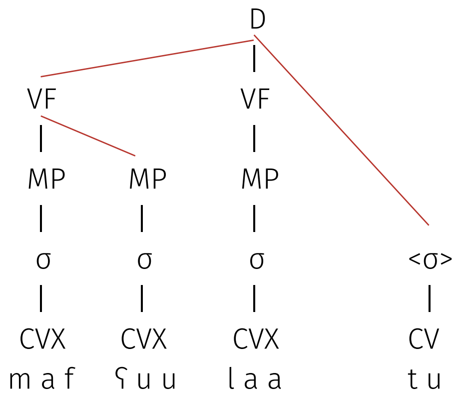
4.3. Extrametricality

The eighth metron /mafʕuulaatu/ (7 h), which is considered to be rare in the attested verse-patterns of Classical Arabic poetry and never surfaces in a hemistich-final position[11], is distinguished from the other seven in a rather peculiar way. Its consonant-vowel sequence never allows parsing of any uneven iamb. It is simply a concatenation of three CVX syllables followed by a light CV syllable. For the proposed account (so far), this state of affairs is problematic in more than one way. Most obviously, if the final CV light syllable is to be parsed into any metrical position, as is the norm with all syllables, it will certainly share one with the previous CVX syllables, creating the disallowed (CVX.CV) and consequently violating the undominated RhHrm. Another potentially fatal violation is that of the constraint Non-Prph&Hd-to-LH, incurred by the lack of the uneven iamb as head coupled with the inevitable peripherality of the head verse foot.

11 Sari is the only metre where the eighth metron appears hemistich-finally in the canonical form of the metre. Nonetheless, this final eighth metron never surfaces with a final light syllable in any of Sari's six verse-patterns. Obviously, this further limits the surface distribution of the eighth metron.

From a different angle, the eighth metron can be compared to those implausible metra in (35) which are lacking in the consonant-vowel sequence required for parsing the (CV.CVX) metrical position. The only contrast is the light CV syllable which occurs finally in the attested eighth metron. The proposed account will capitalise on this difference by assuming that the final CV syllable is marked extrametrical, as diagrammed in (41), where the extrametrical syllable is indicated with angle brackets. This will render non-peripheral any verse foot erected only on the penultimate CVX syllable, satisfying both RhHrm and Non-Prph&Hd-to-LH.

(41)



This configuration in (41) demonstrates how fundamental the constraint Non-Prph&Hd-to-LH is to the harmony of the eighth metron. Some candidates in (35) fail to satisfy this constraint as their head metrical positions are not uneven iambs and both of their verse feet are always peripheral. On the other hand, the eighth metron satisfies the requirement on non-peripherality and eventually avoids violating Non-Prph&Hd-to-LH. Even though its head metrical position is not a CV.CVX, the head verse foot is separated from the final edge of the metron by the extrametrical light syllable and from the left edge of the metron by the other verse foot.

As indicated in Golston & Riad (2005), the violation of Exhaustivity is what defines extrametricality in metre. Thus, of all the constraints introduced thus far, this extrametricality account only violates Exh(X), as the final syllable is not immediately dominated by a metrical position. For this to achieve the desired effect, and only that, extrameticality will have to be restricted on two dimensions, limiting its domain to syllables and light syllables only, not other constituents or other syllable types. As mentioned in a footnote above, the constraint Exh(X) could be decomposed into localised constraints each of which is limited to a specific constituent. Therefore, such constraints will interpret the general requirement on exhaustivity by individually assessing whether or not segments are parsed into syllables, syllables are parsed into metrical positions, and so on.

(42) Exhaustivity

a. Exh(σ): Each segment is immediately dominated by some syllable.

b. Exh(MP): Each syllable is immediately dominated by some metrical position.

c. Exh(VF): Each metrical position is immediately dominated by some verse foot.

d. Exh(M_T): Each verse foot is immediately dominated by some metron.

Now being individually separate, these constraints in (42) might be ranked differently to allow for varied interpretations of Exhaustivity. For example, a given grammar may tolerate having a syllable not immediately dominated by a metrical position but never allows any other constituent to be dominated by one that is not immediately higher in the hierarchy. Not only that, but such grammar may accept unexhaustive parsing of a certain type of syllables and reject it for other types. A set of constraints on extrametricality is presented in Hayes et al. (2012), some of which could be viewed as scaling syllable prominence. For example, the constraint *EM without Fall dictates that an extrametrical syllable must follow one that has more stress (prominence). For Classical Arabic metra, a single final CV syllable could be associated to a constituent higher than the metrical position, yet a heavy CVX syllable will only be licensed by some metrical position. The intrinsic prominence associated with heavy syllables could provide the logical justification for this discrepancy.

The proposed account ranks all undominated constraints introduced so far and other Exhaustivity constraints higher than Exh(MP)Lσ, which assesses the parsing of light syllables into metrical positions[12].

(43) Other Undominated Constraints, Exh(σ), Exh(MP)Hσ, Exh(VF), Exh(Mt) >> Exh(MP)Lσ

In light of this extrametricality account, the two tableaux below compare candidates of the eighth metron and the implausible metron ruled out in (39) earlier:

(44)

(i) /CVXCVXCVXCV/	UNDOMINATED CONSTRAINTS	Exh(MP)Lσ
a. ☞ [(CVX) (CVX)] [(**CVX**)] <CV>		*
b. [(CVX) (CVX)] [(**CVX**.CV)]	*! RhHrm, * Non-Prph&Hd-to-LH	
(ii) /CVXCVXCVX/	**UNDOMINATED CONSTRAINTS**	**Exh(MP)Lσ**
a. ? [(CVX)] [(**CVX**)] <CVX>	*! Exh(MP)Hσ	
b. ? [(CVX) (CVX)] [(**CVX**)]	*! Non-Prph&Hd-to-LH	

12 The assumption is that main restrictions imposed on extrameticality (Hayes, 1995), like peripherality and non-exhaustivity, are somehow interpreted into undominated constraints to disallow extrametricality from marking non-peripheral syllables or exhausting the entire metron.

The candidate (44 i a) is the most harmonious although it violates the low-ranking constraint Exh(MP)Lσ. Most crucial to its harmony is the non-peripheral head verse foot which significantly satisfies Non-Prph, a conjunct of Non-Prph&Hd-to-LH. Conversely, (44 i b) satisfies Exh(MP)Lσ by having all its syllables parsed into metrical positions; however, this is only possible at the expense of the higher undominated constraints RhHrm and Non-Prph&Hd-to-LH. As for both candidates in (44 ii), they are ruled out by undominated constraints whether the final CVX syllable is marked extrametrical (violating Exh(MP)Hσ) or is parsed into the final metrical position, and eventually the final verse foot (violating Non-Prph&Hd-to-LH).

Allowing the final light syllable of the eighth metron to be marked extrametrical requires examining the metrification of all other possible Exh(MP)Lσ violators. The following table lists all possibly configured metra ending in the sequence CVX.CV preceded by either one or two metrical positions. All cells in which the final CVX.CV is preceded by two metrical positions include the two possible metrifications of the overall sequence.

(45)

	... CV.CVX ...	**... CVX ...**	**... CV.CV ...**
...	[(CV.CVX)] [(CVX)] <CV>	[(CVX)] [(CVX)] <CV>	[(CV.CV)] [(CVX)] <CV>
CV.CVX ...	[(CV.CVX)] [(CV.CVX) (CVX)] <CV> [(CV.CVX) (CV.CVX)] [(CVX)] <CV>	[(CV.CVX)] [(CVX) (CVX)] <CV> [(CV.CVX) (CVX)] [(CVX)] <CV>	[(CV.CVX)] [(CV.CV) (CVX)] <CV> [(CV.CVX) (CV.CV)] [(CVX)] <CV>
CVX ...	[(CVX)] [(CV.CVX) (CVX)] <CV> [(CVX) (CV.CVX)] [(CVX)] <CV>	[(CVX) (CVX)] [(CVX)] <CV> [(CVX)] [(CVX) (CVX)] <CV>	[(CVX)] [(CV.CV) (CVX)] <CV> [(CVX) (CV.CV)] [(CVX)] <CV>
CV.CV ...	[(CV.CV)] [(CV.CVX) (CVX)] <CV> [(CV.CV) (CV.CVX)] [(CVX)] <CV>	[(CV.CV) (CVX)] [(CVX)] <CV> [(CV.CV)] [(CVX) (CVX)] <CV>	[(CV.CV) (CV.CV)] [(CVX)] <CV> [(CV.CV)] [(CV.CV) (CVX)] <CV>

With the exception of the unshaded half-cell, all other metrifications in (45) are implausible, and the proposed account should be able to filter them out. In order to achieve that, these unattested metra will be divided into two groups: the ones that violate some constraint(s) already introduced and the ones that require introducing other constraints. What is always true about all metrifications in (45), including the eighth attested metron (7 h), is that they are less harmonious than the first seven metra (7 a-g) because of their consistent violation of Exh(MP)Lσ. Therefore, the purpose of what remains in this subsection is certainly not to examine whether or not they may compete with the first seven metra. The objective, rather, is to show that the eighth metron is the most harmonious among all other possibly configured Exh(MP)Lσ violators.

The table in (45) includes a number of metron candidates that obviously violate one or more of the undominated constraints introduced above. (The table in (48) below gives all the details concerning such candidates.) In addition to those, there are some candidates in (45) that may require introducing other constraints. Specifically, the constraint *Clash-Mt in (46 a) is violated when heads of verse feet are next to one another[13]. Also, the constraint Pk-Prom in (46 b) (Prince & Smolensky, 2004 [1993]) disfavours headedness when assigned to a light syllable. Thirdly, the constraint Align-MtHd-R in (46 c) will render less harmonious any metron candidate that unjustifiably violates the constraint Exh(MP)Lσ by marking extrametrical a final light syllable which follows one of the perfectly attested metra, namely (7 a, c, e, and f). Those attested metra will always be more harmonious than their counterparts with final extrametrical syllables. Crucially, the eighth metron will also be more harmonious than any of such implausible metron candidates. This harmony is assessed by counting the number of syllables intervening between the right-edge of the head metrical position and that of the metron. The less the number of syllables the more harmonious a candidate is. These three constraints might be violated by some of the first seven metra, but such violations will not affect the overall harmony as all three constraints are ranked lower than Exh(MP)Lσ.

(46) a. *Clash-Mt: A metron with adjacent heads of verse feet is prohibited.

b. Peak-Prominence

Pk-Prom: A metron with a verse foot head of low intrinsic prominence is prohibited.

c. Align-MtHd-R: Align (Hd-MP, Right, Mt, Right)

The head MP is rightmost in the MT.

The three tableaux below clarify how the constraints in (46) contribute to optimising the eighth metron (47 i a, ii a, and iii a). (Verse foot headedness is indicated in boldface, and metron headedness in (47 iii) is indicated with the suprasegmental diacritic (ˈ) inserted before the head metrical position):

(47) (i)

METRON CANDIDATES	*Clash-Mt
a. ☞ [(**CVX**) (CVX)] [(**CVX**)] <CV>	
b. [(**CVX**)] [(**CVX**)] <CV>	*!
c. [(**CVX**)] [(**CVX**) (CVX)] <CV>	*!
d. [(**CVX**)] [(**CV.CV**) (CVX)] <CV>	*!

13 A possible line of argument to differentiate a clash that involves an uneven iamb from one that does not could capitalise on the distinction between parsing feet and surface feet (Kager, 1991, 1993).

(ii)

METRON CANDIDATES	PK-PROM
a. ☞ [(**CVX**) (CVX)] [(**CVX**)] <CV>	
b. [(**CV.CV**) (CVX)] [(**CVX**)] <CV>	*!

(iii)

METRON CANDIDATES	ALIGN-MTHD-R
a. ☞ [(**CVX**) (CVX)] [(ˈ**CVX**)] <CV>	σ
b. [(ˈ**CV.CVX**)] [(**CVX**)] <CV>	σσ!
c. [(**CVX**)] [(ˈ**CV.CVX**) (CVX)] <CV>	σσ!
d. [(ˈ**CV.CVX**)] [(**CVX**) (CVX)] <CV>	σσ!σ
e. [(ˈ**CV.CVX**)] [(**CV.CV**) (CVX)] <CV>	σσ!σσ

The table in (48) below explains how the proposed account is able to rule out all implausible EXH(MP)Lσ violators, leaving only one most harmonious metrification (that of the eighth metron in the unshaded half-cell)[14]. It should be noted that some, rather than all, violations are listed.

(48)

[(CV.CVX)] [(CVX)] <CV> *ALIGN-MTHD-R (σσ)	[(CVX)] [(CVX)] <CV> *CLASH-MTN	[(CV.CV)] [(CVX)] <CV> *VF-FINAL H
[(CV.CVX)] [(CV.CVX) (CVX)] <CV> *LH-TO-HD [(CV.CVX) (CV.CVX)] [(CVX)] <CV> *LH-TO-HD and/ or *ALIGN-VFHD-L	[(CV.CVX)] [(CVX) (CVX)] <CV> [(CV.CVX) (CVX)] [(CVX)] <CV> *ALIGN-MTHD-R (σσσ)	[(CV.CVX)] [(CV.CV) (CVX)] <CV> *ALIGN-MTHD-R (σσσσ) [(CV.CVX) (CV.CV)] [(CVX)] <CV> *VF-FINAL H

14 If contrasted with the eighth metron, all candidates that end in the sequence … (CV.CV)] <CV> are ruled out by the constraint VF-FINAL H as their final feet end in light syllables. However, metron candidates ending in the sequence … [(CV.CVX)] <CV> are rendered less harmonious than the eighth metron by decomposing the constraint ALIGN-MTHD-R into more specific constraints and ranking the one that assesses heads of the uneven iamb form (ALIGN-MTHD(UI)-R) higher than the others. Crucially though, this constraint is ranked lower than EXH(MP)Lσ, that is obviously violated by marking any final light syllable extrametrical, but is satisfied in all of the first seven metra. Violating ALIGN-MTHD(UI)-R will be more serious than violating any other constraint of the ALIGN-MTHD-R family. Consequently, any candidate ending in the sequence … [(CV.CVX)] <CV> should be less harmonious than the eighth metron: [(CVX) (CVX)] [(CVX)] <CV>.

[(CVX)] [(CV.CVX) (CVX)] <CV> *ALIGN-MTHD-R (σσ) [(CVX) (CV.CVX)] [(CVX)] <CV> *LH-TO-HD or *ALIGN-VFHD-L	[(CVX) (CVX)] [(CVX)] <CV> *Most Harmonious* [(CVX)] [(CVX) (CVX)] <CV> *CLASH-MTN	[(CVX)] [(CV.CV) (CVX)] <CV> *CLASH-MTN [(CVX) (CV.CV)] [(CVX)] <CV> *VF-FINAL H
[(CV.CV)] [(CV.CVX) (CVX)] <CV> *VF-FINAL H [(CV.CV) (CV.CVX)] [(CVX)] <CV> *LH-TO-HD or *ALIGN-VFHD-L	[(CV.CV) (CVX)] [(CVX)] <CV> *PK-PROM [(CV.CV)] [(CVX) (CVX)] <CV> *VF-FINAL H	[(CV.CV) (CV.CV)] [(CVX)] <CV> [(CV.CV)] [(CV.CV) (CVX)] <CV> *VF-FINAL H

Finally, all constraints required in the proposed account for optimising the eight unique metra of Classical Arabic poetry are summarised in the ranking below:

(49) Constrain ranking – Classical Arabic metra

MP-Bin, VF-Bin, Mt-Bin, Rh-Type=I, LH-to-Hd, Monoheadedness, Align-VFHd-L, Head(X), Non-Prph&Hd-to-LH, Exh(σ), Exh(MP)Hσ, Exh(VF), Exh(Mt), *Clash-MP, VF-Final H, RhHrm, VF-Br

>>

Exh(MP)Lσ

>>

*Clash-Mt, Pk-Prom, Align-MtHd-R

5. Conclusion

Out of all possibly configured representations, the proposed account was able to limit the list of those most harmonious candidates to the eight unique Classical Arabic metra. Imposing binarity requirements on various levels of the metrical structure (namely the metrical position, the verse foot, and the metron) defined the domain within which a well-formed metron might be realised. Any consonant-vowel sequence that fell short of that domain or went excessively beyond it was ruled out. Another distinguishing factor was that of prominence. The various prominence relations holding within and across different constituents did help in highlighting areas of potential ill-formedness. In particular, the intrinsic prominence of the uneven iamb was demonstrated as a predominant feature of almost all Classical Arabic metra. Consequently, that was interpreted into a number of markedness constraints filtering out those implausible verse feet and metra that satisfied all binarity constraints. Finally, the local conjunction militating against peripherality of a head verse foot, when its head metrical position is not an uneven iamb, set the eighth metron apart from other implausible metra that are also lacking in uneven iambs. Marking the final light syllable of the eighth metron extrametrical rendered its head verse foot non-peripheral and consequently more harmonious than a counterpart without that final light syllable. A number of other markedness constraints, however, had to be introduced (and ranked lower than all EXH(X) constraints) to promote the eighth metron as the most harmonious EXHAUSTIVITY violator.

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