Quantified Exponence Constraints and the Typology of Exponence

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1. Overview

- This paper examines the mapping between morphosyntactic structures and their corresponding phonological materials (i.e. their *exponents*), and
- proposes a mechanism that gives a unified account to various phenomena and predicts the full range of typology.

2. A typology of exponence

- languages exhibit various types of mapping between morphosyntactic information and phonological information:

Type	Attested Language
a. Phonologically Conditioned Suppletive Allomorphy (PCSA)	Moroccan Arabic
b. Multiple exponence (ME)	Tamazight Berber
c. Both PCSA and ME	Lower Jubba Maay
d. Partial non-realization	Bukusu
e. Zero realization	English

Examples

a) Moroccan Arabic: 3rd person singular masculine prenominal clitic (Harrel 1962, Mascoró 2007)

	stem	gloss	3p.sg.m	gloss
a.	xt^{ʕ}a	'error'	xt^{ʕ}a-h	'his error'
b.	ktab	'book'	ktab-u	'his book'

b) Tamazight Berber: 2nd person marker (Xu 2007, cf. Noyer 1992, Stump 2001)

feature(s)	{2}	{2, sg.}	{2, pl.}
exponent	t-	-d	-m

- e.g. 2nd person masculine singular of *dawa* ('cure'): t-dawa-d, but *dawa-d

c) Lower Jubba Maay: plural (Paster 2006, 2010)

	singular	plural	gloss
a.	liwa	liwa-yal	'lions'
b.	eey	eey-o, eey-yal, eey-o-yal	'dogs'

- vowel-final nouns can only take -yal
- has both properties of **PCSA** and **ME**

d) Bukusu: 1st person present (Odden 2005)

|	stem	gloss	1st person present	gloss
a.	teexa	'cook'	/N-teexa/ → [ndeexa]	'I cook'
b.	xala	'cut'	/N-fuma/ → [fuma]	'I cut'

3. Claim

1) The phenomena presented above are inherently related.
2) There is a mechanism at morphology-phonology interface that can give rise to various types of exponence.

## 4. Proposal

1) *The organization of the lexicon*

the lexicon:
- morphosyntactic features (**M** information) phonological exponents (**P** information)
- **M-ℜ-P** (cf. Halle and Marantz 1993, Trommer 2001, Walker and Feng 2004, Wolf 2008, Kimper 2009)

a. *Moroccan Arabic* {3P.M.SG}

b. *Lower Jubba Maay* {PLURAL}
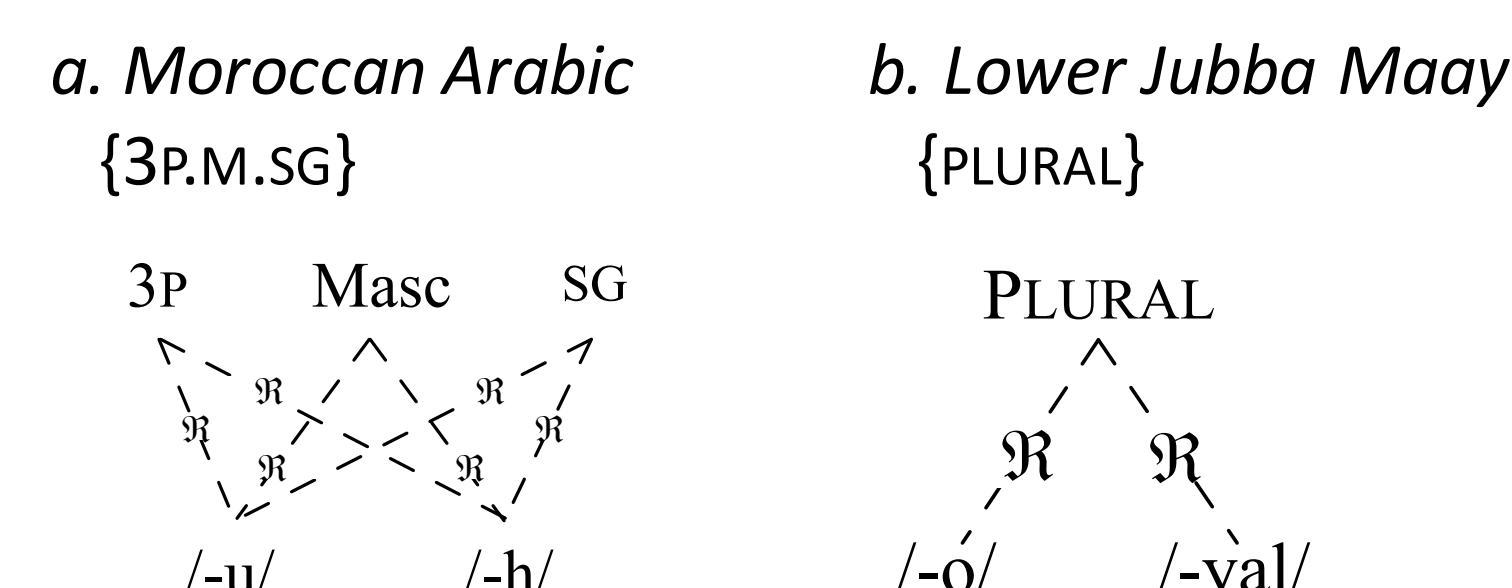
- The structures above will be called the *Lexical Representation (LR)*

2) *Two Gen functions*

- intermediate-GEN (i-GEN): operates on *LR* and generates a set of forms containing various permutations of the exponents, which are called the *Exponent-Chosen Representation (ER)*. (cf. Unification-Gen in Sprouse 1997)
- Familiar GEN in Classic OT operates on *ER* and generates *Surface Representation (SR)*.
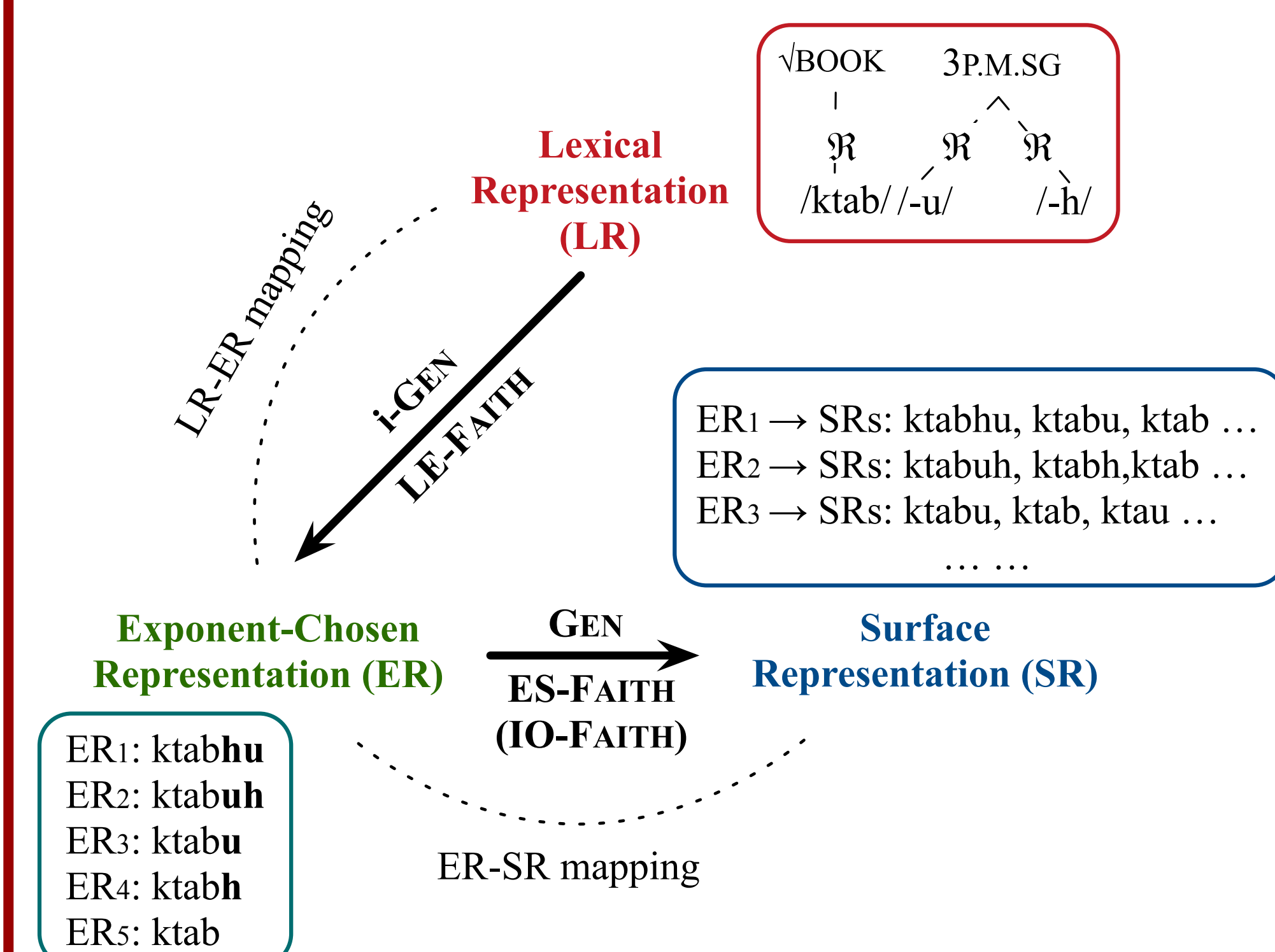
3) *Quantified Exponence Constraints* (for *LR-ER*)

- **MAX-∀LE(F)**: *All* the phonological information provided in LR must be preserved in ER.
- **MAX-∃LE(F)**: *Some* of the phonological information provided in LR must be preserved in ER.

5. Constraints in action

1) PCSA: MAX-∀LE(F) being dominated by markedness

- Moroccan Arabic
- ONSET (ONS) >> NOCODA (*C]σ) (xt^{ʕ}ah > xt^{ʕ}a.u)
- Schema: **MAX-∃LE(F) >> MARKEDNESS >> MAX-∀LE(F)**

√ERROR 3P.M.SG ℜ ℜ ℜ /xt^{ʕ}a/ /-h/ /-u/		MAX-∃LE (3P.M.SG)	ONS	*STRUC-σ	*C]σ	MAX-∀LE (3P.M.SG)
a.	/xt^{ʕ}a-hu/	[xt^{ʕ}a.hu]			2W	L	L
☞ b.	/xt^{ʕ}a-h/	[xt^{ʕ}ah]			1	1	1
c.	/xt^{ʕ}a-u/	[xt^{ʕ}a.u]		1W	2W	L	1
d.	/xt^{ʕ}a/	[xt^{ʕ}a]	1W		1	L	2

2) Both properties of PCSA and ME: MAX-∀LE(F) interleaved with markedness

- Lower Jubba Maay:
- '-yal' is viewed as the strong/default marker, which should be favored (cf. Harris 2017, Caballero and Inkelas 2013) (**PRIORITY**)
- '-yal' can be analyzed as a clitic (Paster 2006), which suggests it should be the outer marker. (**ALIGN**)
- The variation shown in section 2 can be achieved by *Partially Ordered Constraints* (Anttila 1997)

√CAT PLURAL ℜ ℜ ℜ /mukulal/ /-o/ /-yal/		ALIGN -yal	*C]σ	MAX-∀LE(PL)	PRIORITY
☞a.	mukulal-o	mu.ku.la.lo			1	1
☞b.	mukulal-yal	mu.ku.lal.yal		2		1
☞c.	mukulal-o-yal	mu.ku.la.lo.yal		1	1	
d.	mukulal-yal-o	mu.ku.lal.ya.lo	1	1	1	1

a) NOCODA >> MAX-∀LE(F) , PRIORITY: mukulal-o
b) PRIORITY >> MAX-∀LE(F) , NOCODA: mukulal-yal
c) MAX-∀LE(F) >> NOCODA, PRIORITY: mukulal-o-yal

6. Typological predictions

1) **Typological test**
- The typology is tested by a toy language resembling Moroccan Arabic:
  - two exponents of certain feature F: /-tel/ and /-is/
  - /bada-tel/ (vowel-final) vs. /bad-is/ (consonant-final)

- Constraints: ONSET (M1), NOCODA (M2), *STRUC-σ (M3), I-CONTIG, and MAX-IO (collectively FAITH-IO)

2) **Results**
- 15 grammars are predicted by OT-Soft (Staubs et al. 2012)
- All grammars can be categorized as 7 groups
- the grammars within each group exhibit the same pattern of exponence, only differ in markedness
- 5 groups out of 7 are attested (cover 12 grammars); the languages below can represent each group:

Type	Grammar	Attested Language
a. PCSA	MAX-∃LE(F), FAITH-IO, M1 >> M2, M3 >> MAX-∀LE(F)	Moroccan Arabic (3.p.m.sg)
b. ME	MAX-∃LE(F), MAX-∀LE(F), M1, FAITH-IO >> M2, M3	Tamazight Berber (2person)
c. Partial ME (both ME and PCSA)	MAX-∃LE(F), FAITH-IO, M1 >> M2 >> MAX-∀LE(F) >> M3	Lower Jubba Maay (plural)
d. Partial non-realization	FAITH-IO, M1 >> M2 >> MAX-∃LE(F), MAX-∀LE(F) >> M3	Bukusu (1 person present)
e. Zero realization	FAITH-IO, M1, M3 >> M2, MAX-∃LE(F), MAX-∀LE(F)	English (e.g. 1 person present)

- Unattested groups

output (ER→SR)	Grammar
bada-is → ba.da bad-is → ba.di	MAX-∃LE(F), I-contig, ONSET, NOCODA >> *STRUC >> MAX-IO, MAX-∀LE(F)
bada-is → ba.das bad-tel → bad	MAX-∃LE(F), ONSET, *STRUC >> MAX-IO, MAX-∀LE(F) >> NOCODA, I-contig

7. Alternative approaches

1) **Realizational Optimality Theory (Realizational OT)** (Xu 2007)
- the phonological information in encoded in *realizational constraints*, e.g. {2p, sg} : -d
- Multiple exponence is favored by ranking ***FEATURESPLIT** lower than the realizational constraints: [t-dawa-d]: {2p,sg}:-d, {2p}:t- >> ***FEATURESPLIT**

- Works well for multiple exponence, but it can be problematic for phonological variation:

/ba/ + PLURAL	{pl.}:-sa	*VsV	IDENT(VOICE)
a. ba-sa		1	
b. ba-za	?		?

2) **Optimal Construction Morphology (OCM)** (Caballero and Inkelas 2013, Inkelas 2017)
- OCM is an incremental and serial model, which spells out morphs incrementally towards the target meaning.

- **One important difference between OCM and the approach in this paper can be identified:**
- OCM implements a serial approach when analyzing PCSA and ME while the current proposal uses parallel evaluation.
- The *look ahead effect* of less-peripheral allomorphs would pose a problem for the serial construction:

- E.g. a hypothetical language (Wolf 2008)

/peto - {za, xof} - u/   za + C-initial marker
[ROOT]-[GENDER]-[NUMBER]   xof + V-initial marker

References – See handout