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Constraint Interaction in Pashto Language: An OT Approach

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Abstract

Languages reflect resolutions of conflict between competing demands or constraints. A constraint is a structural requirement which may be either violated or satisfied by an output form. The optimal surface forms of a language are possible because it undergoes constraint conflicts, the forms which are least violated in the process emerges as winners and become optimal surface structures in a language. The main aim of this study is to evaluate the Pashto language in the framework of OT (Optimality Theory), this will include different Markedness and Faithfulness family constraint interaction in order to choose the most optimal candidates. This study will present the factorial typology ranking of different constraints out of the universal constraint inventories provided by different scholars (Hammond 1994, Price, Smolensky 1993, Kager 1999). This study will also adopt the methodology of Rene Kager provided by him in his book 'The Optimality Theory' (1999).

Key words: *Pashto, Constraint, Faithfulness and Markedness, OT, Universality.*

Introduction Section-A

Pashto/Pakhto, the official language of Afghanistan belongs to the Indo-Iranian group of Indo-European languages. It is the majority language of Khyber Pakhtunkhwa (KPK) province of Pakistan. According to Ethnologue, there is an estimated 60 million Pashto speakers scattered across Pashtun diaspora throughout the world. A minority group of Pashto speaking people reside in Jammu and Kashmir who migrated from 'KPK' province of Pakistan during the reign of British rule in India. These people settled permanently after the partition and still maintain their language and identity. Pashto is written in a modified Perso-Arabic script to represent different vowels and consonants of the language. Pashto has SOV word order and is a highly inflected language with a complex system of noun declensions and verb conjugations. Pashto nouns, adjectives and pronouns are marked for number, gender and case. Verbs show agreement with subjects in number, person and gender.

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Introduction Section-B

Optimality theory (OT) is a constraint based model which evaluates the optimal surface candidates out of infinite number of candidate possibilities. The surface forms arise after the different factorial typological ranking of the constraints in a language. These constraints interact with each other in such a manner that higher ranked constraints must dominate lower ranked constraints in order to choose an optimal form. The optimal candidate is the one which is a least violated form in the process of constraint interaction, and such that the violation of higher ranked constraints by the candidates is fatal.

Constraint interaction in the OT model was developed in 1990's by Alan Price and Paul Smolensky in the book 'Optimality Theory' constraint interaction in generative grammar. This book defines the structure of Optimality-theoretic grammar, which defines a pairing of underlying and surface forms of the language. This grammar was the development of generative grammar which evaluates grammars on the basis of constraints rather than the early model of generative grammar which is a rule based framework. OT model was embraced by many prominent linguists as this theory provides important insights in defining the phenomenon in a language. According to OT, Markedness properties are the actual substance of the grammar which regulates well formedness in languages unlike earlier models which treat markedness properties as some outside entities which appears only at surface forms.Kager (1999), in his book 'Optimality Theory' provided a comprehensive description of OT and defined different processes and grammatical structures of languages. Kager's work is based on the factorial typology of ranking the universal constraints in different languages. Kager successfully sketched the overall idea of OT in his work and explained conflicts in grammars of different languages. Kager also explained the important phenomena of variation among languages by re-ranking the constraints.

McCarthy 2008, wrote a book 'Doing Optimality Theory' which is based on the analysis 'Applying theory to the Data' is one of the basic books which provides a model of analysis for the researchers in OT. McCarthy argues that the constraints should be violable and he illustrated the essence of violability in OT. He had shown the constraint interaction among Yawalmani syllable structure while applying the theory to the data.

The theory of constraint interaction (OT) is widely adopted as the new approach in the field of phonology. OT shows divergence from rule based generative theory which disallows the violation of strict rules. This theory evaluates grammar by the interaction of markedness and faithfulness family of universal constraints which rank constraints language particularly. Languages choose different constraints out of these universal constraint inventories and rank them according to grammar preferences of that particular language.

Methodology

This study aims to apply the OT model based on the concept of interaction between differently ranked constraints in Pashto language. The data used for this

purpose was collected from the native speakers of Pashto residing in Ganderbal, Anantnag and Baramulla districts of the Kashmir valley. The data was recorded from naturalistic settings as well as systematically with the help of highly sophisticated recorder. This paper uses '50 hours' of recorded speech for the analysis. On the basis of the assumption provided by Prince and Smolensky (1993) that the constraints are universal, ranked and violable in languages, different Pashto word structures were evaluated by adopting the methodology of constraint ranking provided by Rene Kager (1999).

Analysis

The analysis accounts for an OT approach in Pashto language and to show constraint interaction and their factorial ranking. For this purpose the phenomena of Allophonic variation, neutralization and contrast are evaluated in the constraint based OT model.

1. Allophonic Variation

To define the allophonic variation in the light of OT, the identification of the constraints involved in the process is necessary. The nasality feature of vowels in languages is universally a marked feature. Kager stated from the Maddieson (1984) that most of the languages in the world lack nasal vowels having oral vowels only. The languages which have nasal vowels must have oral vowels but the vice-versa is not important. Kager (1999) presented a detailed description on this process, he documented the phenomenon of allophonic patters in English language i.e., vowels in English language are oral except in a context when they precede a tautosyllabic nasal stop[1], in this case they are realized with nasal effect. This allophonic variation occur in many dialects of English language, for example,

1)	Cat	**[kæt̪]**	can't	**[kæ̃nt̪]**
2)	Sad	**[sæd̪]**	sand	**[sæ̃nd̪]**
3)	Met	**[mɛt̪]**	meant	**[mɛ̃nt̪]**
4)	Lick	**[lik]**	link	**[lĩnk]**

1. The occurrence of nasal effect Tautosyllabic nasal: on vowels due to nasal phonemes within the same syllable.

The complementary distribution and the corresponding lack of word pairs that differs only in the specification of some features is what defines an allophonic pattern. Kager stated the violation of universal constraints for the allophonic variation in his study, he compared the marked feature of nasality in oral vowels to oral vowels. Pashto exhibit the phenomena of nasalization in the same manner as English language, which lacks lexical contrast of oral and nasal vowels. In these languages oral and nasal vowels are allophones, variants of one another which are fully predictable from phonological contexts for example,

[kũŋ] (deaf) **[kuz]** (down)

[nãn]	(today)	**[nal]**	(bamboo)
[spĩn]	(white)	**[spi]**	(dogs)
[rãŋ]	(lip)	**[rag]**	(vein)
[mãne]	(tomato)	**[maze]**	(thread)
[mũŋ]	(we)	**[muz]**	(salah)
ɖanɖ	(pond)	[ɖaɖ]	(hollow)

The nasality feature in vowels is expressed by the context free markedness constraints, which militates against nasal vowels (contextual markedness constraints).

The universal markedness constraints given by Prince and Smolensky (1993) are described in the grammar of Pashto language as below:

i) *VNASAL, vowels must not be nasal.

This constraints is found undominated in Pashto language except in the contexts where vowels tend to get nasal feature i.e., before a nasal sound for example, **[ʃũnɖa]** (lip), **[mũŋ]** (us), and **[xuãn] etc.**

Pashto has oral vowels but before a tautosyllabic nasal sound, the vowels get marked nasal feature. The vowels in this case anticipates the nasality of the following nasal sound. The above markedness constraint is dominated in the context where oral vowels precede nasal sounds and ruling out oral vowels.

ii) *VORALN, before a tautosyllabic nasal, vowels must not be oral.

This constraint is context sensitive as it states a connection between the nasality of the vowel and a nasal stop in its context. This constraint is violated by an oral vowel that stands directly before a tautosyllabic nasal.

***VORALN**	satisfied	**[mẽŋe]**	(ant)
***VORALN**	violated	**[meŋe:]**	(ant)

The underlying contrast between oral and nasal vowels will be neutralized, if it is undominated in positions before a tautosyllabic nasal.

2. Neutralization and contrast as constraint ranking.

The basic kinds of constraint interaction between markedness and faithfulness evaluates the surface phonetic contrast (oral and nasal vowels) and express its allophonic or lexical distinctiveness in a language. The dominancy of markedness over faithfulness in a language leads to output which is minimally marked, at the expense of a neutralization of lexical contrasts. The dominance of

faithfulness over markedness results in the realization of input contrasts at the expense of output markedness.

2.1) Markedness >>Faithfulness, lexical contrasts are neutralized

2.2) Faithfulness>>Markedness, lexical contrasts are expressed.

The underlying representation in Pashto language allows the oral/nasal contrast (like any other language), is supported by the concept of Richness of the Base. This contrast is not realized phonemically because Pashto in this case is the language of the type (2.1) i.e., **Markedness>>Faithfulness**, which neutralizes lexical contrasts and the nasality of vowels is obscured by markedness effects. If the Faithfulness constraints dominates the conflict, the surface values of nasality will be identical to their underlying values, such is the case in Pashto but occur only in limited contexts.

iii) IDENT –IO (nasal)

Correspondent segments in input and output have identical values for [nasal].

The languages allow lexical contrast of nasality in vowels in which **IDENT-IO (nasal)** is dominant constraint, not dominated by the markedness. These languages show any lexical contrast between oral and nasal vowels anywhere. This situation corresponds to the interaction (2.2) i.e., **Faithfulness>>Markedness**, i.e., lexical contrasts are expressed.

Pashto is the language in which **IDENT-IO (nasal)** is dominated by both of the markedness constraints **(*VNASAL** and ***VORALN)**. This results in the neutralization of orality and nasality of vowels in Pashto which results in allophonic variation such as nasalization of vowels before a nasal phoneme.

3. Neutralization of Lexical Contrast

Markedness>>Faithfulness

3.a) *VNASAL, *VORALN>> IDENT-IO (nasal)

The above schema of interaction shows that the markedness constraints completely dominates Faithfulness.

***VNASAL** is a context-free constraint, and the languages in which it is undominated will completely lack nasal vowels in the surface forms. Pashto language however, allows nasal vowels (as the allophones of oral vowels) in some environments i.e., before a nasal stop. The ranking therefore, for this allophonic variation can be shown as:

3.b) Contextual markedness >> Contextual free markedness >> Faithfulness

***VORALN *VNASAL IDENT-IO (nasal)**

The above ranking illustrates that in Pashto language the realization of nasal vowels is possible before a tautosyllabic nasal consonant. Thus, the realization of both oral and nasal vowels in Pashto is allowed at the surface but at a fixed

distribution rather than free distribution. The overall ranking of constraints for allophonic variation is illustrated in the Tableaux below. The constraints are placed in the columns and different candidates generated by the Gen are placed in the rows. The marks **'*'** represent the violation by candidates and **'*!'** means fatal violation while as the **arrow** stands for the optimal these tableaux. The ranking of constraints for Allophonic Variation can be illustrated with the input-output correspondence considering the case of oral vowels which have the optimal output e.g., [ʃaḍəl] (coarse). Assuming its lexical representation e.g., [ʃaḍəl] to the surface form in the tableau1 as:

Input: /ʃaḍəl/	***VORALN**	***VNASAL**	**IDENT-IO(nasal)**
a) [ʃaḍəl] ⇨			
b) [ʃãḍəl]		***!**	*

[ʃaḍəl] (1a) is the winning candidate as it doesn't violate any constraint regardless of its ranking. The optimal candidate (1a) also satisfies ***VORALN**, because this candidate doesn't have any tautosyllabic nasal sound as this constraint don't put restrictions on the vowels before oral stop. The optimal candidate in the above tableau also satisfies ***VNASAL** disallowing any possibility of nasal vowels. The lower raked constraint **IDENT-IO (nasal)** is also not violated in the interaction because the optimal candidate (1a) agrees in the correspondence of input and output nasality. Candidate (1b) is the loosing candidate in the conflict of constraint interaction as this is less harmonic candidate. The nasal vowel fatally violating the markedness constraint ***VNASAL**. It also violates **IDENT-IO (nasal)** as the output nasal vowel lacks the input correspondence.

Tableau 2 illustrates the output of same candidate when the input contains the nasal vowel in a hypothetical word form e.g., /ʃãḍəl/.

Input: /ʃãḍəl/	***VORALN**	***VNASAL**	**IDENT-IO (nasal)**
a) [ʃaḍəl] ⇨			*
b) [ʃãḍəl]		***!**	

The optimal candidate 2(a) minimally violates the constraint **IDENT-IO (nasal)** which is a lower ranked constraint in the interaction. However candidate 2(b) fatally violates higher ranked constraint in the interaction i.e., ***VNASAL**, thus excluding candidate 2(b) in the conflict. This whole process motivates the ranking:

3.c) ***VNASAL>> IDENT-IO (nasal)**, a faithfulness constraint is dominated by a markedness constraint.

Tableau 3 represents the interaction of constraint ranking when there is presence of nasal stop following an oral vowel for example, /ʃanḍil/ (walnut shell).

Input: /ʃandil/	***VORALN**	***VNASAL**	**IDENT-IO(nasal)**
a) [ʃanḍil]	***!**		
b) [ʃãnḍil] ☞		***!**	*

The underlying lexical form with an oral vowel is realized with a nasal vowel in the optimal output **[ʃãnḍil].** The optimal candidate 3(b) is validated by the dominant markedness constraint ***VORALN** which is fatally violated by the candidate 3(a), therefore excluding candidate 3(a) from the conflict. The output 3(b) is optimal which satisfies higher ranked constraints i.e., ***VORALN** which requires that vowels are nasal before tautosyllabic nasal stop.

Conclusion

Grammars of the world languages are inherently in conflict to choose the most optimal candidates. The forms which are minimally violated in the constraint interaction are chosen as the optimal output. Pashto language disallow the lexical contrast between oral and nasal vowels due to the dominancy of ***VNASAL** (markedness constraint) over **IDENT-IO (nasal)** (Faithfulness constraint). The realization of nasality in vowels of Pashto language occur due to the dominancy of context-sensitive markedness constraint ***VORALN** (vowels must not be oral before a tautosyllabic nasal stop) over context-free markedness constraint (***VNASAL**). Thus the realization of nasality is only an allophonic variation found only in some defined contexts. In the interaction of markedness and faithfulness for this process, the ranking **"M>>F"** implies that the non-distinctiveness of nasal vowels in Pashto is not an accidental observation rather an effect of constraint interaction in the grammar of Pashto.

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