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# Developing a Tagset for Pashto Part of Speech Tagging

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## ABSTRACT

**While building a machine translation system, the embedded part-of-speech (POS) tagger deserves special attention. The ever first tagset discussed here is created in accordance with the EAGLES guidelines. These guidelines were written for the languages of European Union. They can also be applied to Pashto language. This paper presents the creation process of Pashto tagset, which helps in the development of a POS tagger.**

## I. INTRODUCTION

These ideas in the introduction are taken from encyclopedia [13]. Part of speech tagging (POS tagging) is the process of marking up the words in a text as corresponding to a particular part of speech, based on both its definition, as well as its context. A simplified form of this is commonly taught to school-age children, in the identification of words such as nouns, verbs, adjectives and adverbs. Once performed by hand, POS tagging is now done in the context of computational linguistics, using algorithms which associate discrete terms, as well as hidden parts of speech, in accordance with a set of descriptive tags.

Part-of-speech tagging is harder than just having a list of words and their parts of speech, because some words can represent more than one parts of speech at different times. So a huge percentage of word-forms are ambiguous in any language.

Schools commonly teach that there are 8 parts of speech in English: noun, verb, adjective, preposition, pronoun, adverb, conjunction, and interjection. However, there are clearly many more categories and sub-categories. For example, adjectives are divided into their sub-classes for color, size, number, and other properties. This is not just at the semantic level, because when these sub-types come together, they can only go in certain syntactic orders.

For the creation of a POS tagger, it is necessary to build a tagset for a language. Just like English language and other languages, Pashto language also has some categories of words. This paper is about the creation process of a tagset for Pashto language in accordance with EAGLES guidelines for morphosyntactic annotation of corpora.

The next section discusses a brief summary of the Pashto language and EAGLES guidelines. Subsequently, there is detail of how the creation of the proposed tagset is

summarized. Lastly some examples of Pashto text are presented that use this tagset. The full tagset is presented in the appendix.

## II. PASHTO LANGUAGE AND EAGLES GUIDELINES

In Pakistan, Pashto is spoken by about 28 million people in North-West Frontier Province, Federally Administered Tribal Areas, and Balochistan. It is also spoken by over 13 million people in the south, east, west and a few northern provinces of Afghanistan. Smaller, modern "transplant" communities are also found in Sindh (Karachi, Hyderabad). Other smaller communities exist in Northern India (Pathankot, Rampur) and northeastern Iran [12].

Pashto, being an Indo-European language, shares many cognates with other related languages. Pashto language has a significant influx of loan-words from Arabic, Persian and various Turkic languages [9].

The word order of Pashto language is SOV [1]. Adjectives come before nouns. Nouns and adjectives are inflected for gender (Masculine/Feminine), number (Singular/Plural) and case (Direct/Oblique). Direct case is used for subjects and direct objects in the present tense. Oblique case is used after most prepositions and postpositions as well as in the past tense as the subject of transitive verbs.[12] There exist an additional Ambiposition [1]. There is no definite article, but instead there is extensive use of the demonstratives [7]. The verb system is very intricate. It has Simple Present, Subjunctive, Simple Past, Past Progressive, Present Perfect, and Past Perfect. In any of the past tenses (Simple Past, Past Progressive, Present Perfect and Past Perfect), Pashto is an ergative language, i.e. transitive verbs in any of the past tenses agree with the object of the sentence [12].

## III. PROPOSED MORPHOSYNTACTIC TAGSET FOR PASHTO LANGUAGE

This section presents the procedure to design a tagset for Pashto language. The total numbers of tags in the tagset are 215. This tagset contains some main categories. There are 26 tags for Noun, 77 tags for Verb, 60 tags for Pronouns, 19 tags for Adjectives, 15 tags for Punctuation, 7 tags for Adverb, 3 tags for Adposition, 6 tags for foreign words and 1 tag for each

Interjection and Conjunction. The description of each category is explained from high-level categories to sub level categories.

The following table contains the main categories with their corresponding symbols.

1.	Noun ----- N	6.	Conjunction ----- CC
2.	Verb ----- V	7.	Interjection -----AU
3.	Pronoun ----- P	8.	Adposition ----- A
4.	Adjective ----- J	9.	Foreign ----- F
5.	Adverb ----- R		

It is to be noted that the symbols of the main categories comes to the start of the tag for that category.

The **Noun** is divided on the basis of its Type (Common, Proper), Gender (Masculine, Feminine), Number (Singular, Plural) and Case (Nominative, Oblique, Vocative) [1].

On the basis of these divisions the total numbers of tags for noun are 26. The subcategories of noun are denoted by the words given in the following table:

1.1	Common ----- C	1.6	Plural ----- 2
1.2	Proper ----- P	1.7	Nominative ----- N
1.3	Masculine ----- M	1.8	Oblique ----- O
1.4	Feminine ----- F	1.9	Vocative ----- V
1.5	Singular ----- 1	1.10	Unmarked ----- U

The tags of noun are arranged as

- Masculine Singular Nominative Common Noun (NM1NC)
- Masculine Singular Oblique Common Noun (NM1OC)
- Masculine Singular Vocative Common Noun (NM1VC)
- Masculine Plural Nominative Common Noun (NM2NC)

The remaining noun tags are in the appendix.

The **Verb** is divided on the basis of its Tense (Present, Past), Aspect (Perfective, Imperfective), Mood (Indicative, Subjunctive, Imperative), Gender (Masculine, Feminine), Number (Singular, Plural) and Person (First Person, Second Person, Third Person) [5].

On the basis of these divisions the total numbers of tags for verb are 77. The subcategories of verb are denoted by the words given in the following table:

2.1	Present ----- P	2.12	Root ----- 0
2.2	Past ----- T	2.13	To Do ----- O
2.3	Lexical ----- V	2.14	To Become ----- M
2.4	Imperative ----- I	2.15	To Be ----- E
2.5	Indicative ----- D	2.16	Double ----- Do
2.6	Subjunctive ----- S	2.17	Phrasal ----- H
2.7	Perfective ----- Y	2.18	Simple ----- Si
2.8	Imperfective----- F	2.19	Prefixd ----- Pr
2.9	Infinitive ----- L	2.20	First Category Compound ----- 1
2.10	Auxiliary ----- X	2.21	Second Category Compound ----- 2
2.11	Copula ----- C		

The tags of verbs are arranged as

- Root Form Lexical Verb (VV0)
- Perfective Lexical Verb (VVY)
- First Person Singular Masculine Present 'To Be' Copula Verb (VCEZ1MP)

The remaining verb tags are in the appendix.

The **Pronoun** is divided on the basis of its Person (First, Second, Third), Gender (Masculine, Feminine), Type (Personal, Possessive, Demonstrative), Number (Singular, Plural) and Case (Nominative, Vocative) [1]. The other types of pronouns that exist in Pashto language are Directional, Interrogative, Relative, Indefinite, Reflexive, Distributive, Reciprocal and Intensive.

Here the total numbers of tags for pronouns are 60. The subcategories of pronoun are denoted by the words given in the following table:

3.1	First Person --- Z	3.9	Relative --- R
3.2	Second Person--T	3.10	Indefinite --- N
3.3	Third Person--- H	3.11	Reflexive --- R
3.4	Personal --- P	3.12	Reciprocal --- Y
3.5	Possessive --- S	3.13	Intensive --- K
3.6	Demonstrative--H	3.14	Distributive --- D
3.7	Directional --- T	3.15	Clitic --- L
3.8	Interrogative --- C		

The remaining are the same as used for noun.

The tags of pronoun are arranged as

- First Person Singular Nominative Personal Pronoun (PPZ1N)
- Second Person Singular Nominative Personal Pronoun (PPT1N)
- Third Person Masculine Singular Nominative Personal Pronoun (PPHM1N)

The remaining Pronoun tags are in the appendix.

The **Adjective** is divided on the basis of its Gender (Masculine, Feminine), Number (Singular, Plural) and Case (Nominative, Oblique/Vocative) [1]. There exist Comparative, Noun and Verbal Adjectives. As the Numeral comes under adjective thus its tags also come under adjective tags. The number may be cardinal or ordinal.

On the basis of these divisions the total numbers of Adjective tags are 19. The new subcategories of adjective are denoted by the words given in the following table:

4.1	Number ----- D	4.3	Ordinal ----- R
4.2	Cardinal ----- C	4.4	Comparative --- M

The tags for adjective are arranged as

- Masculine Singular Nominative Adjective (JMM1N)
- Nominative Cardinal Number (JDNC)
- Masculine Singular Ordinal Number (JDM1R)

The remaining Adjective tags are in the appendix.

The **Adverb** may be adverb of time, adverb of place, adverb of manner, adverb of measure and degree, interrogative adverb, adverbial Clitic [1], and negative adverb. So the total numbers of tags for Adverbs are 7. The new subcategories of adverb are denoted by the words given in the following table:

5.1	Time ---- T	5.3	Degree ---- D
5.2	Place ---- P	5.4	Negative ---- N

The tags for adverb are arranged as

- Time, Adverb (RT)
- Place, Adverb (RP)

The remaining Adverb tags are in the appendix.

The **Adposition** in Pashto are Preposition, Postposition and Ambiposition (Circumposition)[1]. There tags are

- Preposition (APr)
- Postposition (APo)
- Ambiposition (AAM)

The Interjection (AU) and Conjunction (CC) use one tag here.

The whole tagset is given in the appendix.

#### IV. EXAMPLES FROM PASHTO TEXT USE THE TAGSET

The following real text [14] is tagged according to the proposed tagset of Pashto language.

VVD\جوړېدو\ APr\د\ NPM1N\پاکستان\ APr\د\ PPZ1O\ما\ APr\د\ RT\پس\ NCU\کاله\ JDM2R\پنځه\ JDNC\يو\ APo\نه\ NCU\سم\ APo\سره\ NCU\نمبرو\ JM\بنو\ RD\دېرو\ پاس\ VV0\کړو\ VXYO\کلي\ NCM1O\ته\ APo\مي\ PL\د\ APr\خپلي\ PSR\کاميابي\ JMM1N\خبر\ NCU\ور\ PT\دېرو\ PL\مي\ NCM1O\کاکاجي\ VVY\کاکاجي\ PL\ني\ VCET1PM\و\ JMM1N\خوشحاله\ CC\چي\ VVT\داخلوم\ PL\دي\ APo\کښي\ NCM1N\کالج\ NCM1N\انجنير\ NCM1N\وکیل\ NCM1N\ډاکټر\ PCN\څه\ PN\بل\ VV0\جوړ\ PT\درنه\ NCM1N\افسر\ PCN\څه\ PPZ1N\زه\ VCMT1PM\شي\ JMM1N\خوشحاله\ PK\هم\ PPZ1N\زه\ VCMT1PM\شي\ VCEZ1MT\وم\

#### V. CONCLUSION AND FUTURE WORK

It is the need of current research that we must enable computer to know our language and communicate with it in a natural way. Part of speech tagging is one of the most important component of natural language processing. To build a part of POS tagger, a tagset is essential.

The future work is to design and test algorithm for Part of Speech Tagging of Pashto language. This process will include the manual tagging of Pashto language, the creation of lexicon and then define different rules to identify each word in a sentence to assign it the most appropriate tag from the tagset.

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## APPENDIX

NCM1N	Masculine Singular Nominative Common Noun	
NCM1O	Masculine Singular Oblique Common Noun	
NCM1V	Masculine Singular Vocative Common Noun	
NCM2N	Masculine Plural Nominative Common Noun	
NCM2O	Masculine Plural Oblique Common Noun	
NCM2V	Masculine Plural Vocative Common Noun	
NCF1N	Feminine Singular Nominative Common Noun	
NCF1O	Feminine Singular Oblique Common Noun	
NCF1V	Feminine Singular Vocative Common Noun	
NCF2N	Feminine Plural Nominative Common Noun	
NCF2O	Feminine Plural Oblique Common Noun	
NCF2V	Feminine Plural Vocative Common Noun	
NPM1N	Masculine Singular Nominative Proper Noun	
NPM1O	Masculine Singular Oblique Proper Noun	
NPM1V	Masculine Singular Vocative Proper Noun	
NPM2N	Masculine Plural Nominative Proper Noun	
NPM2O	Masculine Plural Oblique Proper Noun	
NPM2V	Masculine Plural Vocative Proper Noun	
NPF1N	Feminine Singular Nominative Proper Noun	
NPF1O	Feminine Singular Oblique Proper Noun	
NPF1V	Feminine Singular Vocative Proper Noun	
NPF2N	Feminine Plural Nominative Proper Noun	
NPF2O	Feminine Plural Oblique Proper Noun	
NPF2V	Feminine Plural Vocative Proper Noun	
NCU	Unmarked Common Noun	
NPU	Unmarked Proper Noun	
		Use For
.	Full Stop	-
,	Comma	‘
?	Question Mark	?
!	Exclamation Mark	!
:	Colon	:
;	Semi-Colon	;
“	Open Quotation Mark	”
”	Closed Quotation Mark	“
(	Open Parenthesis	)
)	Closed Parenthesis	(
[	Open Square Bracket	]

]	Closed Square Bracket	[
"	Neutral Quotation	"
‘	Open Single Quotation Mark	’
’	Closed Single Quotation Mark	‘
APr	Preposition	
APo	Postposition	
AAm	Ambiposition (Circumposition)	
JDNC	Nominative Cardinal Number	
JDOC	Oblique Cardinal Number	
JDPC	Pre-Multiplicative Clitic Cardinal Number	
JDM1R	Masculine Singular Ordinal Number	
JDM2R	Masculine Plural Ordinal Number	
JDF1O	Feminine Singular Ordinal Number	
JDF2O	Feminine Plural Ordinal Number	
JDF	Fraction Number	
AU	Interjection	
CC	Conjunction	
RT	Time, Adverb	
RP	Place, Adverbs	
RM	Manner, Adverbs	
RD	Measure and Degree, Adverb	
RN	Negative Modal Adverb	
RC	Interrogative Adverb	
RO	Clitic, Adverb	
JMM1N	Marked Masculine Singular Nominative Adjective	
JMM1O	Marked Masculine Singular Oblique Adjective	
JMM2N	Marked Masculine Plural Nominative Adjective	
JMM2O	Marked Masculine Plural Oblique Adjective	
JMF1N	Marked Feminine Singular Nominative Adjective	
JMF1O	Marked Feminine Singular Oblique Adjective	
JMF2N	Marked Feminine Plural Nominative Adjective	
JMF2O	Marked Feminine Plural Oblique Adjective	
JU	Unmarked Adjectives	
JC	Comparative Adjective	
JN	Noun Adjective	
JV	Verbal Adjective	
PPZ1N	First Person Singular Nominative Personal Pronoun	
PPZ1O	First Person Singular Oblique Personal Pronoun	
PPZ2N	First Person Plural Nominative Personal Pronoun	

PPZ2O	First Person Plural Oblique Personal Pronoun
PPT1N	Second Person Singular Nominative Personal Pronoun
PPT1O	Second Person Singular Oblique Personal Pronoun
PPT2N	Second Person Plural Nominative Personal Pronoun
PPT2O	Second Person Plural Oblique Personal Pronoun
PPHM1N	Third Person Masculine Singular Nominative Personal Pronoun
PPHM1O	Third Person Masculine Singular Oblique Personal Pronoun
PPHM2N	Third Person Masculine Plural Nominative Personal Pronoun
PPHM2O	Third Person Masculine Plural Oblique Personal Pronoun
PPHF1N	Third Person Feminine Singular Nominative Personal Pronoun
PPHF1O	Third Person Feminine Singular Oblique Personal Pronoun
PPHF2N	Third Person Feminine Plural Nominative Personal Pronoun
PPHF2O	Third Person Feminine Plural Oblique Personal Pronoun
PSZ1K	First Person Singular Weak Possessive Pronoun
PSZ2K	First Person Plural Weak Possessive Pronoun
PST1K	Second Person Singular Weak Possessive Pronoun
PST2K	Second Person Plural Weak Possessive Pronoun
PSH1K	Third Person Singular Weak Possessive Pronoun
PSH2K	Third Person Plural Weak Possessive Pronoun
PSZ1	First Person Singular Possessive Pronoun
PSZ2	First Person Plural Possessive Pronoun
PST1	Second Person Singular Possessive Pronoun
PST2	Second Person Plural Possessive Pronoun
PSHM1	Third Person Masculine Singular Possessive Pronoun
PSHM2	Third Person Masculine Plural Possessive Pronoun
PSHF1	Third Person Feminine Singular Possessive Pronoun
PSHF2	Third Person Feminine Plural Possessive Pronoun
PN	Indefinite Pronoun
PSR	Reflexive Possessive Pronoun
PY	Reciprocal Pronoun
PK	Intensive Pronoun
PH1MNX	Singular Masculine Nominative Proximal Demonstrative Pronoun
PH1MOX	Singular Masculine Oblique Proximal Demonstrative Pronoun
PH2MNX	Plural Masculine Nominative Proximal Demonstrative Pronoun
PH2MOX	Plural Masculine Oblique Proximal Demonstrative Pronoun
PH1FNX	Singular Feminine Nominative Proximal Demonstrative Pronoun
PH1FOX	Singular Feminine Oblique Proximal Demonstrative Pronoun

PH2FNX	Plural Feminine Nominative Proximal Demonstrative Pronoun
PH2FOX	Plural Feminine Oblique Proximal Demonstrative Pronoun
PH1MNL	Singular Masculine Nominative Distal Demonstrative Pronoun
PH1MOL	Singular Masculine Oblique Distal Demonstrative Pronoun
PH2MNL	Plural Masculine Nominative Distal Demonstrative Pronoun
PH2MOL	Plural Masculine Oblique Distal Demonstrative Pronoun
PH1FNL	Singular Feminine Nominative Distal Demonstrative Pronoun
PH1FOL	Singular Feminine Oblique Distal Demonstrative Pronoun
PH2FNL	Plural Feminine Nominative Distal Demonstrative Pronoun
PH2FOL	Plural Feminine Oblique Distal Demonstrative Pronoun
PH1NKL	Singular Nominative Farther Distal Demonstrative Pronoun
PH1OKL	Singular Oblique Farther Distal Demonstrative Pronoun
PH2NKL	Plural Nominative Farther Distal Demonstrative Pronoun
PH2OKL	Plural Oblique Farther Distal Demonstrative Pronoun
PCN	Nominative Interrogative Pronoun
PCO	Oblique Interrogative Pronoun
PR	Relative Pronoun
PT	Directional Pronoun
PL	Pronominal Clitic
PD	Distributive Pronoun
VV0	Root Form Lexical Verb
VVLSi	Simple Infinitive Lexical Verb
VVLPr	Prefixed Infinitive Lexical Verb
VVL1	First Category Compound Infinitive Lexical Verb
VVL2	Second Category Compound Infinitive Lexical Verb
VVLH	Phrasal Infinitive Lexical Verb
VVLDo	Double Infinitive Lexical Verb
VVY	Perfective Lexical Verb
VVT	Imperfective Lexical Verb
VVIT1	Second Person Singular Imperative Lexical Verb
VVIT2	Second Person Plural Imperative Lexical Verb
VVD	Singular Indicative Lexical Verb
VVSZ1M	First Person Singular Masculine Subjunctive Lexical Verb
VVSZ2M	First Person Plural Masculine Subjunctive Lexical Verb
VVSZ1F	First Person Singular Feminine Subjunctive Lexical Verb
VVSZ2M	First Person Plural Feminine Subjunctive Lexical Verb
VVST1M	Second Person Singular Masculine Subjunctive Lexical Verb

VVST2M	Second Person Plural Masculine Subjunctive Lexical Verb
VVST1F	Second Person Singular Feminine Subjunctive Lexical Verb
VVST2F	Second Person Plural Feminine Subjunctive Lexical Verb
VVSH1M	Third Person Singular Masculine Subjunctive Lexical Verb
VVSH2M	Third Person Plural Masculine Subjunctive Lexical Verb
VVSH1F	Third Person Singular Feminine Subjunctive Lexical Verb
VVSH2F	Third Person Plural Feminine Subjunctive Lexical Verb
VXYO	Root Perfective ‘To Do’ Auxiliary Verb
VXIO	Root Imperfective ‘To Do’ Auxiliary Verb
VXYM	Root Perfective ‘To Become’ Auxiliary Verb
VXIM	Root Imperfective ‘To Become’ Auxiliary Verb
VCEZ1MP	First Person Singular Masculine Present ‘To Be’ Copula Verb
VCEZ2MP	First Person Plural Masculine Present ‘To Be’ Copula Verb
VCET1MP	Second Person Singular Masculine Present ‘To Be’ Copula Verb
VCET2MP	Second Person Plural Masculine Present ‘To Be’ Copula Verb
VCEH1MP	Third Person Singular Masculine Present ‘To Be’ Copula Verb
VCEH2MP	Third Person Plural Masculine Present ‘To Be’ Copula Verb
VCEZ1FP	First Person Singular Feminine Present ‘To Be’ Copula Verb
VCEZ2FP	First Person Plural Feminine Present ‘To Be’ Copula Verb
VCET1FP	Second Person Singular Feminine Present ‘To Be’ Copula Verb
VCET2FP	Second Person Plural Feminine Present ‘To Be’ Copula Verb
VCEH1FP	Third Person Singular Feminine Present ‘To Be’ Copula Verb
VCEH2FP	Third Person Plural Feminine Present ‘To Be’ Copula Verb
VCEZ1MT	First Person Singular Masculine Past ‘To Be’ Copula Verb
VCEZ2MT	First Person Plural Masculine Past ‘To Be’ Copula Verb
VCET1MT	Second Person Singular Masculine Past ‘To Be’ Copula Verb
VCET2MT	Second Person Plural Masculine Past ‘To Be’ Copula Verb
VCEH1MT	Third Person Singular Masculine Past ‘To Be’ Copula Verb
VCEH2MT	Third Person Plural Masculine Past ‘To Be’ Copula Verb
VCEZ1FT	First Person Singular Feminine Past ‘To Be’ Copula Verb
VCEZ2FT	First Person Plural Feminine Past ‘To Be’ Copula Verb
VCET1FT	Second Person Singular Feminine Past ‘To Be’ Copula Verb
VCET2FT	Second Person Plural Feminine Past ‘To Be’ Copula Verb
VCEH1FT	Third Person Singular Feminine Past ‘To Be’ Copula Verb
VCEH2FT	Third Person Plural Feminine Past ‘To Be’ Copula Verb

VCMZ1MP	First Person Singular Masculine Present ‘To Become’ Copula Verb
VCMZ2MP	First Person Plural Masculine Present ‘To Become’ Copula Verb
VCMT1MP	Second Person Singular Masculine Present ‘To Become’ Copula Verb
VCMT2MP	Second Person Plural Masculine Present ‘To Become’ Copula Verb
VCMH1MP	Third Person Singular Masculine Present ‘To Become’ Copula Verb
VCMH2MP	Third Person Plural Masculine Present ‘To Become’ Copula Verb
VCMZ1FP	First Person Singular Feminine Present ‘To Become’ Copula Verb
VCMZ2FP	First Person Plural Feminine Present ‘To Become’ Copula Verb
VCMT1FP	Second Person Singular Feminine Present ‘To Become’ Copula Verb
VCMT2FP	Second Person Plural Feminine Present ‘To Become’ Copula Verb
VCMH1FP	Third Person Singular Feminine Present ‘To Become’ Copula Verb
VCMH2FP	Third Person Plural Feminine Present ‘To Become’ Copula Verb
VCMZ1MT	First Person Singular Masculine Past ‘To Become’ Copula Verb
VCMZ2MT	First Person Plural Masculine Past ‘To Become’ Copula Verb
VCMT1MT	Second Person Singular Masculine Past ‘To Become’ Copula Verb
VCMT2MT	Second Person Plural Masculine Past ‘To Become’ Copula Verb
VCMH1MT	Third Person Singular Masculine Past ‘To Become’ Copula Verb
VCMH2MT	Third Person Plural Masculine Past ‘To Become’ Copula Verb
VCMZ1FT	First Person Singular Feminine Past ‘To Become’ Copula Verb
VCMZ2FT	First Person Plural Feminine Past ‘To Become’ Copula Verb
VCMT1FT	Second Person Singular Feminine Past ‘To Become’ Copula Verb
VCMT2FT	Second Person Plural Feminine Past ‘To Become’ Copula Verb
VCMH1FT	Third Person Singular Feminine Past ‘To Become’ Copula Verb
VCMH2FT	Third Person Plural Feminine Past ‘To Become’ Copula Verb
FF	Foreign Word
FP	Persian Word
FO	Formula
FA	Abbreviation
FL	Letter of Alphabet
FU	Unspecified Non Pashto Element