

Development of Dictionary Entries for the Bangla Vowel Ended Roots for Universal Networking Language

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ABSTRACT

Conversion from another language to native language is highly demanding due to increasing the usage of web based application. Firstly, the respective sentence of a native language is converted to Universal Networking Language (UNL) expressions and then UNL expressions can be converted to any native language. UNL system is developed for most of the languages already but a very little effort has been made to convert Bangla language to UNL expressions. In this paper, we have described Bangla verb, Verb root, Verbal Inflections and the finally developed the dictionary entries for the vowel ended roots and their respective verbal inflections.

General Terms

Universal Networking Language, Bangla Verb, Verb Root, Verbal Inflections

Keywords

Vowel Ended Group (VEG), Consonant Ended Group

1. INTRODUCTION

Bangla is the 4th widely spoken language with more than 250 million speakers, most of who live in Bangladesh and the Indian state of West Bengal [1]. Therefore it is essential to take into account a conversion process of Bangla to UNL and vice versa, so that a vast people can be benefited to share information in the Internet. The Universal Networking Language (UNL), which is a formal language for symbolizing the sense of natural language sentences, is a specification for the exchange of information. Currently, the UNL includes 16 languages [2], which are the six official languages of the United Nations (Arabic, Chinese, English, French, Russian and Spanish), in addition to the ten other widely spoken languages (German, Hindi, Italian, Indonesian, Japanese, Latvian, Mongol, Portuguese, Swahili and Thai). In the last few years, Machine Translation (MT) techniques have been applied to web environments. The growing amount of available multilingual information on the Internet and the Internet users has led to a justifiable interest on this area. Hundreds of millions of people of almost all levels of education, attitudes and different jobs all over the world use the Internet for different purposes [3], where English is the main language of the Internet. But English is not understandable for most of the people. Interlingua translation programs are needed to develop. The main goal of the UNL system, which allows users to visualize websites in their native languages, is to provide a common representation for accessing Internet of multilingual websites by the majority of Bangla or Bengali (বাংলা, pronounced as bangla) is an eastern Indo-Aryan language. It is native to the region of eastern South Asia known as Bengal, which comprises

the people over the world. A significant part of the development of any machine translation (MT) system is the creation of lexical resources that the system will use. Dictionaries are of critical importance in MT. They are the largest components of an MT system in terms of the amount of information they hold. Generation of natural language from a machine processable, precise knowledge representation has to grapple with the problem of redundancy and imprecision inherent in any natural language. In the UNL System [4], natural language analysis has been carried out by the EnConverter (EnCo) [5] associated with Word Dictionary of a native language and language specific analysis rules that converts a native language text into UNL expression and DeConverter (DeCo) [6] also associated with Word Dictionary that converts UNL expression to a variety of native languages using language specific generation rules. As our is to include Bangla in this system with less effort and we have been working for the last 4 years to achieve our goal. In this paper we have concentrated on Bangla Vowel Ended Roots and their related Verbal Inflections. Finally we have explained the lexicon (dictionary) entries of the Vowel Ended Roots.

The organization of this paper is as follow: In section 2 we describe the literatures that have been used to do this research work. Section 3 explains the Bangla verb, Verb root, verbal Inflections, etc., Section 4 shows the various Vowel Ended Group (VEG) that we have proposed for the system, Dictionary entries of the Vowel Ended Roots and Verbal Inflections are shown in section 5 & 6. Finally, some concluding remarks are in Section 7.

2. LITERATURE REVIEW

For converting Bangla sentence to UNL expressions firstly, we have gone through Universal Networking Language (UNL) [5, 7, 8] where we have learnt about UNL expression, Relations, Attributes, Universal Words, UNL Knowledge Base, Knowledge Representation in UNL, Logical Expression in UNL, UNL systems and specifications of Enconverter. All these are key factors for preparing Bangla word dictionary, dictionary entries, etc. Secondly, we have rigorously gone through the Bangla grammar [9, 10, 11, 16], Verb and roots (Vowel ended and Consonant Ended) [11, 12, 15], Primary suffixes [10, 12, 13, 14]. Using above references we extort ideas about Bangla grammar for morphological and semantic analysis in order to prepare Bangla word dictionary (for vowel ended root, root word suffix etc).

3. ANALYSIS OF BANGLA VERB, VERB ROOT, VERB INFLECTIONS

Bangladesh, the Indian state of West Bengal and parts of the Indian states of Tripura and Assam. Bangla is written in a script called the Bengali Script. Like other languages, the

letters are grouped together based on the way they are pronounced. The first 11 letters are vowels followed by consonants.

3.1 Bangla Verb (ক্রিয়া)

Bangla verbs are highly inflected and are regular with few exceptions. They consist of a stem and an ending; they are traditionally listed in Bangla dictionaries in their “verbal noun” form, which is usually formed by adding – a (আ) to the stem, for instance, রাখা (rakha) means “to keep”. The stem can end in either a vowel or a consonant, based on which Bangla verb roots can be divided into two categories, i.e. 1) Vowel Ended Root 2) Consonant Ended Root. As we have worked on Vowel Ended Roots, this paper will concentrate on Vowel Ended Roots more.

3.2 Vowel Ended Root

Bangla language has more than 30,000 verbs [12]. Verbs come from Roots and Verbal Inflections i.e. Verb = Verb Root + Verb Inflections. In Bangla there are around 25 Vowel Ended Roots. These are: পা(paa), থা(kha), গা(gaa), চা(cha), ছা(chha), নি(ni), দি(di), যা(ja), ছু(chhu), থু(thu), শু(shu),

ধু(dhhu), অ(na), দু(du), নু(nu), রু(ru), ই(ha), ধা(dhaa), না(naa), বা(baa), কা(ka), বা(ba), রা(ra) and স(sa)

3.3 Verbal Inflections

The inflections that are added after Verb Roots to make verbs are called Verbal Inflections [12]. For example, ই(i), ইতেছি(itechhi), এলাম(elam), etc.

4. OUR PROPOSED CATEGORIZATION OF VOWEL ENDED ROOTS

For appropriate morphological analysis and designing template of verb roots Vowel Ended Roots are categorized in 10 different categories based on the usages of Verbal Inflections. Categorizations are shown in the following tables. Here we have shown the tables for the first person only.

Table 1: Variations of Vowel Ended Roots and their verbal Inflections of VEG1, VEG1.1, VEG2 and VEG3 for 1st Person

Vowel Ended Roots									
	Tenses	পা	থা	গা	চা	ছা	নি	দি	যা
First Person	Present Indefinite (Ch and Sh)	ই	ই	ই	ই	ই	ই	ই	ই
	Present Cont (Ch)	ছি	ছি	ছি	ছি	ছি	ছি	ছি	ছি
	Present Cont (Sh)	ইতেছি	ইতেছি	ইতেছি	ইতেছি	ইতেছি	তেছি	তেছি	ইতেছি
	Present Perfect (Ch)	প>প এয়েছি	থ>থ এয়েছি	গ>গ এয়েছি	চ>চ এয়েছি	ছ>ছ এয়েছি	য়েছি	য়েছি	য>গ ইয়েছি
	Present Perfect (Sh)	ইয়াছি	ইয়াছি	ইয়াছি	ইয়াছি	ইয়াছি	য়াছি	য়াছি	য>গ ইয়াছি
	Imperative	*	*	*	*	*	*	*	*
Past	Past Indef (Ch)	প>প এলাম	থ>থ এলাম	ইলাম	ইলাম	ইলাম	লাম	লাম	য>গ এলাম
	Past Indefinite (Sh)	ইলাম	ইলাম	ইলাম	ইলাম	ইলাম	লাম	লাম	য>গ এলাম
	Past Continuous (Ch)	ছিলাম	ছিলাম	ছিলাম	ছিলাম	ছিলাম	ছিলাম	ছিলাম	ছিলাম
	Past Continuous (Sh)	ইতেছি লাম	ইতেছি লাম	ইতেছি লাম	ইতেছিলা ম	ইতেছিলা ম	তেছিলাম	তেছিলাম	ইতেছিলাম
	Past Perfect (Ch)	প>প এয়েছি লাম	থ>থ এয়েছি লাম	গ>গ এয়েছিলা ম	চ>চ এয়েছিলা ম	ছ>ছ এয়েছিলা ম	য়েছিলাম	য়েছিলাম	য>গ ইয়েছিলাম
	Past Perfect (Sh)	ইয়াছি লাম	ইয়াছি লাম	ইয়াছি লাম	ইয়াছিলা ম	ইয়াছিলা ম	য়াছিলাম	য়াছিলাম	য>গ ইয়াছিলাম
Future	Future Indefinite (Ch)	বো, ব	বো, ব	বো, ব	বো, ব				
	Future Indefinite(Sh)	ইব, ইবো	ইব, ইবো	ইব, ইবো	ইব, ইবো	ইব, ইবো	বো, ব	বো, ব	ইব, ইবো
	Imperative	*	*	*	*	*	*	*	*
Group VEG1				Group VEG1.1			Group VEG2		Group VEG3

Table 2: Variations of Vowel Ended Roots and their verbal Inflections of VEG4, VEG5, VEG6 and VEG7 for 1st Person

Vowel Ended Roots										
	Tenses	ବୁନ୍ଦ	ଥୁ	ଙ୍ଗ	ଧୁ	ନ	ଦୁ	ଗୁ	କୁ	ଲ
First Person Present	Present Indefinite (Ch and Sh)	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ
	Present Cont (Ch)	ଛି	ଛି	ଛି	ଛି		ଛି	ଛି	ଛି	ଛି
	Present Cont (Sh)	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି		ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି
	Present Perfect (Ch)	ଯେହି	ଯେହି	ଯେହି	ଯେହି		ଯେହି	ଯେହି	ଯେହି	ଯେହି
	Present Perfect (Sh)	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି		ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି
	Imperative	*	*	*	*		*	*	*	*
Past	Past Indef (Ch)	ଲାମ	ଲାମ	ଲାମ	ଲାମ		ଲାମ	ଲାମ	ଲାମ	ଲାମ
	Past Indefinite (Sh)	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ		ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ
	Past Continuous (Ch)	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ		ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ
	Past Continuous (Sh)	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ		ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ
	Past Perfect (Ch)	ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ		ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ
	Past Perfect (Sh)	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ		ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ
Future	Future Indefinite(Ch)	ବ	ବ	ବ	ବୋ, ବ		ବୋ, ବ	ବୋ, ବ	ବୋ, ବ	ବୋ, ବ
	Future Indefinite(Sh)	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ		ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ
	Imperative	*	*	*	*	*	*	*	*	*
Gorup VEG4						VE G5	Group VEG6			Group VEG7

Table 3: Variations of Vowel Ended Roots and their verbal Inflections of VEG8, VEG9 and VEG10 for 1st Person

Vowel Ended Roots										
	Tenses	ହ	ଧା	ନା	ବା	କ	ବ	ର	ଲ	
First Person Present	Present Indefinite (Ch and Sh)	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ	ଇ
	Present Cont (Ch)	ଛି	ଛି	ଛି	ଛି	ଛି	ଛି	ଛି	ଛି	ଛି
	Present Cont (Sh)	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି	ଇତେଛି
	Present Perfect (Ch)	ଯେହି	ଧାଧ ଏଯେହି	ନାନ ଏଯେହି	ବାବ ଏଯେହି	ଯେହି	ଯେହି	ଯେହି	ଯେହି	ଯେହି
	Present Perfect (Sh)	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି	ଇୟାଛି
	Imperative	*	*	*	*	*	*	*	*	*
Past	Past Indef (Ch)	ଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଲାମ	ଲାମ	ଲାମ	ଲାମ	ଲାମ
	Past Indefinite (Sh)	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ	ଇଲାମ
	Past Continuous (Ch)	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ	ଛିଲାମ
	Past Continuous (Sh)	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ	ଇତେଛିଲାମ
	Past Perfect (Ch)	ଯେଛିଲାମ	ଧାଧ ଏଯେଛିଲାମ	ନାନ ଏଯେଛିଲାମ	ବାବ ଏଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ	ଯେଛିଲାମ
	Past Perfect (Sh)	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ	ଇୟାଛିଲାମ
Future	Future Indefinite(Ch)	ବ	ବ	ବ	ବ	ବୋ, ବ	ବୋ, ବ	ବୋ, ବ	ବୋ, ବ	ବୋ, ବ
	Future Indefinite(Sh)	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ	ଇବ, ଇବୋ
	Imperative	*	*	*	*	*	*	*	*	*
VEG8			Group VEG9			Group VEG10				

5. OUR PROPOSED DICTIONARY ENTRIES OF VOWEL ENDED ROOTS

Attribute's Descriptions:

VR-Verb Root,
 VE-Vowel Ended, DEF-Default,
 VEG-Vowel Ended Group

Group VEG1

[ପ] {}“...” (VR,VE,DEF,VEG1)
 [ପ] {}“...” (VR,VE, ALT,VEG1)
 [ଥ] {}“...” (VR,VE,DEF,VEG1)
 [ଥ] {}“...” (VR,VE, ALT,VEG1)
 [ଗ] {}“...” (VR,VE,DEF,VEG1.1)
 [ଗ] {}“...” (VR,VE, ALT,VEG1.1)
 [ଜ] {}“...” (VR,VE,DEF,VEG1.1)
 [ଜ] {}“...” (VR,VE, ALT,VEG1.1)
 [ଛ] {}“...” (VR,VE,DEF,VEG1.1)
 [ଛ] {}“...” (VR,VE, ALT,VEG1.1)

Group VEG2

[ନି] {}“...” (VR,VE,DEF,VEG2)
 [ନ] {}“...” (VR,VE, ALT,VEG2)
 [ଦି] {}“...” (VR,VE,DEF,VEG1)
 [ଦ] {}“...” (VR,VE, ALT,VEG2)

Group VEG3

[ଯ] {}“...” (VR,VE,DEF,VEG3)
 [ଗ] {}“...” (VR,VE, ALT,VEG3)

Group VEG4

[ଛୁ] {}“...” (VR,VE,DEF,VEG4)
 [ଛେ] {}“...” (VR,VE,ALT,VEG4)
 [ଥୁ] {}“...” (VR,VE,DEF,VEG4)
 [ଥେ] {}“...” (VR,VE,ALT,VEG4)
 [ତେ] {}“...” (VR,VE,DEF,VEG4)
 [ଶୀ] {}“...” (VR,VE,ALT,VEG4)
 [ଧୂ] {}“...” (VR,VE,DEF,VEG4)
 [ଧେ] {}“...” (VR,VE,ALT,VEG4)

Group VEG5

[କ] {}“...” (VR,VE,DEF,VEG5)

Group VEG6

[ଦୁ] {}“...” (VR,VE,DEF,VEG6)
 [ଦୋ] {}“...” (VR,VE,ALT,VEG6)
 [ନୁ] {}“...” (VR,VE,DEF,VEG6)

[ନୋ] {}“...” (VR,VE,ALT,VEG6)
 [କ୍ର] {}“...” (VR,VE,DEF,VEG6)
 [ରୋ] {}“...” (VR,VE, ALT,VEG6)

Group VEG7

[ଲ] {}“...” (VR,VE,DEF,VEG7)

Group VEG8

[ହ] {}“...” (VR,VE,DEF,VEG8)

Group VEG9

[ଧ] {}“...” (VR,VE,DEF,VEG9)
 [ଧ] {}“...” (VR,VE,ALT,VEG9)
 [ନା] {}“...” (VR,VE,DEF,VEG9)
 [ନ] {}“...” (VR,VE,ALT,VEG9)
 [ବା] {}“...” (VR,VE,DEF,VEG9)
 [ବି] {}“...” (VR,VE,ALT,VEG9)

Group VEG10

[କ] {}“...” (VR,VE,DEF,VEG10)
 [ବ] {}“...” (VR,VE,DEF,VEG10)
 [ର] {}“...” (VR,VE,DEF,VEG10)
 [ସ] {}“...” (VR,VE,DEF,VEG10)

6. DICTIONARY ENTRIES OF VERBAL INFLEXIONS

First Person

Present Tense

[ଈ] “”{}(VI,P1,PRT, DEF) ®
 [ଚିର] “”{}(VI,P1,PRT,PRG, DEF,CH) ®
 [ଇତେଚି] “”{}(VI,P1,PRT,PRG, DEF,SD,^VEG2) ®
 [ତେଚି] “”{}(VI,P1,PRT, PRG, DEF,SD,VEG2) ®
 [ଏହେଚି] “”{}(VI,P1,PRT, PER, ALT,CH, VEG1, VEG1.1, VEG9) ®
 [ମେଚି] “”{}(VI,P1,PRT, PER, DEF,CH, VEG2, VEG4, VEG6,VEG7, VEG8, VEG10) ®
 [ଇମେଚି] “”{}(VI,P1,PRT, PER, ALT,CH,VEG3) ®
 [ଇଯାଚି] “”{}(VI,P1,PRT, PER, DEF,SD,^VEG2, ^VEG3) ®
 [ଇଯାଚି] “”{}(VI,P1,PRT, PER, ALT,SD,VEG3) ®

Past Tense

[ଏଲାମ] “”{}(VI,P1,PST,ALT,CH,VEG1,VEG3) ®
 [ଇଲାମ] “”{}(VI,P1,PST,DEF,CH,VEG1.1,VEG9) ®
 [ଲାମ] “”{}(VI,P1,PST,DEF,CH,VEG2,VEG4, VEG6,VEG7, VEG8, VEG10) ®
 [ଇଲାମ] “”{}(VI,P1,PST,DEF,SD,^VEG2,^VEG3) ®

[ଲାଗ] “ ”{}(VI,P1,PST,DEF,SD,VEG2) ®
 [ଏଲାଗ] “ ”{}(VI,P1,PST,ALT,SD,VEG3) ®
 [ଛିଲାଗ] “ ”{}(VI,P1,PST,PRG,DEF,CH) ®
 [ଇତେଛିଲାଗ] “ ”{}(VI,P1,PST,PRG,DEF,SD,^VEG2) ®
 [ତେଛିଲାଗ] “ ”{}(VI,P1,PST,PRG,DEF,SD,VEG2) ®
 [ଏଯେଛିଲାଗ] “ ”{}(VI,P1,PST, PER,ALT,CH,VEG1,VEG1.1,
 VEG9) ®
 [ଯେଛିଲାଗ] “ ”{}(VI,P1,PST, PER,DEF,CH,VEG2,VEG4,
 VEG6,VEG7, VEG8,VEG10) ®
 [ଇଯେଛିଲାଗ] “ ”{}(VI,P1,PST, PER,ALT,CH,VEG3) ®
 [ଇୟାଛିଲାଗ] “ ”{}(VI,P1,PST, PER,DEF,SD,^VEG2,^VEG3)
 ®
 [ଯାଛିଲାଗ] “ ”{}(VI,P1,PST, PER,DEF,SD,VEG2) ®
 [ଇୟାଛିଲାଗ] “ ”{}(VI,P1,PST, PER,ALT,SD,VEG3) ®

Future Tense

[ବୋ] “ ”{}(VI,P1,FUT,DEF,CH) ®
 [ବ] “ ”{}(VI,P1,FUT,DEF,CH) ®
 [ଇବ] “ ”{}(VI,P1,FUT,DEF,SD,^VEG2) ®
 [ଇବୋ] “ ”{}(VI,P1,FUT,DEF,SD,^VEG2) ®
 [ବୋ] “ ”{}(VI,P1,FUT,DEF,SD) ®
 [ବ] “ ”{}(VI,P1,FUT,DEF,SD,VEG2) ®

Second Person

Present Tense

[ଓ] “ ”{}(VI,P2,GEN,PRT,DEF) ®
 [ସ] “ ”{}(VI,P2,NEG,PRT,DEF) ®
 [ନ] “ ”{}(VI,P2,RES,PRT,DEF) ®
 [ଜ୍] “ ”{}(VI,P2,GEN,PRT,PRG,DEF,CH) ®
 [କ୍ଷିମ] “ ”{}(VI,P2,NEG,PRT, PRG,DEF,CH) ®
 [କ୍ଷେନ] “ ”{}(VI,P2,RES,PRT, PRG,DEF,CH) ®
 [ଇତେଚ] “ ”{}(VI,P2,GEN,PRT,PRG,DEF,SD) ®
 [ଇତେଛିମ] “ ”{}(VI,P2,NEG,PRT,PRG,DEF,SD) ®
 [ଇତେଛେନ] “ ”{}(VI,P2,RES,PRT,PRG,DEF,SD) ®
 [ଏଯେଚ] “ ”{}(VI,P2,GEN,PRT,PER,ALT,CH) ®
 [ଏଯେଛିମ] “ ”{}(VI,P2,NEG,PRT,PER,ALT,CH) ®
 [ଏଯେଛେନ] “ ”{}(VI,P2,RES,PRT,PER,ALT,CH) ®
 [ଇୟାଚ] “ ”{}(VI,P2,GEN,PRT, PER,DEF,SD) ®
 [ଇୟାଛିମ] “ ”{}(VI,P2,NEG,PRT, PER, DEF,SD) ®
 [ଇୟାଛେନ] “ ”{}(VI,P2,RES,PRT, PER, DEF,SD) ®

Past Tense

[ଏଲେ] “ ”{}(VI,P2,GEN,PST, ALT,CH) ®
 [ଏଲି] “ ”{}(VI,P2,NEG,PST, ALT,CH) ®
 [ଏଲେନ] “ ”{}(VI,P2,RES,PST, ALT,CH) ®
 [ଇଲେ] “ ”{}(VI,P2,GEN,PST,DEF,SD) ®
 [ଇଲି] “ ”{}(VI,P2,NEG,PST,DEF,SD) ®
 [ଇଲେନ] “ ”{}(VI,P2,RES,PST,DEF,SD) ®

[ଏତେ] “ ”{}(VI,P2,GEN,PST, ALT,CH) ®
 [ଏତିନ] “ ”{}(VI,P2,NEG,PST, ALT,CH) ®
 [ଏତେନ] “ ”{}(VI,P2,RES,PST, ALT,CH) ®
 [ଇତେ] “ ”{}(VI,P2,GEN,PST,DEF,SD) ®
 [ଇତିନ] “ ”{}(VI,P2,NEG,PST,DEF,SD) ®
 [ଇତେନ] “ ”{}(VI,P2,RES,PST,DEF,SD) ®
 [କ୍ଷିଲେ] “ ”{}(VI,P2,GEN,PST,PRG,DEF,CH) ®
 [କ୍ଷିଲି] “ ”{}(VI,P2,GEN,PST, PRG,DEF,CH) ®
 [ଇତେକ୍ଷିଲେ] “ ”{}(VI,P2,GEN,PST,PRG,DEF,SD) ®
 [ଇତେକ୍ଷିଲି] “ ”{}(VI,P2,NEG,PST,PRG,DEF,SD) ®
 [ଇତେକ୍ଷିଲେନ] “ ”{}(VI,P2,RES,PST,PRG,DEF,SD) ®
 [ଏଯେକ୍ଷିଲେ] “ ”{}(VI,P2,GEN,PST, PER,ALT,CH) ®
 [ଏଯେକ୍ଷିଲି] “ ”{}(VI,P2,NEG,PST, PER,ALT,CH) ®
 [ଏଯେକ୍ଷିଲେନ] “ ”{}(VI,P2,RES,PST, PER,ALT,CH) ®
 [ଏଯେକ୍ଷିଲେନ] “ ”{}(VI,P2,RES,PST, PER,DEF,SD) ®
 [ଇୟାକ୍ଷିଲେ] “ ”{}(VI,P2,GEN,PST,PER,DEF,SD) ®
 [ଇୟାକ୍ଷିଲି] “ ”{}(VI,P2,NEG,PST,PER,DEF,SD) ®
 [ଇୟାକ୍ଷିଲେନ] “ ”{}(VI,P2,RES,PST,PER,DEF,SD) ®

Future Tense

[ବେ] “ ”{}(VI,P2,GEN,FUT,DEF,CH) ®
 [ବି] “ ”{}(VI,P2,NEG,FUT,DEF,CH) ®
 [ବେଳ] “ ”{}(VI,P2,RES,FUT,DEF,CH) ®
 [ଇବେ] “ ”{}(VI,P2,GEN,FUT,DEF,SD) ®
 [ଇବି] “ ”{}(VI,P2,GEN,FUT,DEF,SD) ®
 [ଇବେଲ] “ ”{}(VI,P2,GEN,FUT,DEF,SD) ®
 [ଏୱା] “ ”{}(VI,P2,GEN,FUT,DEF,CH) ®
 [ଇସ] “ ”{}(VI,P2,NEG,FUT,DEF,CH) ®
 [ଇୱା] “ ”{}(VI,P2,GEN,FUT,DEF,SD) ®
 [ସ] “ ”{}(VI,P2,NEG,FUT,DEF,SD) ®

Third Person

Present Tense

[ୟ] “ ”{}(VI,P3,GEN,PRT,DEF) ®
 [ନ] “ ”{}(VI,P3,RES,PRT,DEF) ®
 [ଏୟ] “ ”{}(VI,P3,GEN,PRT,ALT) ®
 [ଏନ] “ ”{}(VI,P3,GEN,PRT,ALT) ®
 [ଜ୍ଞ] “ ”{}(VI,P3,GEN,PRT,PRG,DEF,CH) ®
 [କ୍ଷେନ] “ ”{}(VI,P3,RES,PRT,PRG,DEF,CH) ®
 [ଇତେଚ] “ ”{}(VI,P3,GEN,PRT,PRG,DEF,SD) ®
 [ଇତେଛେନ] “ ”{}(VI,P3,RES,PRT,PRG,DEF,SD) ®
 [ଏଯେଚ] “ ”{}(VI,P3,GEN,PRT,PER,ALT,CH) ®
 [ଏଯେଛେନ] “ ”{}(VI,P3,RES,PRT,PER,ALT,CH) ®
 [ଇୟାଚ] “ ”{}(VI,P3,GEN,PRT,PER,DEF,SD) ®
 [ଇୟାହେନ] “ ”{}(VI,P3,RES,PRT,PER,DEF,SD) ®

Past Tense

[ଏଳ] “ ”{}(VI,P3,GEN,PST, ALT,CH) ®

- [এলেন] “ ”{}(VI,P3,RES,PST,ALT,CH) ®
- [ইল] “ ”{}(VI,P3,GEN,PST,DEF,SD) ®
- [ইলেন] “ ”{}(VI,P3,RES,PST,DEF,SD) ®
- [এত] “ ”{}(VI,P3,GEN,PST,ALT,CH) ®
- [এতেন] “ ”{}(VI,P3,RES,PST, ALT,CH) ®
- [ইত] “ ”{}(VI,P3,GEN,PST, DEF,SD) ®
- [ইতেন] “ ”{}(VI,P3,RES,PST, DEF,SD) ®
- [চিল] “ ”{}(VI,P3,GEN,PST,PRG,DEF,CH) ®
- [চিলেন] “ ”{}(VI,P3,RES,PST,PRG,DEF,CH) ®
- [ইতেচিল] “ ”{}(VI,P3,GEN,PST,PRG,DEF,SD) ®
- [ইতেছিলেন] “ ”{}(VI,P3,RES,PST,PRG,DEF,SD) ®
- [এয়েচিল] “ ”{}(VI,P3,GEN,PST,PER,ALT,CH) ®
- [এয়েছিলেন] “ ”{}(VI,P3,RES,PST,PER,ALT,CH) ®
- [ইয়াছিল] “ ”{}(VI,P3,GEN,PST,PER,DEF,SD) ®
- [ইয়াছিলেন] “ ”{}(VI,P3,RES,PST,PER,DEF,SD) ®

Future Tense

- [বে] “ ”{}(VI,P3,GEN,FUT,DEF,CH) ®
- [বেন] “ ”{}(VI,P3,RES,FUT,DEF,CH) ®
- [ইবে] “ ”{}(VI,P3,GEN,FUT,DEF,SD) ®
- [ইবেন] “ ”{}(VI,P3,RES,FUT,DEF,SD) ®

7. CONCLUSION AND FUTURE WORKS

We have shown dictionary entries for Bangla Vowel Ended Roots and their respective verbal Inflections that are useful for conversion of Bangla sentences to UNL expression. In future we'll work on the Consonant Ended Roots and develop the dictionary entries in the same manner. Then we'll use the en-convertor to see the result.

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