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Regional Language Driven Presentation tool

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ABSTRACT: India is a big research hub for Natural Language Processing area. There are 22 regional languages in India, which can be worked upon for various aspects of processing. Research done in Natural Language Processing area will always be interdisciplinary at the border between linguistics and artificial intelligence. This paper aims at providing details about a regional language driven presentation tool (RLDPT), which will take user input in the form of Sanskrit Nyasa (from Mathematical Grantha Lilavati) and would convert that mathematical expression into algorithm followed by its Graphical presentation.

KEYWORDS: Natural Language Processing, Artificial Intelligence, Sanskrit, Lilavati.

I. INTRODUCTION

Having 22 Regional Languages, India is always treated as big research hub for Natural Language Processing area. Aim of Natural Language Processing and Artificial Intelligence area is to develop computer programs capable of human-like behaviour related to 'understand given texts or produce meaningful texts' in natural languages such as Sanskrit, Marathi, Hindi, English and many other regional languages.

The most important applications of natural language processing include Retrieval of Information, Organization of the collected information, Machine Translation, Automatic Summarization, Sentiment Analysis, Text Classification and many more.

As in any science, activities of researchers are manly concentrated on its internal art and craft. Many problems arise during analysis and generation of Natural Language texts. Researchers focus on the solution of these problems of Semantic and Syntactic analysis, compilation of dictionaries, language text and grammar ambiguities.

In this project, we map the Nyasa written in Sanskrit, into corresponding Algorithm steps and its Graphical representation. This would clearly show the mathematical steps mentioned in that specific method.

Being Emerging field in India, Natural Language Processing (NLP) has a very good potential for research. Extensive research can be done in below NLP levels;

1. 'Conversion from Speech to text' technology,
2. Understanding of the Natural Language Text (with context) and
3. Effective and Efficient management/organization of the knowledge

The main objective is be to develop applications which are more relevant to those people speaking various regional languages.

Natural Language Processing (NLP) is a field of computer science, artificial intelligence and computational linguistics concerned with the interactions between computers and human (natural) languages. The idea of using a natural language for computer programming is to make it easier for people to talk to computers in their native languages. For many, it is tedious and painful to learn Computer friendly languages like assembly, C, C++, Java, LISP etc. Use of native languages for Computer programming relieves such pain of learning Compute languages.

Multiple languages are spoken in India, each with its own flavour. Being mother of all languages, Sanskrit is the perfect language for computer programming. This language is grammatically perfect and has huge treasure for all the fields.

Among all the Natural Languages, Sanskrit in its style is identified to be the best language which has minimum deviation. The creator of Sanskrit grammar, Panini, formulated 3,949 rules. Sanskrit is said to be a Mother of all



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languages. It deals with multiple limitations of Artificial Intelligence like NLP, Semantic Net, Vibhakti, Dual Case, Inflection based Syntax etc. Sanskrit language fulfils almost all of the prerequisites of a Natural Language Processor.

Information retrieval and information organization are the most important applications of natural language processing. Some other applications are Natural Language Interfaces, Machine Translation and many more. In Natural Language Processing, below eight Technical areas can be considered for both theoretical study and application development:-

- Information Retrieval and Text Clustering
- Morphology, Syntax, Named Entity Recognition
- Semantics
- Opinion, Emotions, Textual Entailment
- Text and Speech Generation
- Machine Translation
- Educational Applications
- Applications

We can apply NLP techniques to retrieve treasure of knowledge, written by our ancestors, in Sanskrit.

II. LITERATURE SURVEY

Sr. No.	Paper Name	Year of Publication	Methodology Used	Description
1.	Relational Learning of Pattern-Match Rules for Information Extraction	1998	Machine Learning	In Information extraction, the thorough processing of the text is done. Set of Items relevant to natural language document is located. Deep domain specific knowledge is required for such systems. These systems are also time consuming and difficult to build by hand. Hence is a candidate application for Machine Learning.
2.	Semantic Lexicon Acquisition for Learning NL Interfaces	1998	Artificial Intelligence	This paper describes about Word Learnings from Interpreted Examples (i.e. WOLFIE) This system acquires a semantic lexicon from a corpus of sentences paired with representations of their meaning.
3.	Journal of Machine Learning Research Homepage	2016	Machine Learning	A tool for measuring String similarity
4.	White Paper on Natural Language Processing	2007	Natural Language Processing	Semantics analysis in Natural Language Processing
5.	Lilavati	2013	Hindi Translation of Lilavati Grantha	All the mathematical methods described in Original Lilavati Grantha are translated in Hindi language and given in Nyasa form.
6	NLP for NLP	https://link.springer.com/	Natural Language Processing	This paper tries to address gap, between Programming Language and NLP. A system is



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(Natural Language Processing for Natural Language Programming)	chapter/10.1 007/1167129 9_34-2006		proposed which attempt to convert NL test into computer programming. From given Natural Language Text (English), the programming system can identify sequence of steps, Loops, Comments and convert them into a program.
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III. PROPOSED SYSTEM

Bhaskaracharya wrote Siddhantashiromani at the age of 36, Lilavati is the first part of it. The main Grantha Siddhantashiromani consists of four parts namely (Bhaskaracharya: 1144 – 1223 AD).

- 1) Lilavati (लीलावती)
- 2) Algebra (बीजगणित)
- 3) Planetary motions (ग्रहगणित)
- 4) Astronomy (गोलाध्याय).

Lilavati, the first 'prakarana' of Siddhantashiromani deals with 'Pati-Ganit' i.e. 'Vyakta Ganit' or Arithmetic in today's Mathematical Terms. It contains 278 verses. Being a Kavi also, Bhaskaracharya has written these verses in Poetic form (Shlokas) in Sanskrit language. There are certain verses which deals with Menstruation (measurement of various Geometrical Objects), Volume of Pyramids, and Cylinders, heaps of grains etc., wood cutting, shadow and trigonometric relationship. Also on certain elements of Algebra such as finding an unknown quantity subject to certain constraints with the help of supposition method.

The Lilavati consists of 279 verses of rules and examples. The main contents are:

- Basic arithmetic operations including square roots and cube roots calculation for numbers, fractions, and the effect of text encryption.
- The rule of three, rule of five and so on
- Bartering, buying and selling
- Permutations and combinations
- Progressions and series
- Geometrical operations
- Solutions to indeterminate equations

In proposed system, we consider the Nyasa written in Lilavati Grantha. These Nyasa represent specific Mathematical formulae written for specific Mathematical Methods like Addition, Subtraction and so on.

Proposed system takes Sanskrit Nyasa as an input from front end GUI. Maps these Nyasa tokens into corresponding English words (Mathematical operations) and prepare and algorithm (in English) for the given method. The algorithm then also would be represented in the form of Flowchart. This would help user to clearly visualize the mathematical steps mentioned in that specific Sanskrit Nyasa.

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IV. SYSTEM ARCHITECTURE

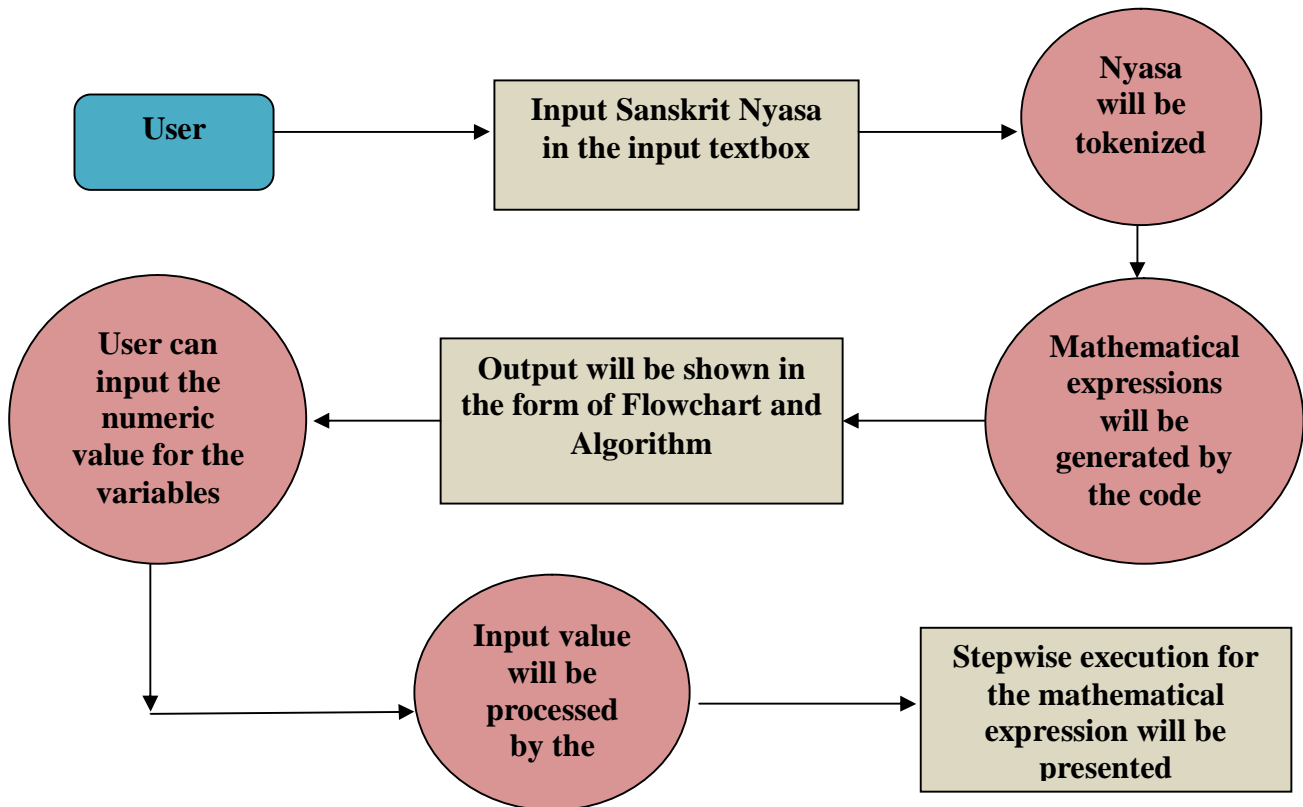


Figure 1. Proposed System Architecture

Above figure shows proposed system architecture. The system would take input, in the form of Sanskrit Nyasa, from user in a textbox. The Nyasa will be then tokenised and corresponding Mathematical expression will be generated. Output will be shown in the form of Algorithm.

User will also be able to execute the mathematical expression with input values.

V. CONCLUSION

The paper proposes a Regional language tool (Which is a Sanskrit Language) which would accept input Nyasa from LilavatiGrantha and would represent the mathematical methods mentioned in it graphically. This tool can be used by Learners of Sanskrit Language and can be extended for other Indian Languages in which the mathematical formulae are mentioned.



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