

DEEP – DEvnagari Enabled Programming, A way to program in Marathi

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Abstract:- Technology has become the fourth basic need of man's life. So, the need for computer programming is arising every passing day. However, since most of the computer programming languages are English-based, they can act as barriers for people who are not comfortable with English. Mother tongue is essential for learning as a part of intellectual ability. It helps a child in his/her moral, mental and emotional development. Mother tongue has central role in education that demands cognitive development. Studies show that children who come to school with a solid foundation in their mother tongue develop stronger literacy & logical abilities. DEEP is an initiative that will provide the Marathi speaking people, Non-English based programming system which will enable them to learn and write computer programs in Marathi. It will also provide the Marathi students a platform to learn and practice computer programming at the Elementary school level itself.

Keywords: Devnagari Enabled Programming, Importance/Need for Programming In Native Language, Importance Of Programming In Primary Schools, Marathi Programming Language, Python Language.

1. Introduction

This paper describes a compiler called "DEEP" which we have developed for programming education in Marathi language and its implementation procedure. Multiple studies have shown that, learning in Mother Tongue is an essential key for intellectual development of one [2]. Also, it has been found that, we have been losing the existence of our native languages over the past few decades [5]. Lack of logical ability and research in particular language is one of the reasons behind it. Besides that, introduction of programming to Primary schools can be done in better way by facilitating them to use their own mother tongue (Native Language). People will be more comfortable while learning, developing logic as well as implementing it in the computer programs in their native languages which they understand inside out.

The Government of India has been encouraging various Digital India initiatives since 2014, to transform India into a digitally empowered society and knowledge economy. This project can be a step taken towards the accomplishment of the initiative. This soft-ware accomplishes to achieve all of the above objectives.

DEEP – Devnagari Enabled Programming is a way to program in Marathi. It is actually a compiler and NOT a new programming language. This project aims at removing language barrier of English based programming languages, by allowing people from non-English background to take on software development, especially, Devnagari and Marathi background. The reason we call it Devnagari Enabled programming is that although it works for Marathi keywords as of now, the project has the capability to incorporate different language keywords using their respective language keywords.

Similar initiatives like ChaScript [1] (for Programming in Bengali language) and Dolittle [3] (for programming in Japanese language) have already proved successful for the learners to program in Bengali and Japanese languages respectively at the primary school level itself..

2. Related Work

ChaScript [1] is a Bengali Educational Programming Language which was built in order to provide platform for Bengali speaking people to learn computer programming without the need for English language. It is built with ECMA Script grammar and is parsed using JISON JavaScript parser.

Hindawi [4] is a suite of open source programming languages that allows users to program in Indic languages (Hindi, Bangla and Gujarati). It can be used to teach children Programming in their mother tongue, and can also be used for serious programming tasks, including systems programming in equivalents of C, C++, lex, yacc, Java(TM) and assembly.

Dolittle [3] is a Japanese based educational programming language that fully supports Object Oriented Paradigm. Moreover, easy syntaxes are provided for Japanese people to learn programming smoothly.

Mallet [2] has discussed the problems which students face while studying Mathematics as they are not familiar with the language used for teaching them. Mallet also emphasized how a person who cannot quickly understand the spoken form of the language of instruction will have difficulty understanding what is being taught without the facility of additional learning support.

3. Methodology

3.1 WORKING OF DEEP

a. Input from the user

DEEP first accepts the Marathi code input from the user. The user needs to take care of the syntaxes, indentation and all the rules required to write the proper code. This input can be provided from a file. Devnagari characters in the form of Unicode are accepted as the input.

b. Tokenization

The input is split into several strings based on line breaks. The input statements are parsed using the grammar which is written with the help of PyParsing library. Then each of these

strings is again broken down into tokens. Each token is then analyzed and handled accordingly. Tokens are formed based on the grammar which is written with help of PyParsing library. These tokens are required for the conversion of the Marathi code into its English equivalent code. For example, if the input string is "c = a + b", the tokens are formed from this string and stored as {c, =, a, +, b}.

c. Keyword Handling

The tokens are then compared with the predefined list of keywords which contains the English-Marathi keywords' pairs. If match found, the corresponding English keyword is printed into the in-between code. If no match found, the token is searched into the variables' list.

The keywords are defined to check whether the entered syntaxes follow the exact grammar required for the code to execute. The Marathi keywords used have almost the same meaning as the corresponding English keyword.

d. Execution of the Intermediate Code

The Intermediate Code generated is fed to the Python Compiler and the output generated is processed further. This Intermediate code can be provided to the user if required. The Intermediate Code is in the form of the Standard English Python Code.

e. Output Processing

The output generated by the Python Compiler is converted into corresponding Marathi language. This conversion is done with the help of the grammar written with the help of the PyParsing library. Thus, the output displayed to the user is also in Marathi language format which is understandable to him.

f. Error Handling

Syntax errors in the program are also displayed to the user using Marathi language representation. Thus, the user can understand the errors and correct them accordingly. Syntax errors are also in Marathi language form, thus enabling the user to understand the errors and carry out the required corrections.

4. Block Diagram

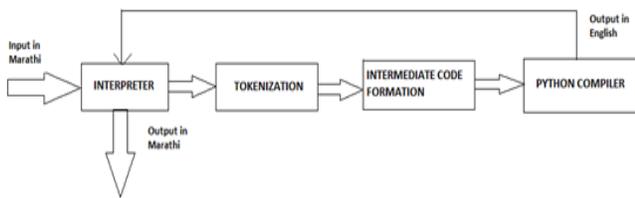


Figure 1: Block Diagram

Flowchart

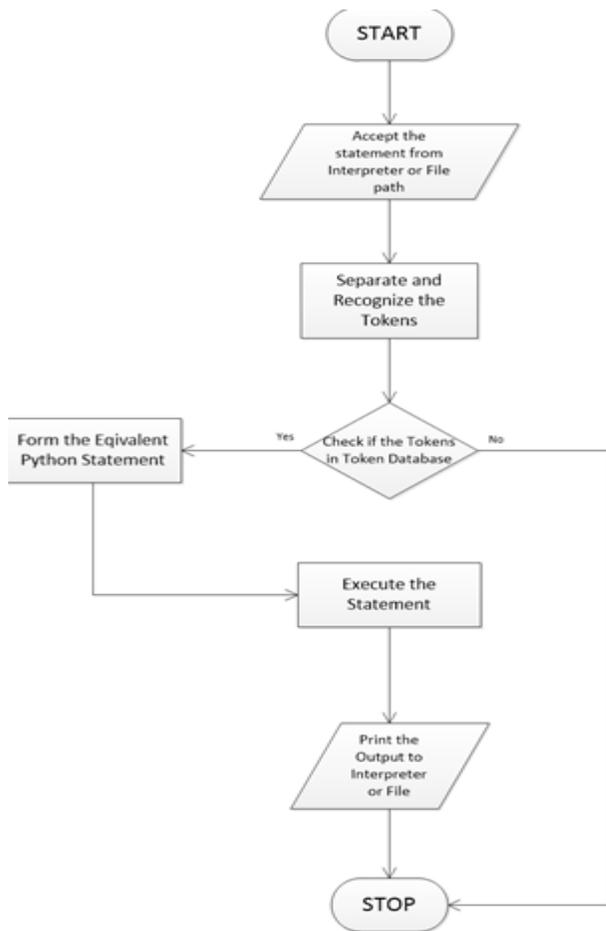


Figure 1: Flowchart for DEEP functioning

5. Working Model

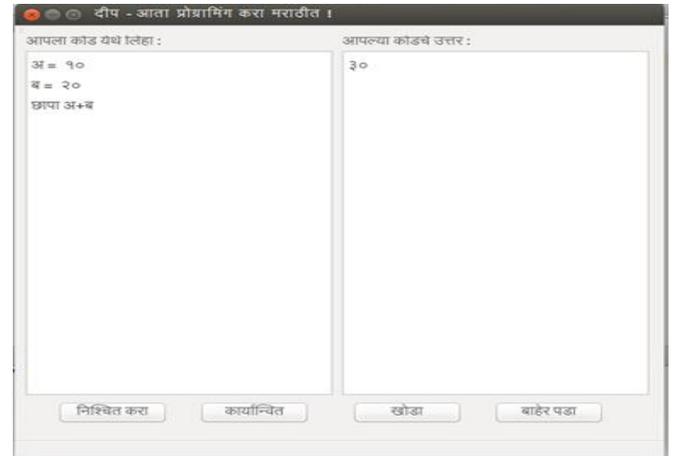


Figure 2: DEEP working GUI

DEEP has a simple GUI as shown in fig. 3 which is understandable by every user who knows Marathi language. The user simply needs to write the Marathi code and choose the appropriate option. The code then gets executed and the output is displayed on the window.

DEEP GUI has been developed using the QT library. QT5 version is used which was available for the development in Python language.

6. Conclusion

In this paper, we introduced new programming language called DEEP (DEvnagari Enabled Programming) which allows user to become a Programmer even if he/she is not comfortable with English language but has a good hold over Marathi language. Using DEEP, students who study in Marathi medium schools (and don't know much about English) would be able to write commands for computers. Thus, students who aspire to be software developers someday are saved the effort to concrete their hold over English and can practice coding at primary school level itself.

DEEP works for limited Marathi language Python syntaxes but it can be further extended to work for the entire Python language. If Intermediate code is generated in the form of machine language rather than Python code, it would improve the efficiency of system. DEEP implementation method can be studied and used to build similar projects for different languages

6. References

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