NigLT Ver 1.0: An Indigenous Language Translator Application for Major Ethnic Groups in Nigeria

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Abstract

National Integration can effectively be realized through a Common Unified Framework (CUF) that will enable the major ethic groups in Nigeria to appreciate communication in their respective languages. This paper developed a language translator application software referred to as NigLT ver1.0, which focus on translating words in the three major Nigerian Languages, (English, Hausa, Igbo Language, and Yoruba Language). This paper argues that the application will assist the citizenry to familiarize with the grammatical structures, meanings and other features of the major Nigerian languages. The application was developed with JAVA programming language and BabelMap Unicode generator, as such making it adaptable to any computer system. This solution will enable end users quickly understand and adapt to its usage. In this context, this paper presented the system flowchart and the design methodology.

[**Keywords**: Language, Translation, National, Integration, CUF, Grammatical, Unicode, Structures, Comparative]

I. INTRODUCTION

NigLT ver1.0 is an application developed with integrated technologies owing to the rising need for language mastery among the major ethnic groups in Nigeria. It was intended to run on windows platforms and provides word translations from English to Hausa, Igbo, and Yoruba and vice versa. In its functionality, words can be entered in the search bar by just typing the first few letters or by double clicking on the words and selecting the translation format. The application will perform an incremental search to show any matching headwords or forms, and will try to bypass spelling errors. Clicking on any word in a definition searches for that word in the text dictionary again. Almost any word is clickable, except the pronunciations in phonetic characters and numerals.

Software such as DictUnifier [1] can be used to add more entries into the application but we considered flexibility and ease of adaptation in implementing the application. From [2], the number of languages currently estimated and catalogued in Nigeria is 521. This number includes 510 living languages, two second languages without native speakers and 9 extinct languages. In some areas of Nigeria, ethnic groups speak more than one language. The official language of Nigeria-English was chosen to facilitate the cultural and linguistic unity of the country. The major languages spoken in Nigeria are Hausa, Igbo, Yoruba, Fulfulde, Kanuri, and Ibibio. Even though most ethnic groups prefer to communicate in their own languages, English, being the official language, is widely used for education, business transactions and for official purposes [2]. English, however, remains an exclusive preserve of the country's urban elite, and is not widely spoken in rural areas. With approximately 75% of Nigeria's populace in the rural areas, the major languages of communication in the country remain national languages, with the most widely spoken being Hausa, Igbo and Yoruba.

Nigeria is the most populous country in Africa, the seventh most populous country in the world, and the most populous country in the world in which the majority of the population is black. It is listed among the "Next Eleven" economies, and is a member of the Commonwealth of Nations. The economy of Nigeria is one of the fastest growing in the world, with the International Monetary Fund projecting a growth of 9% in 2008 and 8.3% in 2009 [3,4,5]. The International monetary fund (IMF) further projects a 8% growth in the Nigerian economy in 2011[6].

Consequently, considering Nigeria as an entity that needs effective national integration, this work aims to develop application software that will convert English words to Hausa, Igbo, and Yoruba and vice visa. This first phase of the project takes into cognizance the Nigeria's linguistic diversity as a microcosm of Africa as a whole, encompassing the three major classifiable languages in context. This work argues that this is the major work on language translator application developed for the Nigerian environment. We shall next discuss the implementation blocks and modules vai flowchart and the methodology.

1.1. Literal System Flowchart for Translation

Figure 1a, 1b shows the literal flow chart. This basically shows the navigation sequence as implemented in the application. The work adopted incremental as well as agile software development methodologies for its delivery.

1.2 The Unicode Standard

The authors adopted the Unicode [7] as a computing industry standard for the consistent encoding, representation and handling of text used in the application . The Unicode developed in conjunction with the Universal Character Set standard consists of a repertoire of more than 109,000 characters covering 93 scripts, a set of code charts for visual reference, an encoding methodology and set of standard character encodings, an enumeration of character properties such as upper and lower case, a set of reference data computer files, and a number of related items, such as character properties, rules for normalization, decomposition, collation, rendering, and bidirectional display order (for the correct display of text containing both right-to-left scripts, such as Arabic and Hebrew, and left-to-right scripts) [8] .

The Unicode Consortium, the nonprofit organization that coordinates Unicode's development, has the ambitious goal of eventually replacing existing character encoding schemes with Unicode and its standard Unicode Transformation Format (UTF) schemes, as many of the existing schemes are limited in size and scope and are incompatible with multilingual environments [7].

Technically, owing to the Unicode's ability of unifying character sets, this has led to its widespread and predominant use in the internationalization and localization of computer software in general. The standard has been implemented in many recent technologies, including XML, the Java programming language, the Microsoft .NET Framework, and modern operating systems [7]. Unicode can be implemented by different character encodings. The most commonly used encodings are UTF-8 (which uses one byte for any ASCII characters, which have the same code values in both UTF-8 and ASCII encoding, and up to four bytes for other characters), the now-obsolete UCS-2 (which uses two bytes for each character but cannot encode

every character in the current Unicode standard), and UTF-16 (which extends UCS-2 to handle code points beyond the scope of UCS-2). This work leveraged on the functionally of UTF-8 character encoding. Section 3 explains the methodology and application in this work.

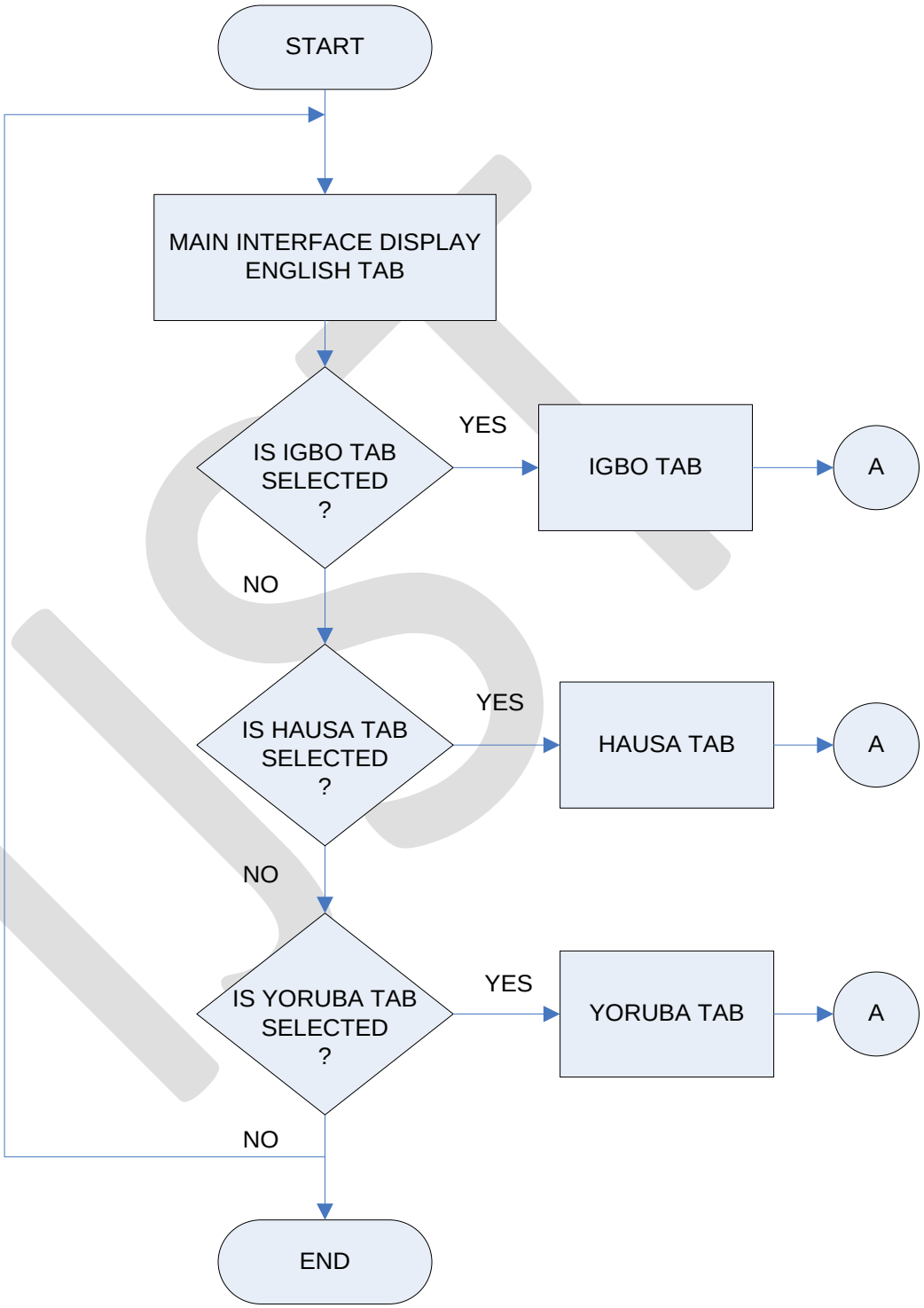

Figure 1a: System Flowchart for Translation

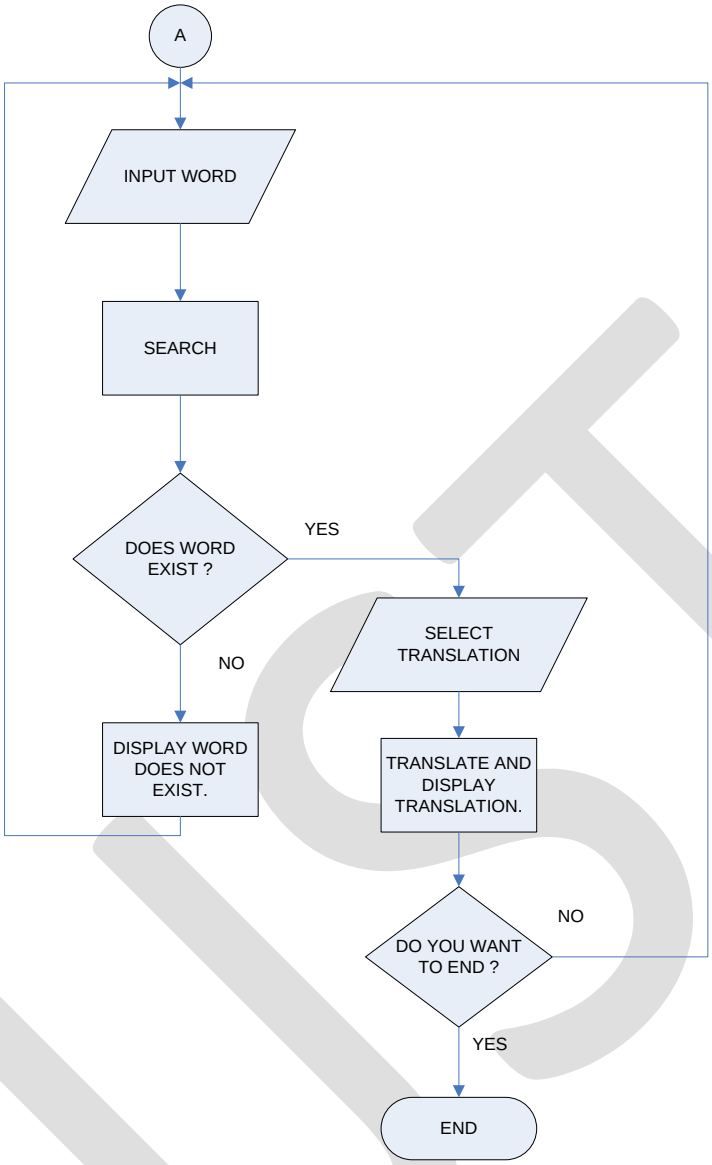

Figure 1b: Flowchart for each native language and the translation process.

II. DESIGN METHODOLOGY

Essentially, a detailed research shows that the usage of wrong approaches leads to software failure. However, objected oriented analysis model (OOAM) was used in this paper while BabelMap for Unicode character generation, Notepad, JVM and JAVA Netbeans IDE were deployed in the implementation phases of the NigLT ver 1.0.

2.1 BabelMap (Unicode Character Map for Windows)

This work used the BabelMap character map tool to generate all variants of words for our text engine file directories (English, Igbo, Hausa, and Yoruba) for the NigLT ver 1.0. BabelMap is a free character map application for Windows that allows you to browse through the entire Unicode character repertoire of nearly 110,000 characters, or search for a particular character by name or by code point. Characters can then be copied to the clipboard for use in any Unicode-aware application.

In our context, the characters generated is copied into the MS-word and notepad text editor and saved into the hard drive and imported into the JAVA code for processing. Figures 2 shows the BabelMap application used in this work.

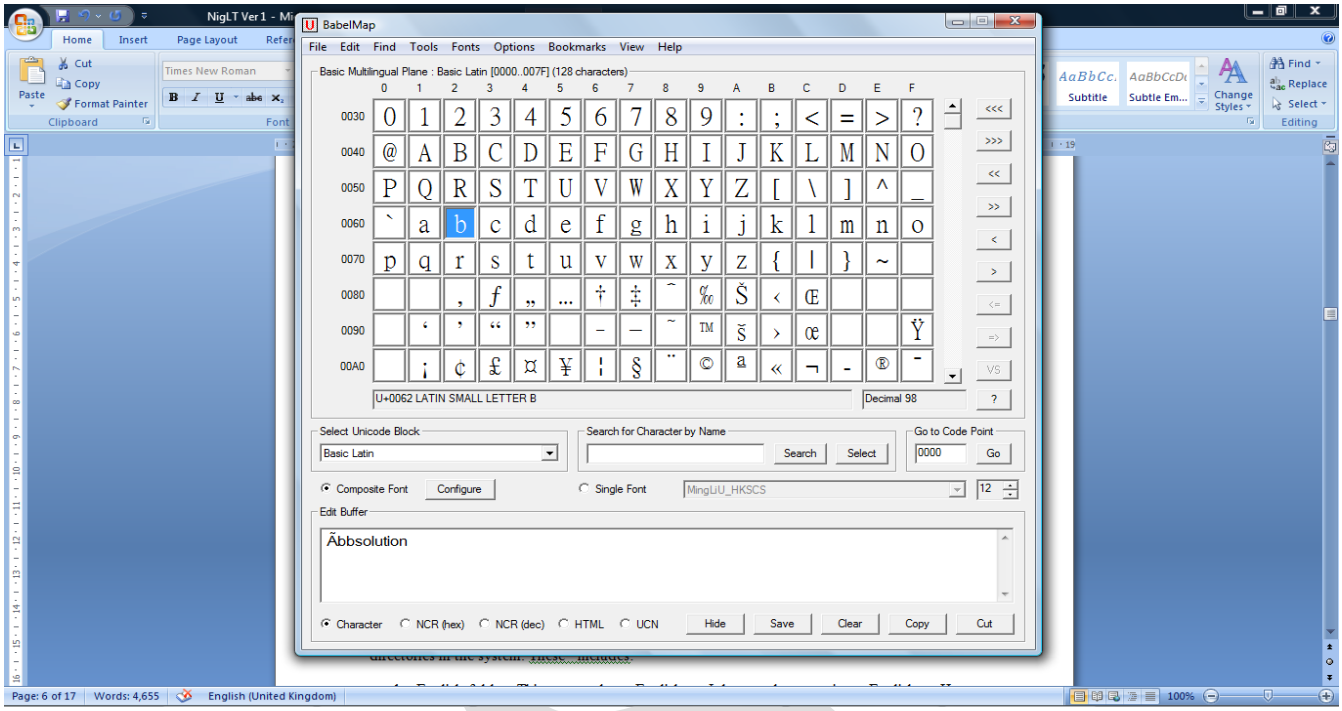

Figure 2: Babelmap for Windows

2.2 Text Engine File Directory

From figures 1a&1b, for the Igbo, Hausa and Yoruba modules, the text file engines were built by creating four distinct text file folder directories in the system. This includes:

1. English-folder: This encapsulates English to Igbo word conversions, English to Hausa word conversions, English to Yoruba word conversions.
2. Igbo-folder: This encapsulates Igbo to English word conversions, Igbo to Hausa word conversions, Igbo to Yoruba word conversions.
3. Hausa-folder: This encapsulates Hausa to English word conversions, Hausa to Igbo word conversions, Hausa to Yoruba word conversions.
4. Yoruba-folder: This encapsulates Yoruba to English word conversions, Yoruba to Igbo word conversions, Yoruba to Hausa word conversions. These folder directories were embedded into the JAVA code in various classes for the application design.

2.3 Using JAVA NetBeans to Compile and Run Java Codes

Existing literatures defines NetBeans as both a platform framework for Java desktop applications, and an integrated development environment (IDE) for developing with Java [9], JavaScript [9], PHP [9], Python [10], Groovy [9], C [9], C++ [9] . The agree with the definition buts suggests that platform and framework can be used interchangeably depending on context. The NetBeans IDE is written in Java and can run anywhere a Java virtual machine (JVM) is installed, including Windows, Mac OS, Linux, and Solaris. A Java development kit (JDK) is required for Java development functionality, but is not required for development in other programming languages. The NetBeans platform allows applications to be developed from a set of modular software components called modules. Applications based on the NetBeans platform (including the NetBeans IDE) can be extended by third party developers [11].

The NetBeans IDE is an open-source integrated development environment which supports the development of all Java application types (Java SE including JavaFX, (Java ME, web, EJB and mobile applications).Among its other features are : an Ant-based project system, Maven support, refactorings, and version control (supporting CVS, Subversion, Mercurial and

Clearcase). The NigLT ver1.0 is written with JAVA programming language in NetBeans 7.0 and as such can run on any system.

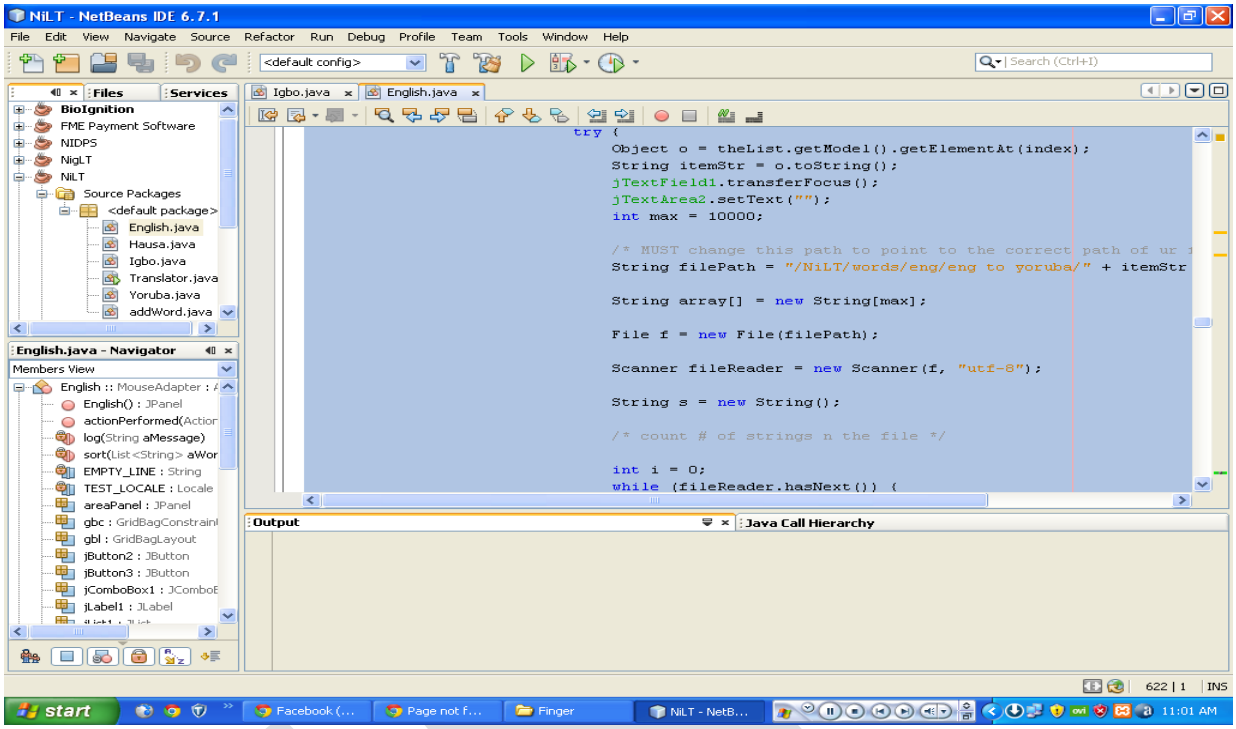

Figure 3: JAVA Netbeans IDE for Coding

2.4 NetBeans Platform

The NetBeans Platform is a reusable framework for simplifying the development of Java Swing desktop applications. The NetBeans IDE bundle for Java SE contains essential tools to start developing NetBeans plugins and NetBeans Platform based applications; no additional SDK is required in this case. The platform offers reusable services common to desktop applications, allowing developers to focus on the logic specific to their application. See figure 3. However, among the features of the platform are:

- User interface management (e.g. menus and toolbars)
- User settings management
- Storage management (saving and loading any kind of data)
- Window management
- Wizard framework (supports step-by-step dialogs)
- NetBeans Visual Library
- Integrated Development Tools

III. DISCUSSION AND RESULTS

The application is made to be very portable since the approach of implementation ignored the usage of database like MYSQL, Sybase or Oracle. as such there is no drain on the system resources when deployed. Also application that can convert words from English to Hausa, Igbo, and Yoruba and vice versa and hence will assist Nigerians to master other languages effectively. The major features of this application include:

i. Words translation (English, Igbo, Hausa, and Yoruba)
ii. Excellent Look and feel.
iii. Easy navigation and drop down Interface
iv. Platform interoperability, hence portable.
v. Flexibility

vi. Search Optimization Routine (SOR)
vii. Full Multilingual Unicode (UTF-8)

Besides, this paper proposes some areas of applications as : Nigerian Schools, Government Establishments, National Assembly, Airport, Embassy, NYSC, and Media Houses. Figures 4,5, 6 shows the application interface designs.

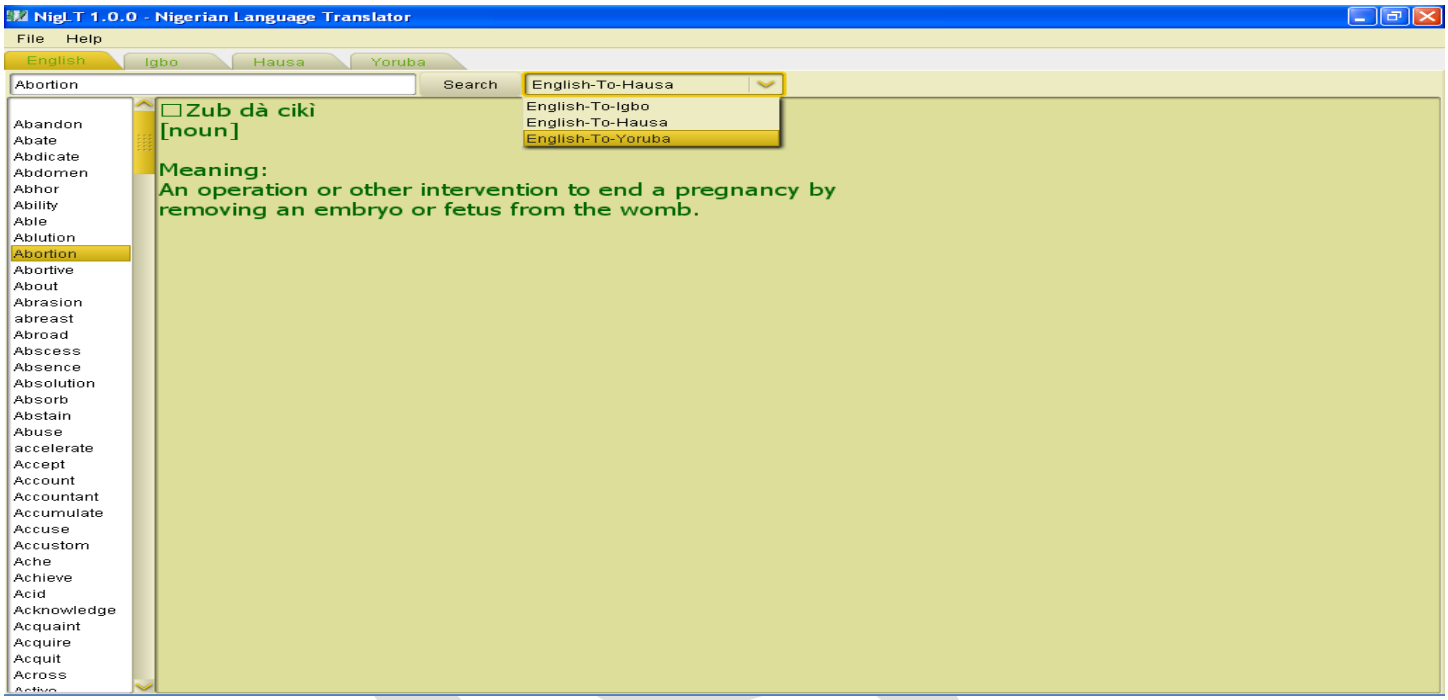

Figure 5: Interface for English Yoruba Translation

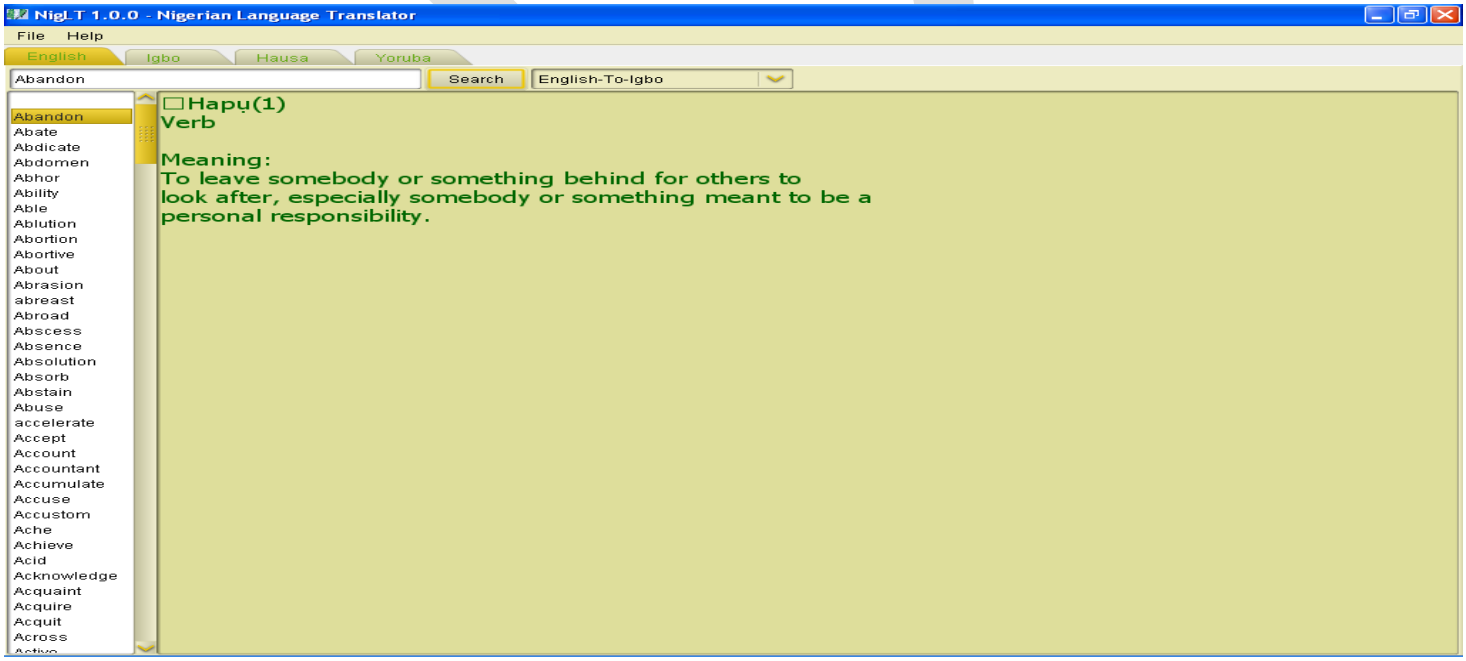

Figure 5: Interface for English to Igbo translation

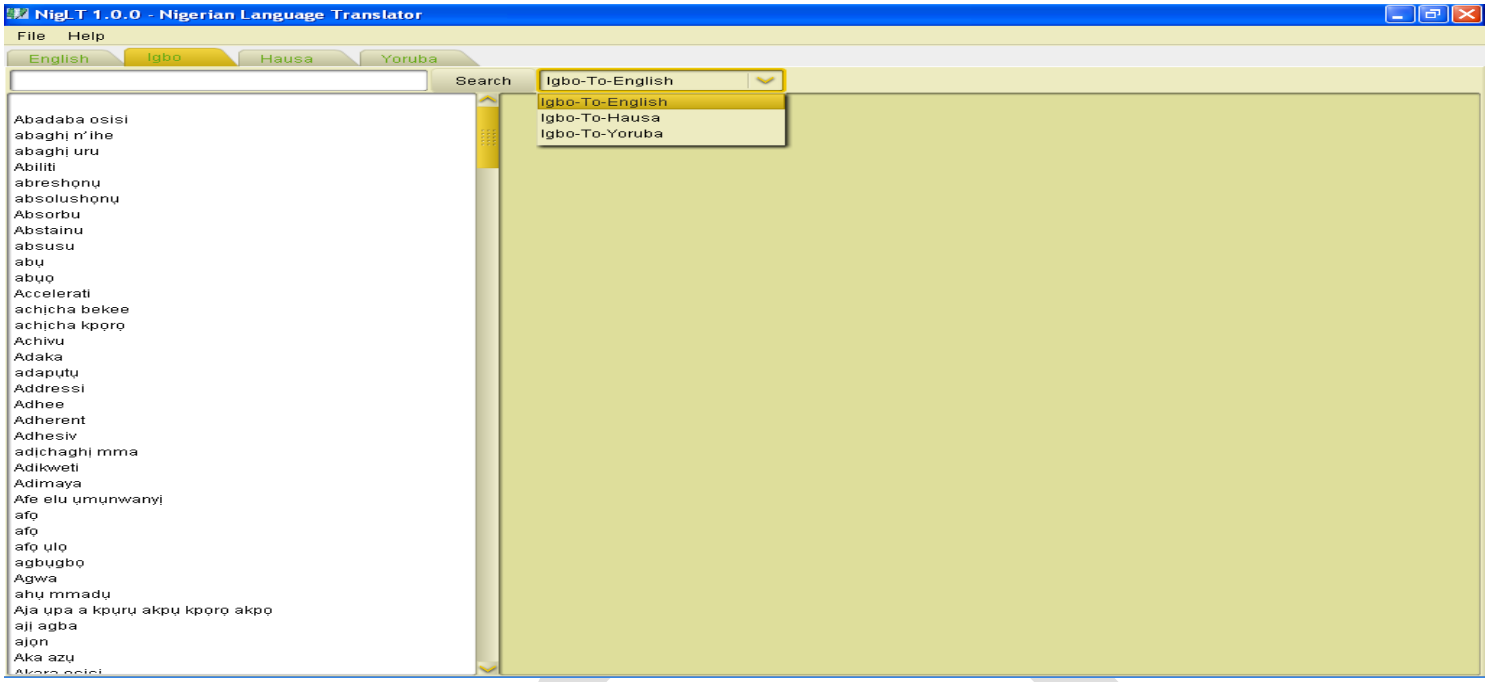

Figure 6: Igbo to English Translation

IV. CONCLUSION AND FUTURE STEPS

In conclusion, this research through the concept of object oriented programming with JAVA Technology and BabelMap presents the NigLT ver 1.0: an indigenous word translator which will facilitate national integration through learning of languages in the major ethic groups in Nigeria. A brief discussion on the development technologies has been presented. With the use of JVM, the application can run on any platform with ease. Hence laying a good foundation for the possibility of cloud interface technology for language translation (online) in Nigeria. Future work will focus on complete sentence translation and voice encoding, while migrating the application to the cloud computing datacenter.

References

1. http://code.google.com/p/mac-dictionary-kit.
2. http://wikipedia/wiki/Languages of Nigeria.
3. IMF Survey: Nigeria Needs Sustained Reforms to Build on Success". Imf.org. http://www.imf.org/external/pubs/ft/survey/so/2008/CAR021508A.htm. Retrieved 2008-11-21.
4. Aminu, Ayodele. "allAfrica.com: Africa: IMF Forecasts 9 Percent Growth for Nigeria (Page 1 of 1). Allafrica.com. http://allafrica.com/stories/200804140655.html. Retrieved 2008-11-21.
5. Godwin, Atser. "The Punch: IMF predicts 9% GDP growth rate for Nigeria". Punchng.com. http://www.punchng.com/Articl.aspx?theartic=Art20080229153046. Retrieved 2008-11-21.
6. Odueme, Stella (2011-05-09). ":RenCap projects 8% growth for Nigeria in 2011". Independentngonline.com. http://independentngonline.com/DailyIndependent/Article.aspx?id=33492. Retrieved 2011-05-28.
7. http://wikipedia/wiki/unicode
8. The Unicode Standard: A Technical Introduction". http://www.unicode.org/standard/principles.html#. Retrieved 2010-03-16.
9. http://netbeans.org/community/releases/70/relnotes.html
10. http://wiki.netbeans.org/Python
11. platform: NetBeans Modules and Rich-Client Applications Learning Trail
12. Boudreau, Tim; Glick, Jesse; Greene, Simeon; Woehr, Jack; Spurlin, Vaughn (October 15, 2002). *NetBeans: The Definitive Guide* (First ed.). O'Reilly Media. pp. 672. ISBN 0596002807. http://oreilly.com/catalog/9780596002800/.

13. Heffelfinger, David (October 31, 2008). *Java EE 5 Development with NetBeans 6* (First ed.). Packt Publishing. pp. 400. ISBN 1847195466. http://www.packtpub.com/java-ee5-development-with-netbeans-6/book.
14. Myatt, Adam (February 21, 2008). *Pro Netbeans IDE 6 Rich Client Platform Edition* (First ed.). Apress. pp. 491. ISBN 1590598954. http://www.apress.com/book/view/9781590598955.
15. Keegan, Patrick; Champenois, Ludovic; Crawley, Gregory; Hunt, Charlie; Webster, Christopher (May 9, 2006). *NetBeans IDE Field Guide: Developing Desktop, Web, Enterprise, and Mobile Applications* (Second ed.). Prentice Hall. pp. 424. ISBN 9780132395526. http://www.informit.com/store/product.aspx?isbn=0131876201.
16. Boeck, Heiko (July 01, 2009). *The Definitive Guide to NetBeans Platform* (First ed.). Apress. pp. 450. ISBN 1430224177. http://www.apress.com/book/view/1430224177.
17. Petri, Jürgen (August 11, 2010). *NetBeans Platform 6.9 Developer's Guide* (First ed.). Packt Publishing. pp. 288. ISBN 1849511764. https://www.packtpub.com/netbeans-platform-6-8-developers-guide/book.
18. Kleiner, Fred S.; Christin J. Mamiya (2009). *Gardner's Art Through the Ages: Non-Western Perspectives* (13, revised ed.). Cengage Learning. p. 194. ISBN 0495573671.

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