THE USE OF COMPUTER IN SUSTAINING YORUBA LANGUAGE THROUGH A PRACTICAL LEARNING APPROACH.

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Abstract

This paper focused on the development based on the integration of ideas from computer aided education; computer mediated communication as well as techniques in artificial intelligence. using mathematical and word principle, Yoruba and English words were grouped into two exclusive sets. The set theory was used to determine acceptable structure, axiom of extension, for any two subsets from source and target languages to be equal there must be like components. The law of probability, Bayes' theorem, and Statistical design theory were used to increase the CALL system accuracy and produce result.

INTRODUCTION

Nigeria as three major languages Hausa, Yoruba and Igbo, however the target of this paper is based on Yoruba language. Zainab O.A. Submitted that Yoruba tribe makes up of about 35 million populations in total with majority constituent from Nigeria which is about 21 % of Nigerians population. According to her 1.2 million of Yoruba spoken people are in Benin, 0.4 Million in Ghana ,0.1 million in Togo, I million in Ivory Coast ,0.2 million in Europe and 0.2 million in North America. With this we can conclude that Yoruba as a spoken language is known across the entire world.

REVIEWOFRELATEDRESEARCH

Generally, research has been done in Computer Assisted Language Learning (CALL) and also in Intelligent Computer-Assisted Language Learning (ICALL). Morphological usage of CALL had also been dealt with by various researchers. This paper does not attempt to review CALL and ICALL generally, but add to the existing knowledge in the field of computer language learning. In the motivation and prerequisites of a successful integration of ICALL tools into current Foreign Language

Teaching and Learning (FLTL) practice is presented. The authors focused on

(i) the relationship between activity design and restrictions needed to make natural language processing tractable and reliable, and

(ii) pedagogical considerations and the influence of activity design choices on the integration of ICALL systems into FLTL practice. We profited from their insights while focusing on the task of supporting the (re-) learning of Yoruba, a mother-tongue language in some parts of Africa.

The TAGARELA framework developed was employed to develop online CALL exercises for Russian. The system aims to teach basic grammar to learners of Russian, and this involves audio and video exercises that enable the observation of language situations outside the classroom and life-like listening practice. The system is internet-based, facilitating learning anytime and anywhere.

The exercises international Journal of Computer and Information Technology (ISSN: 2279 – 0764) Volume 02– Issue 05, September 2019 www.ijcit.com 994 have fixed content, thus limiting learners to the content the developer put in the exercise and there is no avenue to automatically add to the knowledge base. Research told us that GLOSSER is an early system that extensively utilizes a morphological analyzer in language learning. The major components of this system include a morphological analyzer for French, a part-of-speech disambiguation system, a bilingual dictionary, and aligned bilingual corpora. The system provided intelligent assistance to Dutch students learning to read French. The focus, however, is the learning of vocabulary that needs to be acquired separately from reading exercises.

In recent years there has been an explosion of interest in using computers for language teaching and learning.

It is predicted that the future of CALL will heavily rely on the ability of learners and instructors to find, evaluate, and critically interpret net-based information [1]. The insights gained from these works informed our research with respect to the history

and future directions of CALL. In spite of some interest in Computer-Assisted Language Learning for African languages, it is evident that more research needs to be done. From the literature reviewed, the focus of our study remains different from other studies reported in the following ways:

a. We focus on Yoruba, a mother-tongue language and commonly taught language but not generally known.

b. We target re-learners, including learners who have only basic, passive abilities in Yoruba language both in group and individual.
c. We provide exercises derived from a natural language processing system, unlike in other learning systems where a morphological analyzer is used to analyze the learners' answers [5], or as aid in providing morphological knowledge or dictionary access. We utilized the morphological analyzer to develop exercises for learning.

An Intelligent CALLSystem for Arabic Learners was designed for Primary Schools and Arabic language learners. The system CoRI'16, Sept 7–9, 2016, Ibadan, Nigeria. To employed Natural Language Processing for learning the language and provides learning materials for the users, on which they are expected to take test on. The instructor is able to stipulate conditions to determine the test questions specialisation. The response given by users is analysed using morphological analyser, syntax analyser and semantic analyser. The morphological analyser breaks down response of the users to smallest component of the language. The syntax analyser checks for the structural correctness of user's response and form syntactic categories.

The Semantic analyser checks for rule based approach to generate appropriate response to result given by the system users to promote effective learning. CALL, a standalone system is aimed to provide electronic language acquisition domain for learning and improving knowledge of users with at least the basic/passive noesis of Runyakitara language. The system centred on nominal morphology, morphological analyser was used to develop exercises for learning. The system focused on nouns and made use of natural language processing to create extensive lesson materials for prospective users of the system. Runyakitara Computer Assisted Language Learning was created as a screening tool for users, to test the users syntactic and semantic knowledge of the language, serve as access tool for learners and give relevant activity for learners.

The system accomplished its intended goal with large percentage of users showing continual interest in CALL. There is Computer Assisted Language Learning system which consists of comprehensive wordbook consisting of Root language (English) to Object language (Yoruba). The Language Assistance System identifies words separated by space which is converted to source text by lexical transfer and attaching appropriate part of speech. The acceptable structure was achieved by matching twenty-eight corresponding English Noun Phrase rules with corresponding Yoruba arrangement of the rule. Data fed into the

system (in English) is pre-processed and translated to corresponding data in Yoruba language. The input is checked for its correctness using existing information in the database.

A system with about 90 percent exactitude was produced and regarded as auspicious and satisfactory. The principles of Natural Language Processing and Digital Signal Processing was adopted to develop a CALL system. Natural Language Processing does the breakdown of sentences into syllables, which is the smallest unit of the sentence (vowel, consonant: nasal and non-nasal) by emphasizing on tones of the syllables. Digital Signal Processing consists of speech processing and sound processing. Speech processing checks for syllables corresponding to input block of text and combine together to form strings and then optimizing them. The sound processing (Speech signal) process the sound and make the pronunciation sound available. A web based Computer Assistance Language Learning on two languages was built, to translate from Yoruba phrases to English Language and contra wise. Poly-layer framework and Hidden Markov Model were employed. Using mathematical and word principle, Yoruba and English words were grouped into two exclusive sets. The set theory was used to determine acceptable structure, axiom of extension, for any two subsets from source and target languages to be equal there must be like components. The law of probability, Bayes' theorem, and Statistical design theory were used to increase the CALL system accuracy and produce result.

Yourba as a language

Yoruba(*Èdè Yorùbá*) is a language spoken in West Africa. The number of speakers of Yoruba is estimated between 30 and 40 million. It is a pluricentric language spoken principally in Nigeria and Benin, with communities in Sierra Leone, Liberia, other parts of Africa, the Americas, and Europe. The non-vernacular remains of the language in the Caribbean, Lucumi, is the liturgical language of the Santería religion of the region. Many Yoruba words are used in the Afro-Brazilian religion known as Candomblé. Yoruba language remnants are also used in many other Afro-American religions in the Americas and the Caribbean. Yoruba is most closely related to the Itsekiri language (spoken in the Niger Delta) and to Igala (spoken in centralkogi

Yoruba is classified among the Edekiri languages, which together with Itsekiri and the isolate Igala form the Yoruboid group of languages within the Volta–Niger branch of the Niger–Congo family. The linguistic unity of the Niger–Congo family dates to deep

prehistory, estimates ranging around 15,000 years ago (the end of the Upper Paleolithic). In present-day Nigeria, it is estimated that there are over 40 million Yoruba primary and secondary language speakers as well as several other millions of speakers outside Nigeria, making it the most widely spoken African language outside of the continent.

Yoruba language is a tonal language consisting of seven vowel sounds exclusive of nasal vowels and eighteen consonantsounds, making up 25 alphabets and 3 tonal signs (three level tones: high, low and mid (the default tone) to distinguish between words with the same spelling but different pronunciation and meaning. Every Yoruba syllable must have at least one tone. There is a continued decline in the number of "Yorubas" that can speak Yoruba language fluently and write it correctly with appropriate tonal signs. This is as a result of adoption of English Language (a colonial language) by parent as their children first language and the neglect of Yoruba from most Nigeria Educational system curricula. To prevent extinction of Nigeria's indigenous languages there have being persistent calls by various esteemed scholars and organisation to revive Nigeria indigenous languages,by adopting Indigenous languages as Children's first language and making Indigenous languages a compulsory course to be taken by students in all level of education.

Fafunwa A. B (1974). had carried out an experiment on this idea in two separate schools in Ile-Ife, Osun State. While pupils in one of the schools were taught in English, pupils in the other received lessons in Yoruba Language. The result of the experiment showed that pupils in the schools where Yoruba language (mother tongue of the pupils) was the medium of instruction came out with distinctions in Mathematics and Science subjects. Fafunwa argued that European and Japanese children learnt better because they were taught in their indigenous languages, and therefore recommended the same approach in Nigerian schools.

He reiterated that the use indigenous languages to teach Mathematics and Sciences at the primary and secondary school levels. He also cited the example of China and India, saying that the technological advancement in these countries grew fast because Mathematics and Science were taught in indigenous languages for us to build the country of our dreams; for us to make Nigeria a truly great nation, a nation that is able to feed and house its citizens, a nation with a stable currency, we must embrace science and technology…because no nation can become great without science and technology," he noted. Indeed, scholars have identified

advantages of using indigenous languages in the Nigerian education system, among which is the impact on the national culture. Since language is one of the most significant components of a nation's identity, it has been argued that teaching students in an indigenous language ensures that children can grow up to produce and enjoy great works in that language. Using indigenous languages, however, ensures that teachers can themselves be Nigerians, thus creating opportunities for stable and economically beneficial jobs for native Nigerians, which helps spur increased economic development.

Computer as a Machine

A computer is a machine that can be instructed to carry out sequencesof arithmeticor logical operations automatically via computer programming. Modern computers have the ability to follow generalized sets of operations, called *programs.* These programs enable computers to perform an extremely wide range of tasks. A "complete" computer including the hardware, the operating system (main software), and peripheral equipment required and used for "full" operation can be referred to as a computer system. This term may as well be used for a group of computers that are connected and work together, in particular a computer networkor computer cluster.

Computers are used as control systems for a wide variety of industrial and consumer devices. This includes simple special purpose devices like microwave ovens and remote controls, factory devices such as industrial robots and computer-aided design, and also general purpose devices like personal computersand mobile devices such as smartphones. The Internet is run on computers and it connects hundreds of millions of other computers and their users.

Early computers were only conceived as calculating devices. Since ancient times, simple manual devices like the abacus aided people in doing calculations. Early in the Industrial Revolution, some mechanical devices were built to automate long tedious tasks, such as guiding patterns for looms. More sophisticated electrical machines did specializeanalogy calculations in the early 20th century. The first digital electronic calculating machines were developed during World War II. The first semiconductor transistors in the late 1940s were followed by the silicon-based MOSFET (MOS transistor) and monolithic integrated circuit (IC) chip technologies in the late 1950s, leading to the

microprocessor and the microcomputer revolution in the 1970s. The speed, power and versatility of computers have been increasing dramatically ever since then, with MOS transistor counts increasing at a rapid pace (as predicted by Moore's law, leading to the Digital Revolution during the late 20th to early 21st centuries.

Conventionally, a modern computer consists of at least one processing element, typically a central processing unit (CPU) in the form of a metal-oxide-semiconductor (MOS) microprocessor, along with some type of computer memory, typically MOS semiconductor memory chips. The processing element carries out arithmetic and logical operations, and a sequencing and control unit can change the order of operations in response to stored information. Peripheral devices include input devices (keyboards, mice, joystick, etc.), output devices (monitor screens, printers, etc.), and input/output devices that perform both functions (e.g., the 2000s-era touchscreen). Peripheral devices allow information to be retrieved from an external source and they enable the result of operations to be saved and retrieved.

Uses of Computer to enhance Yoruba Language

The Uses of Computer is phenomenal and the indigenous language (Yoruba) is not left out. Computer Assisted language learning (CALL) for Yoruba is developed to help speakers of Yoruba language to speak correctly and fluently by applying the appropriate tone on words the pronounced. CALL is perceived as an approach to language teaching and learning in which the computer is used as an aid to the presentation, reinforcement and assessment of material to be learned, usually including a substantial interactive element

The computer is used to ameliorate users' knowledge of particular Language/languages. CALL has been continually adopted as medium of learning new languages or improving on old ones. Over the years CALL is used to incite language learners, provide comfortable access to learning material, testing of users' acquisition level and examining the relevance of call to Learning and Disseminating System (Checking if it has accomplished its functions and purpose).

The CALL system provided information which is expected to be responded to by system users. The system in turn process input and gives appropriate justification of input structure and meaning. To improve Flexibility of Computer Assisted Language Learning Interaction between system and users have being adopted, text, static and moving images and

audio are used for interactive Computer Assisted Learning Language System Environment. By adopting a practical iterative learning approach, this work focuses on improving users knowledge of yoruba tonal sign assigning, correct word pronunciation It also improvesYoruba language literacy by implementing a Computer Assisted Language Learning System that translates Yoruba text to speech, and allows users to check up the meaning of words and undertake test on Yoruba language literacy.

Previous studies have focused on CALL by identifying three historical phases of CALL and classified them according to underlying pedagogical and methodological approaches. The participation of the potential users of the system in CALL development cannot be side lined, which is "the active involvement of end-users, as non-professional developers, in a software development life cycle. The contribution of language learners tutoring system improves the effectiveness of the system design. The CALL system developers should be focused on getting right requirements and intelligibly transforming it to a standardised design.

Yoruba Phonemics

Yoruba language is a tonal language consisting of seven oral vowel sounds, five nasal vowels and eighteen consonant sounds and 3 tonal signs (three level tones: high, low and mid (the default tone) to distinguish between words with the same spelling but different pronunciation and meaning. Every Yoruba syllable must have at least one tone.

- Consonant Soundsb, d, f, g, gb, j, k, l, m, n, p, r, s, ṣ, t, u, w, y
- Vowel SoundsOral vowel: a e ẹ i o ọ u
- Nasal vowel: an ẹn in ọn un

SYSTEM MODEL

The framework of Yoruba Computer Assisted Language Learning (YorCALL), as shown in figure 1, presents the different components and their interactions. Sectionalized into three, the framework can be viewed as:

- Front end Interactive interface(YorCALL Interface)
- Modules (Palindrome, Class, Game, Learn & Dictionary) and

- Back end (YorCALL Database)

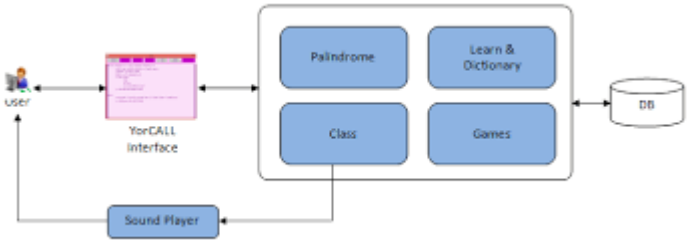


Figure 1: YorCALL Architectural Framework

The YorCALL interactive interface provides the user with an interface to enter any Yoruba text with the use of on-Screen keyboard or the provided buttons with Yoruba alphabets and sign. The Yor CALL Database mainly consist all the Yoruba syllable sounds as recorded by a Yoruba Language expert from Oyo town. The Learn & Dictionary modules provide the users with basic knowledge on the meaning of most common Yoruba words such as cardinal and ordinal numbers from one to ten and days of the week and months of the year as well as English words listed in alphabetical order from A-Z with information about them. It consists of 1000 English words and their equivalent in Yoruba language. Users are able to hear the corresponding pronunciation of the words. The Palindrome module responds to indicate whether any Yoruba word as entered by the user is/is not a palindrome.

- **Class Module**

The CLASS module provides principles of pronouncing words in Yoruba language and also provides guide on the principle of tonal signs and applications. It allows the user to write down words, check for validity and pronounce the word for the user.

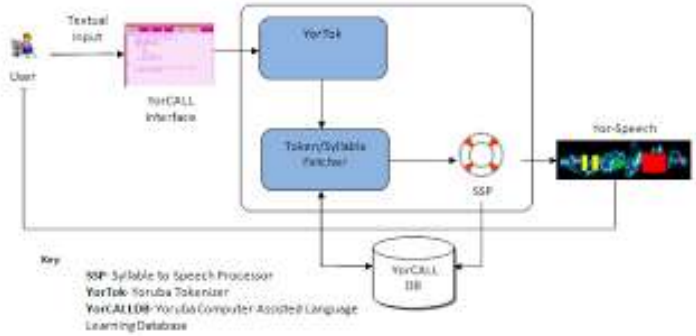


Figure 2: Model of the Class Module

As depicted in figure 2, YorCALL system's processes include:

a} breaking words into syllable

b) fetching the audio equivalent of syllable

c)stacking and concatenating sounds to produce a word sound Users. This can be in words for pronunciation by using the onscreen keyboard provided or use any keyboard that allows user to type Yoruba fonts. The words are broken down to syllable(s) and equivalent audio sound of the syllable is fetched and concatenated. After which a sound player box pops up and users are able to play the sound.

- **Tokenizer**

A syllable in Yoruba can either be a vowel sound, combination of vowel and consonant, or nasal sound. During the process of breaking words down to syllables, the tonal sounds assigned by the user is taken into consideration. Each word input by the user is scanned through, vowel letters are the main unitisused for tokenisation. The tokenization process is broadly divided in three phases, namely

:i. accept word

ii. scan from the left, check for vowel sounds

iii. anywhere there is a vowel sound break, and then add to syllable set until end of the word.

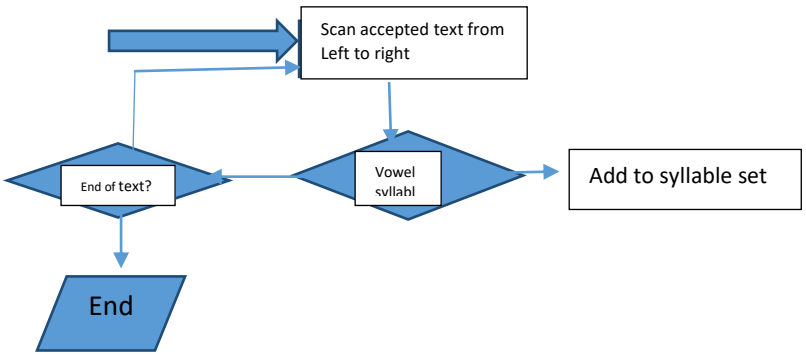


Figure 3: Flow Diagram of the tokenization process

For Illustration, if /d/ is to be combined with the vowel sounds; it will produce the following syllables as in table 1:

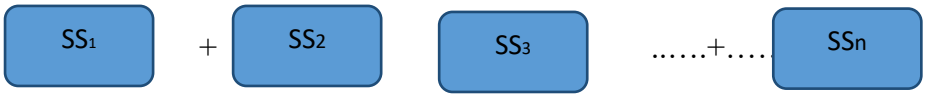
Consonant Sound	Vowel sounds	Syllables Produced
/d/	a e ẹ i o ọ u	da de de di do do du
	à è ẹ̀ ì ọ ò ù	da de de di do do du
	à è ẹ̀ ì ọ ò ù	da de de di do do du
	an ẹn in ọn un	dan den din don dun
	an ẹn in ọn un	dan den din don dun
	an ẹn in ọn un	dan den din don dun

- **Token/Syllable Fetcher**

Each of the vowel sounds was combined with each consonant and nasal sound to generate all possible syllable. These sounds to each syllable were recorded using audio recorder by a Yoruba language speaking expert. The recorded sounds were subsequently trimmed to eliminate noise and saved in the YorCALL DB with the file name they represent. The Token/syllable fetchers searches through for the coreesponding audio sound for each token for stacking and concatenation.

- **Syllable to Speech**

Processor. After successful process of tokenisation and equivalent audio sound of the syllables are fetched from the audio dataset, they are stacked in the order of their entry (from left to right) and concatenated, ready to be played by the sound player box. Users are able to view the breakdown of words pronounced to syllable and play the sound equivalent as often time as possible as shown in Figure 6.



SS represents Syllable Sound

System Class Diagram

YorCALL has five classes (Class, Palindrome, Dictionary, Learn, Games) which are subclasses of the Home. The Sound Player is a sub class of the Class with a modal dependency. As shown in Figure 4, each class has at least member methods with data member ranging from zero to six.

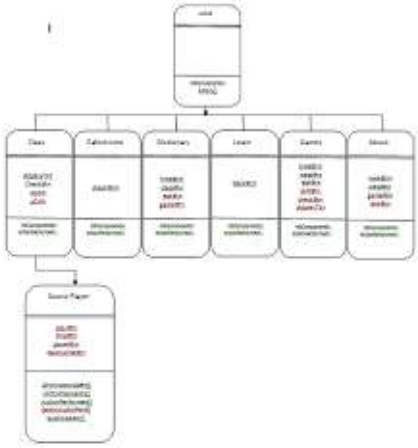


Figure 4: YorCALL Class Diagram

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SAMPLE SCREEN SHOTS OF YORCALL

The user enters a yoruba text with the customized keyboard provided as shown in Figure 2 which allows the entering of any Yoruba word. On clicking the 'check' button, the tokenize method is called and the inputted text is syllabized.

Figure 5. The Text input Screen

Figure 6 The Sound Screen

PERFORMANCEMEASURE BY YORUBA SPEAKERS

Three category of users (amateur speakers, average Yoruba speakers, above average speakers) yielded the following summarized responses as observed below

Figure 7: YorCALL Performance Measure by Amateur Yoruba Speakers

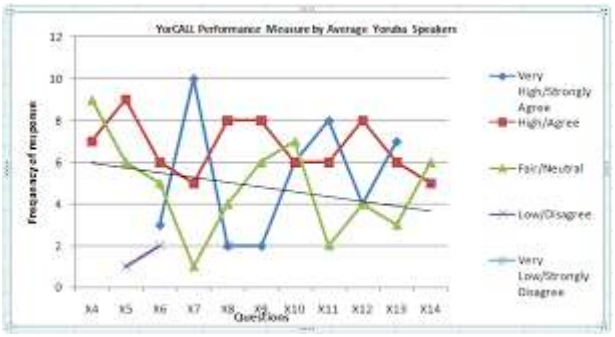

Figure 8: YorCALL Performance Measure by Average Yoruba Speakers

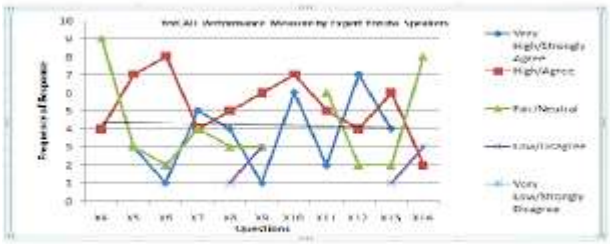

Figure 9: YorCALL Performance Measure by Expert Yoruba Speakers

Figure 9: YorCALL Performance Measure by Expert Yoruba Speakers

The responses of the three categories of users /Yoruba speakers (amateur, average and expert) as shown in Figures 7,8 and 9, reveal, at both extremes, about 75%acceptability and usability of the system but only 20%voted for it to be used by the visually challenged persons. Based on the feedback inX7,X8, X10, about 80% agreed that the naturalness of the system produced sound was like that of Yoruba natural speaker. 70% of the respondents agreed that the system can be used to not only improve the language tonal sign assigning but also the language literacy

CONCLUSION

Through the use of Computer, this study has presented a CALL system for Yoruba language with the main objective of providing a digital learning environment that introduce Yoruba language to new learner or improve amateur's knowledge, especially in the area of correct word pronunciation and right sign assigning. The use of personal Computer (PC) will enable learners to practice at his or her own time and place.

RECOMMENDATION

Future research should be done to expand the number of words in the dictionary and improve on present functionalities of the system such as development of game whereby the system pronounces. Yoruba words randomly and the user provides the textual equivalence, considering the tone, where by the user input is validated. In conclusion we believe the system can be further scaled to include other threatened languages and taught in various levels of Institutions of learning.

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