Implementation Mobile App for Foreign Language Acquisition Based on Structural Visual Method

Imad Tahini[1], and Alex Dadykin[2]
[1,2] Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus
[1*]imad.tahini@live.com
[2]alex_05_07@rambler.ru

Abstract. Among all modern communication devices, mobile phones are the most powerful means of communication even richer than email or chat, as it can act as a teaching device despite its technical limitations. Therefore, we need to create a fast and efficient automated system that allow increased interest of students to learn foreign language, which provides the cognitive activity of students, stimulates and develops cognitive processes: thinking, perception, memory. With such a system, the learner controls the learning process and progress in his own space based on his cognitive state and learners can speak the target language without effort and psychological barriers. The Purpose of the research is to create interactive speech trainer system based on a structural and visual approach, will ensure the formation of stable foreign language skills of trainees on the background of the active use of visual representation of language and interactive speech technology, this system use a technique for applying the visual Approach and structural-visual method in the educational environment by transforming grammatical information from verbal to graphic form and replacing complex text rules with appropriate visual structures in the form of pictures, schemes and diagrams. We present our steps to implement our proposed architecture based on a visual model as a platform in mobile application with the establishment of content management system to provide the process of controlling the formation of speech skills and allowing the transition from foreign language learning to its improvement and acceleration. We also describe the ideas that will guide the design of this system.

Keywords: Structural visual method; Learning management system; Learning content management system.

1 Introduction

The modern world of rapidly developing and instantly gaining mass distribution of mobile network technologies is fundamentally changing the whole paradigm of education. Today, the school, university and the system of additional education cannot be limited to transferring to students a certain set of knowledge and skills

that very quickly become obsolete and lose their practical value. To be successful, a modern person of any age needs to constantly develop in a professional and personal plan (which determines the essence of the concept of lifelong education) [1], using the most affordable and effective educational and information technologies.

As demonstrated by studying existing prototypes, at present there are no programs that allow you to prevent thinking in your own language and ensure that you quickly acquire direct thinking skills in another language. The use of structural visual method (SVM) in teaching helps to implement new generation of learning management system (LMS) to provide individualization and differentiation acquisition language which allows to understand the meaning of perceived or produced constructions of foreign language without reliance on the native language. Implementing this LMS for learning foreign languages with the help of mobile programs aroused great interest among students.

Thus, using SVM, as well as other visual tools developed within the framework of the Visual approach, it is possible to significantly simplify the process of obtaining skills in using basic grammatical constructions, as well as to be able to measure and control the learning process at each particular point in the learning or retraining curve.

This visual approach is used in the development of Learning Management System (LMS) in mobile application, It will help to provide both management of the process of obtaining skills, and the possibility of gamification, socialization and cooperation for translating the educational process into a modern intensive and effective format using the latest developments in the IT sphere and various areas of pedagogy and psychology.This LMS reduces psychological barriers and increases motivation for classes and independent training, as well as reduces the burden on teachers and allows you to automate routine processes.

This article is organized as follows: the next section discusses the related work, where the visual model and Learning Content Management System (LCMS) were selected to be integrated into the proposed system in order to profile learners; the structure of the proposed adaptive system is discussed in section 3; section 4 describes the method of working the LCMS; section 5 describes the method of working the mobile application; section 6 describes the method of processing data from LCMS to Mobile application; and the conclusion is discussed in the last section.

2 Related Work

A new generation of systems to create language skills for mastering a foreign language for adults using the proposed SVM [2], which is based on scientific theories from different branches of knowledge to facilitate learning in a more efficient way and to provide personalized learning.

The research work [2] presents a visual approach to general scientific theories and pedagogical principles aimed to improve the structure of activity and ensuring a uniform terminology in the development of complex scientific and educational projects. Brief examples clearly demonstrating features and benefits of the visual approach. This approach has been applied to a variety of scientific theories. The greatest practical importance is a set of models of the structure of English language and its implications for foreign language learning by adults.

In the work [3] is aimed to create a formal model of a limited part of the language and the meanings described by it, in order to use it in a subsystem for measuring the rate of change of a skill and managing this process.

In the work [4] two new very promising methods were analyzed and possible ways of their further research, improvement, integration and automation were identified and directed to the association of two these methods, the methods are the Visual-Auditory Shadowing (VAS) method [5] and the Structural-Visual Method (SVM).

In the work [6] was developed the generalized structure of a new generation learning management system with the display the development of the main components of LMS that carried out in interrelated steps and show information - contact form and management of the educational process to set the concept of building the visual models as an interface using modern technology.

In the work [7] was developed a prototype system and display the implementation of visual approach as application-based technologies into the educational environment, this prototype is the result of the detailed analysis and result models for visual learning, the construction of this prototype is based on web-based development programming with the implement the first step to build the content management system to store the data for lesson in database.

The learning algorithm for the principles of constructing English sentences for different times [2] as shown in Figure 1, persons and for different types of sentences is as follows:

First, the logic of describing the various stages of the same action (event) is analyzed in the native language and these meanings are linked to the color code and move the meanings into the intermediate sign system in the form of the visual objects.

Then the students get acquainted with the forms of the verb of the language being studied and associate visual coding elements and a color code with them.

At the next step, they learn to describe the situation in the target language, using not the terms, rules or tables as the basis for their speech activity, but the SVM.

This solution allows you to transfer the planning of the utterance and control over its correctness from the speech fields of the left hemisphere of the brain into the visual fields of the right hemisphere, thus freeing up the speech zone for free speaking. Perception has its internal structure, according to the works of [8] and [9], with memory and with the limbic system responsible for motivation and emotion. The perception cycle is completed by returning the signal to the primary projection zone, which creates the image of the perceived object.

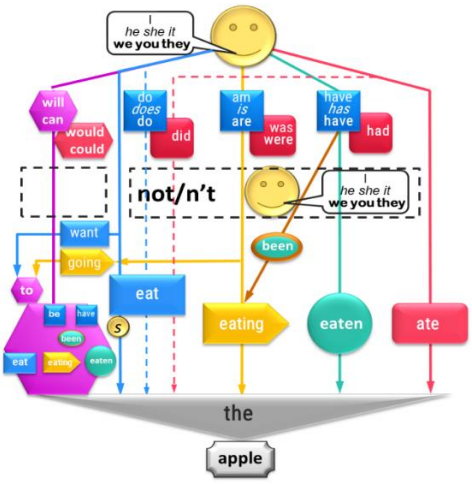

Fig. 1. Full model for all active levels.

3 Proposed Approach

Several models have been worked on to implement this project [7], and among these models is the model for creating a mobile application. In this paper we will show how to implement and build this project and the construction of the components will be discussed and explained.

Building an effective simulation model on the mobile phone required creativity skills in terms of technology and construction. Therefore, work was done on the technical side of the application in a technical manner and experience to achieve.

The working is done on developing this system, as shown in Figure 2, Which contains educational content, storage techniques, content management process and using mobile to display the lesson in different forms (lesson map, pictures, sound and voice recognition). special language mobile applications can speed up and improve the process of learning English. They also help to develop stable language patterns, communication skills, and the rules of English grammar.

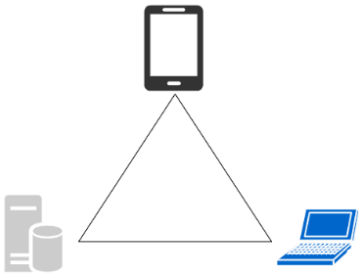

Fig. 2. Architecture of whole system

The main contributions of this paper are:

- Working with the real-time voice processing and voice recognition that provide user inputs and system outputs to reach a correct pronunciation;
- We present an android interface for specifically designed to support building such design for "Language-Map" (Map for construction a sentence (SVM));
- The effectiveness of this approach by conducting a several prototypes of "Map" developed using the proposed android API requiring well-timed inputs and outputs in real-time;
- The components for this system are run using LCMS in Desktop and Android platforms to display visual interactive learning to accelerate learning for learner interaction provided via voice and recognition processing and view the action images;

4 Learning Content Management System (LCMS)

Recently, a new class of systems has been developing [10] that implement the management of educational content (Learning Content Management System, LCMS). LCMS is designed for managing data content on mobile application (adding, deleting, editing content), in our developments provide functions for administering existing data resources (changing the structure of a Lesson, parameters), and can also be a tool for developing new Lesson resources. With the help of this system, the owner can independently manage the content of his resource without resorting to the services of developers.

4.1 From Big Data to Simplified Parameters

The current programs for learning languages available in the market depend on traditional methods of teaching, to manage educational content on the current method of teaching the English language and methods of storing it requires a lot of time to coordinate and divide lessons and increase infinite sentences, and these lessons differ from one program to another so that you do not find limited content from the educational material, The current sentences of any many language require a lot of time to be memorized and displayed in the correct teaching method, and this requires a large space to be stored and displayed in the desired manner. The traditional designs of language programs increased information and efforts to produce a database containing the required sentences for each lesson. Currently, and through our research and continuous work to change the method of teaching and show a new style of education based on colors and linguistic maps, the teaching effort has been reduced from expanding unintended lessons into limited sentences and dividing them into a scientific way, and this will accelerate education and transform the educational content that depends on fully stored sentences to a hashed word and saved in the database so that it will be compiled as sentences while the program is running.

Any change of any word in a sentence in the current educational programs that exist in market leads to the creation of a new sentence and an increase in the information in the database, wasting time by entering the sentences and corrected and revised for each lesson individually. So, our supposed design leads to the reduction of the method of memorizing the information in the database for a particular lesson as parameters to be formulated in front end use of system.

4.2 Discrete Parameters

Any process in reality is infinitely complex and has an infinite number of parameters and connections with other processes [3], it is impossible to control a system with an infinite number of parameters.
In addition, the use of scientific terminology greatly complicates the process and reduces motivation. And the use of the verbal description of the language (in the form of rules) to control the planning, execution and control of language activity prevents this activity, since it uses the same physiological mechanisms and mental processes. This has been repeatedly emphasized by leading psychologists and linguists [11], [12], [13].
We propose to change the direction to natural and fix not the formal side of the language, but the events, phenomena and facts that it describes.
As we need to hold the grammatical and set the forms 8 (subjects) x 4 (grammatical change of model) x 7 (change of forms) = 224 variants of constructions for describing a single-type event.
To extend the many types of events to different verbs into number of N verbs, then the grammatical set forms as N x 224 for describing a N-type events where the number of verbs will depend on describing the field of lesson.
So, the we will describe the parameters of the grammatical sentences as discrete parameters words to be used to present the complete event.
The method of processing the lesson in the proposed approach depends on the withdrawal of words from the database to reconfigure the sentence during use the lesson, this means we need only to store the words and types and link these words for a particular lesson and when requesting the presentation of the lesson by the user, the program uses a function to formulate the sentence as required programming for educational maps as seen in Figure 3 and the mathematical formula will be discussed in section 6.

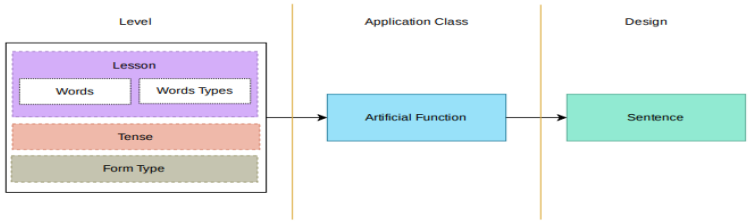

Fig. 3. Method of compose the sentence from parameters.

4.3 Block Diagram

The working of LCMS will be explained by describing the block diagram and algorithmic description as seen Figure 4:

a. User Login to a system: The system will begin from user login; the system checks if the login does not exist then the user creates one and then login;
b. User (Add, Update, Delete) the Words: User has authority to enter information about subject, verb and Objects and upload their represented images and User can modify and delete the information;
c. User (Add, Update, Delete) a Lesson: User has authority to enter information about Lesson, and upload the represented images and User can modify and delete the lesson;
d. User (Add, Update, Delete) the Words to a Lesson: The Lesson can be completed by add the words to it, User can add/Delete these words to a lesson;
e. User (Add, Update, Delete) the Lesson to a Selected Level: The Level is a set of lessons, User can Add/Delete these Lessons to a Level;
f. User (Add, Update, Delete) the Form Types to a Selected Level: The Role of the parameter of Form type is to change the Form of Sentence (+,-,+?,-?,Do, What, Who) , this can be added to Level by user to set the change of model of the map for target sentence.

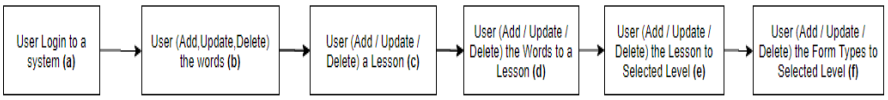

Fig. 4. Block Diagram of LCMS

4.4 Design Overall

The program is designed using windows base techniques as seen in Figure 5 and the program is divided into screens to enter the information about Levels and Lessons to be displayed on the mobile application.
The entry of information was previously reviewed on Block Diagram, and the split screens will be displayed in the figure below.

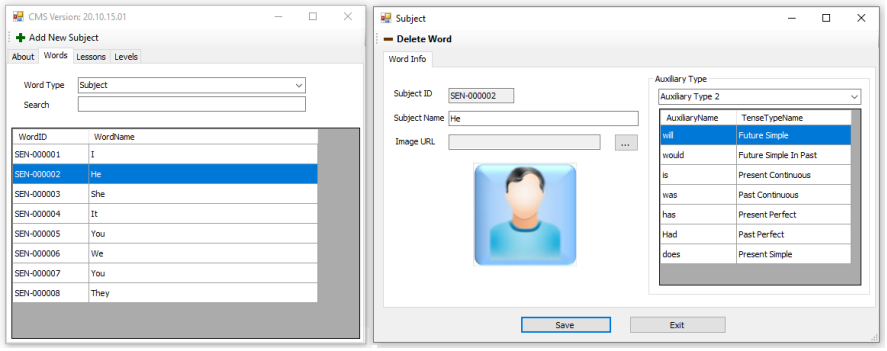

Fig. 5. Interfaces of LCMS

It should include the following key components:

1) Repository of educational objects. The Learning Objects Repository is the central database that stores and manages learning content for the ways for the efficient retrieval of information from multimedia data storage [15], [16].
2) Display interface: To present educational objects in accordance with the training profile, for preliminary testing or in accordance for lesson contents, an interface for displaying materials is required. This component also provides the tools to control by the information, and various options for editing and creation from users. In addition, controls and design elements can be localized for the required SVM.
3) Administration tools. This application is used to manage student accounts, launch courses from the catalog, track progress, report learning progress, and other simple administrative functions. This information can be passed to an LMS designed to provide more advanced administrative functionality.

5 Mobil Application

5.1 Block Diagram

The working of program will be explained by describing the block diagram as seen Figure 6 and Algorithmic description:

a. User Login to a system: First of all, the start use of the system will begin from user login, the system checks if the login does not exist then the user creates one and then login.
b. System displays a set of levels: After that the system gets the levels from database and display them on screen.
c. User Select a Level: User can choose any level to go to new next step of training.
d. System displays a set of lessons for selected Level: The system gets the Lessons from database and display them on screen and display form types for lessons.

e. User Select a Lesson: User can scroll the screen and choose any lesson.
f. System Display Form Types for a Lesson: System gets set of form types (+, -, +?, -? , Do, who , what) for a lesson , each form type display the form of construction for sentence.
g. User Select Form Type: User can choose the form type from a set of options {+, -, +? ,-? , Do, who , what).
h. System Display a Type of Lesson: System set a popup and display a group of options: - Training Model, - Voice Recognition Map Model, - Voice Recognition Visual Model.
i. User Select a Type of Lesson: User Choose an option from: - Training Model, - Voice Recognition Map Model, - Voice Recognition Visual Model, to enter the Lesson content.
j. Training Model: This Model contains a map to construct a sentence and option to control this map to change the construction of a sentence, go to next sentence, return to previous sentence, change type of tense, change form type, text to speech, option to change (Subject, Verb, Object).
k. Voice Recognition - Map Model: This Model contains a map that represent the construction of a sentence and voice recognition button to change speech to text and option to text to speech, and tools to control the change of form of a sentence.
l. Voice Recognition - Visual Model: This Model contains the images that represent the sentence and voice recognition button to change speech to text and option to text to speech.
m. User Interact with a Lesson: User use the chosen model under the displayed controls.
n. System Save a Result: System save a result in a database after interact with lesson.
o. Action to End the Program or Continue: if the user wants to stop the system then he can go to (p) else user can go to (A) or (B).

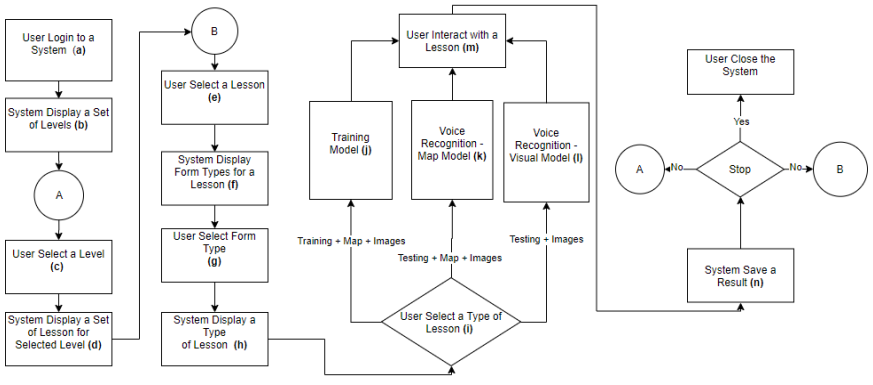

Fig. 6 Block Diagram of working the system

5.2 Design Overall

This program contains multiple levels and lessons, for each level has several lessons. Here we will review how to use the program and divide the program into several interlinked screens so that it facilitates the user's access to the screen and the level to do a training for formation language skills.
Among the screens reviewed there is a screen has a group of form types which represent a set of patterns, each pattern has a role to determine the method of build sentence that belong to selected lesson, and when choosing one from the set of patterns, the system will switch to a specific screen and focus on maps that represent sentence and then the user have ability to easily understand how to build the sentence , The screens as seen in Figure 7 are divided into several maps and each map will represent the sentence for particular tense as follows:

- From Type (+) it will display the screen for constructed sentence as he will eat the apple.
- From Type (-) it will display the screen for constructed sentence as he will not eat the apple.
- From Type (+?) it will display the screen for constructed sentence as will he eat the apple? That has a postive answer.
- From Type (-?) it will display the screen for constructed sentence as will he eat the apple? That has a negative answer.
- From Type (who) it will display the screen for constructed sentence as who will eat the apple?.
- From Type (what) it will display the screen for constructed sentence as what will he eat?.
- From Type (do) it will display the screen for constructed sentence as what will he do?.

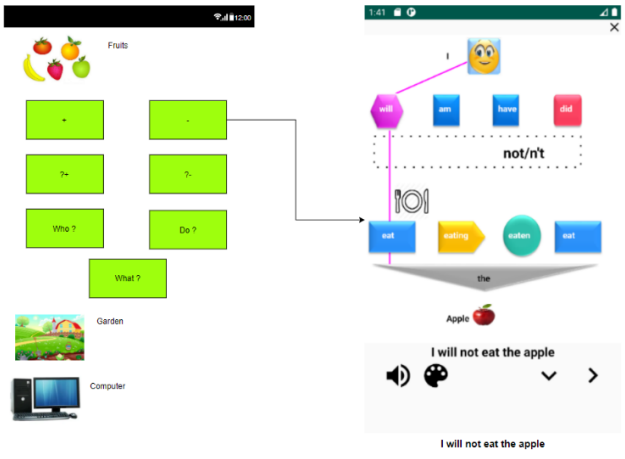

Fig. 7. Interfaces the method of different forms for construction of sentences

The screen in Figure 8 is used to change the lexical words and the grammatical form of sentence. When entering to training screen a number of options will appear that allow the user to build sentences by practicing in tools of building sentences and change the (subject, verb, object, tense), when pressing the subject and object the screen will replaced by another new screen, this screen has a set of images about (subjects and objects) that play a role to change the parameters of subject and object during the building a new target sentence ,same as when user do a touch on verb then system will get set of images about verbs to select the verb to build a new sentence , and any pressing on the button that represent the left arrow the new sentence will move to a next sentence with different tense and when pressing the button that represent the down arrow, the new sentence will move to a new sentence with different subject, When pressing a black button we get a pop up of group tenses to change to a new sentence that have a different tense , and image of voice to allow the system to speak the sentence.

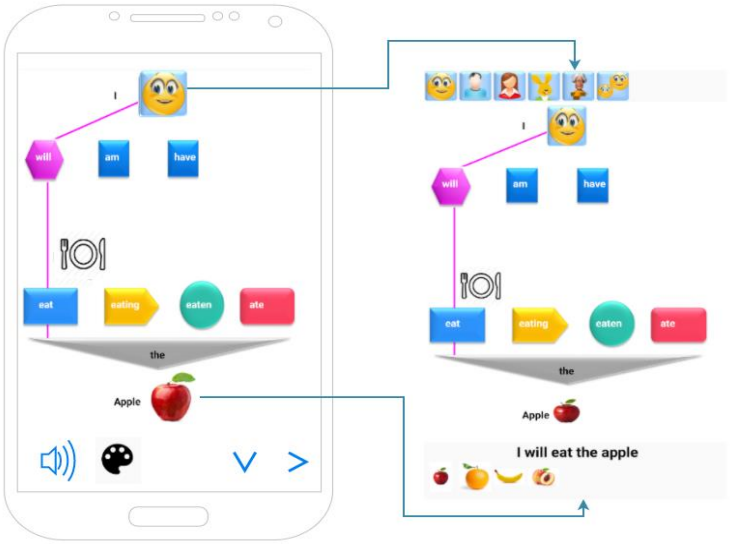

Fig. 8. Lesson interface and key controls for interaction with contents

5.3 The Method of Implementing the Platform with Voice and Speech Recognition System

To adapt the speech recognition system in android system as seen in Figure 9: We suggest a mechanism to facilitate interaction between the user and the platform through an interface that uses voice recognition.

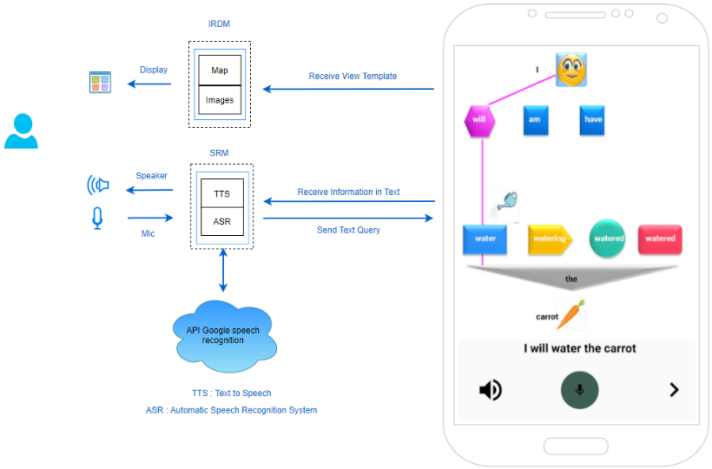

Fig. 9. Adapt the speech recognition and voice with android system

Information Request and Display Module (IRDM): In this module the images that represent the action of sentence are displayed as action image and map, and this module allows the user to control by the options of program through the Mobile screen. Once information is processed, the requested are shown to the user as data lesson.

Speech Recognition Module (SRM): This module allows to the learner to interact in our Platform by using voice. For instance, the system returns the information to the SRM in order to be converted to speech using TTS (Text-to-Speech). The user speaks for information in the microphone and such consult is converted to text in the Automatic Speech Recognition System (ASR) [17] system. In android application the java functions check from this input data if it is correct to the displayed text at IRDM. We will focus specifically in API Google for (ASR) Service because it is a cloud computing system and does not compromise the performance of the Mobile.

6 Principles of Formulating Sentences for the Lesson

Artificial function in the programming of mobile application uses the mathematical formula to construct the sentence as follows:

The one dimensions of arrays for subject and Object and multidimensional arrays for Auxiliary and Verb are the discrete values to formulate data lesson that belong to selected level (l) that contains tenses (t) and form Types (f). Let S[i], i ϵ {0, 1,…, s} is the array for subjects in lesson, O[k], kϵ {0, 1,…, o} is the array for Objects in lesson, let A[s][4] is the multidimensional arrays as matrix for Auxiliary with row subjects and column length for tenses.

$$\begin{bmatrix} A_{01} & A_{02} & A_{03} & A_{04} \\ A_{11} & A_{12} & A_{13} & A_{14} \\ . & . & . & . \\ . & . & . & . \\ A_{s1} & A_{s2} & A_{s3} & A_{s4} \end{bmatrix} = (A_{s4}\,)$$

And V[b][4] is the multidimensional arrays as Matrix for Verbs with row Verbs and Column length for tenses.

$$\begin{bmatrix} V_{01} & V_{02} & V_{03} & V_{04} \\ V_{11} & V_{12} & V_{13} & V_{14} \\ . & . & . & . \\ . & . & . & . \\ V_{b1} & V_{b2} & V_{b3} & V_{b4} \end{bmatrix} = (V_{b4}\,)$$

Set the Mathematical Model in the form.

$$r(i,j,k,t,f) = \begin{cases} S_i + A_{it} + V_{jt} + L + O_k, & f = 1 \\ S_i + N + A_{it} + V_{jt} + L + O_k, & f = 2 \\ A_{it} + S_i + V_{jt} + L + O_k, & f = 3, f = 4 \\ Q_{f-5} + A_{it} + V_{jt} + L + O_k, & f = 5 \\ Q_{f-5} + A_{it} + S_i + V_{jt}, & f = 6\,, f = 7 \end{cases}$$

$$w(i,j,k,t,f) = \begin{cases} Y + S_i + A_{it}, & f = 3 \\ E + S_i + A_{it} + N, & f = 4 \\ S_i + A_{it} + V_{jt} + L + O_k, & f = 5 \\ L + O_k, & f = 6\,, f = 7 \end{cases}$$

Where $0 \le i < s, 0 \le j < b, 0 \le k < o, 0 \le t < 4$, *s=length of array subjects, b = length of row dimension of multi array verbs, o= length of array objects, t the index of change for the grammatical change*.

The main task is to create the sentence from a set of variable parameters, it is interesting the guidance of the coordinate parameters r(i ,j , k ,t , f) to formulate a set of sentences or questions and w(i ,j , k ,t , f) to formulate the answer which are referring to input variables conditions of form type that represented by (f) where f is the index of changes of array of different forms {+,-,+?,-?, Who, Do, what} , for example the index of '-' is f=2, and the variable L belong to set of values of articles , L ϵ {'a' ,'an' ,'the'} ,and the array variable of interrogative Q[f-5] has set of array values ϵ {+?,-?, Who, Do, what } depends to condition of variation of index f.

Example:

Set a Lesson of two subjects = {'I', 'He'}, Two verbs = {eat, Buy}, Two Objects = {'Apple', 'Banana'} and this lesson belong to Level has form types = {+, -, +?, Who},

So, the Matrix values for Auxiliary

$$\begin{bmatrix} will & am & have \\ will & is & has \end{bmatrix} = (A_{s4}\,)$$

And Matrix values for verbs

$$\begin{bmatrix} eat & eating & eaten & ate \\ buy & buying & bought & bought \end{bmatrix} = (V_{j4})$$

Then, the results of formulated sentence due the model function where the artificial function at mobile application API provides the input index are listed in Figure 10.

Change if Index The providers of input index to the steps.	**Discrete Values** Values, resources required to perform the processes.	**Function** The steps to perform to transform the inputs into outputs, providing value to function r(i,j,k,t,f).	**Output Sentence** The sentence to be produced from the steps.
f=1, t=0, i=0 , j=0 , k=0	S[0]="I" , A[0][0] ="will" , O[0]="Apple" , L= 'The' ,V[0][0]='eat'	S[i] + A[i][t] + V[j][t] + L + O[j]	I will eat the Apple
f=2, t=1, i=1 , j=0 , k=1	S[1]="He" , A[1][1] ="is" , O[1]="Banana" , L='The', V[0][1]='eating' , N= 'not'	S[i] + A[i][t] +N+ V[j][t] + L +O[j]	He is not eating the banana
f=4, t=2, i=1 , j=0 , k=0	S[1]="He" , A[1][2] ="has" , O[1]="Apple" , L='The',V[0][2]='eaten'	A[i][t] + S[i] + V[j][t] + L +O[k] + '?'	Has he eaten the apple ?
f=5, t=1, i=1 , j=0 , k=1	S[1]="He" , A[1][1] ="is" , O[1]="Banana" , L='The',V[0][2]='eating' , Q[0]='who'	Q[f-5] + A[i][t] + V[j][t] + L + O[k] +?'	Who is eating the apple ?

Fig. 10. Applied values to formulate the sentences

7 Conclusion

In this paper we presented an on-going work to create the first type of method learning language towards use SVM to represent visual language which help to produce the structure to compose the sentence and give each element from the sentence the visual design with color encode. We showed our steps to implement the proposed architecture with describing the ideas about the design of this system as mobile platform. We also described the step of working system.

The novelties in this program are considering to display the method of creating LCMS to get simplified storage and accelerate the creation of data lessons that depends on parameters then using algorithm by mobile platform to compose the sentences of lessons.

The proposed architecture has the advantage of allowing the integration of new methods to improve system management with minimal effort. Pronunciation training using the technique helps not only to bring your pronunciation closer to the level of native speakers, but to perceive and understand the language by ear. Thanks to the methodology, almost all the disadvantages of traditional language

teaching are eliminated - the time of language acquisition is reduced several times, while the results are significantly improved. this will help you can gain the ability to communicate freely with native speakers and eliminate at the same time for disfigured pronunciation and for a slow response.

Currently, the Mobile app has already been created and successfully operating, interactive simulators for primary and secondary levels of education have been developed. Encouraging results were obtained regarding the accuracy of speech recognition in english language increased to 95%.

Experimental testing of teaching materials, trial simulators and elements of the proposed approach on a limited group of students showed interesting results, close to those obtained in other developments of rapid learning methods according to [18]. There was a decrease in the time spent on learning to perform a specific action without errors by 3-30 times and an increase in the success of training from 10-25% to 80-95%.

The future incorporation is to work on updating and developing this program while conducting experiments to reach an integrated program for teaching all foreign languages.

References

1. Wilson, E.O.: On Human Nature. Harvard University Press. 1978
2. Dadykin, A.K., Dibrova, V.A., Tahini, I.H.:The Visual Approach in Educational Projects. In: International Journal of Social Science and Humanity. Vol. 7, No. 6, June 2017, pp. 373-377
3. Tahini I.H., Dadykin A.K, Dibrova V.A.:The Model of Change as the Basis of the Knowledge Structure in the Next Generation E-LMS, 10th annual International Conference of Education. Research and Innovation, 2017, Seville, Spain (ISBN: 978-84-697-6957-7 / ISSN: 2340-1095, doi: 10.21125/ 10.21125/iceri.2017.1325). – Pages: 5022-5032
4. Tahini I., Nakayama, T., Dibrova, V., and Dadykin, A.:Cognitive Psychology Models and Approaches to Develop Language Skills. 5th International Conference on Education and Psychological Sciences (ICEPS 2018), Seoul, South Korea, January 27-29, 2018, International Journal of Information and Education Technology (IJIET, ISSN: 2010-3689, DOI: 10.18178/IJIET)
5. Nakayama, T.: Efficacy of Visual-Auditory Shadowing Method in SLA Based on Language Processing Models in Cognitive Psychology. Tokyo: Kaitakusha, 2017, 110 p
6. Tahini, I.H., Dadykin, A.K.:A study of new techniques for learning management system to accelerate language acquisition using structural visual models. 2018 Sixth International Conference on Digital Information, Networking, and Wireless Communications.IEEE. Beirut. 2018. pp. 92-97.doi: 10.1109/DINWC.2018.8357002
7. Tahini, I.H., Dadykin, A.K.:Proposed System of New Generation LMS Using Visual Models to Accelerate Language Acquisition. Advances in Science, Technology and Engineering Systems Journal, Vol. 3, No. 5, October 2018, pp. 277-287
8. Ivanitsky, A.M.:Brain Science on the Way to Solving the Problem of Consciousness. Herald of the Russian Academy of Sciences. 2010, Vol. 80, No. 3, pp. 229-236

9. Edelman, G.M. :Wider than the Sky: The Phenomenal Gift of Consciousness. Yale Univ. Press, ISBN 0-300-10229-1, 2004
10. Yakushin, A.:Analysis of technologies and management systems for e-learning. M. Dialectics. 2008;p. 78
11. Zhinkin, N.:About code transitions in internal speech. Questions of linguistics, No. 6, pp. 26-38, 1964
12. Krashen, S.D.:Principles and Practice in Second Language Acquisition.University of Southern California, p.202
13. Leontiev, A.N.:Activities. Consciousness. Personality. Moscow, 1975
14. Anggraini, N., Kurniawan, A., Wardhani L., Hakiem, N.:Speech Recognition Application for the Speech Impaired using the Android-based Google Cloud Speech API. TELKOMNIKA, Vol.16, No.6, December 2018, pp.2733~2739 ISSN: 1693-6930
15. Vijayakumar, T., Vinothkanna, R.:Retrieval of complex images using visual saliency guided cognitive classification. J Innov Image Process (JIIP) 2, no. 02 (2020): 102-109
16. Sayantan, D., Ayan Banerjee, A.:Highly Precise Modified Blue Whale Method Framed by Blending Bat and Local Search Algorithm for the Optimality of Image Fusion Algorithm. Journal of Soft Computing Paradigm (JSCP) 2, no. 04 (2020): 195-208
17. Jing, L.:Industrial Mobile Application Design and Development. Uppsala Universitet, 2013
18. Galperin, P.Y.:Psychology of thinking and teaching about the gradual formation of mental actions. Research in the thinking of Soviet psychology. Moscow, 1966