Software for Creating Tutorials and Examinations on Natural Languages

Polina Dolmatova

Institution: Applied Mathematics and Informatics department, American University of Central Asia, 7/6 Aaly Tokombaev Street, 720060, Bishkek, Kyrgyz Republic
Telephone: +996312915000 (+426)
Fax: +996312915028
Hand phone: +996555241450
*Corresponding author E-mail: dolmatova_p@auca.kg

Abstract

Currently, philologists often use various software in studying and testing foreign languages. This work presents the software for creating tutorials and exams by philologists independently from software developers. To cover various features of natural languages and involve more abilities of users, such tutorials and exams contain randomly generated tasks of different types. Both questions and answers of the tasks can be text, graphic, sound, or combined. This software implements the algorithmic programming language for creating randomly generated (parameterized) tasks. The paper describes the objects, the syntax, and the procedure for generating random tasks in this programming language. The developed software is tested and used in secondary and higher educational institutions.

Keywords: algorithmic programming language, complex examination, natural language, parameterized question, randomly generated task.

1. Introduction

Nowadays, computer equipment is widely used in studying foreign languages and testing of language proficiency. There are various software packages for learning languages. However, majority of such approaches use methods of studying the language with the help of an intermediary language (most often, a native language for a person). Existing software for language proficiency testing (TOEFL, IELTS, recently developed KyrgyzTest) do not completely involve possibilities brought by up-to-date computers: tasks are unvaried; most are textual, based on multiple choice.

We decided to develop software for creating tutorials and exams with following options:

1. Tutorials and exams contain randomly generated tasks of all types (textual, graphic, audio, or combined) with properly generated responses (textual, actions with graphic objects, voice, or their combinations).
2. Philologists can develop their own tutorials and exams independently from software developer.
3. User-learner and user-examinee can give a text respond, a voice respond, and a respond in the form of actions (parallel transfer, rotation, and other transformations) with graphical objects on the screen.

2. Preceding Works

Asher (1966) proposed the method of studying the language Total Physical Response (TPR). The essence of this method is the following. A person who studies the language should understand new words and react to them in a corresponding way without translation into a language known to him. However, Choo (2006) mentioned in his review of Live Action English Interactive – TPR on a computer that this technique did not appear earlier in the study of languages using computer programs.

Kashy et al. (1993) suggested using personalized assignments while conducting learning and testing on computers.

Pankov (1992) proposed to study languages by means of various “actions” with objects on the screen without any other intermediate language. This is as follows: computer demonstrates the word and the corresponding actions to the user; the same word and the corresponding initial situation appear; the user needs to perform the action (with the cursor); the computer checks the correctness of the action performed by the user.

If the set of situations is fixed, then the user can form a connection of a certain concept, not only with the word being studied, but also with other words present in the corresponding commands. Therefore, situations (tasks) should be generated randomly, that is, when the program is restarted, other, but similar, situations should appear (Pankov, 1996).

To improve the efficiency of testing, Pankov and Janalieva (1995) formulated the following principles of complex examination:

- generativity (a complete task must not exist before the testing and must be randomly generated just before it);
- uniqueness (all examinees must obtain different versions of tasks);
- full confidence (if the testing is official and is conducted by a computer program (generating tasks) then nobody must know answers before the end of testing).

Pankov and Alimbay (2005) presented the software for interactive learning of natural language. However, each new concept and every scene had to be programmed anew that made this software dependent on the developer.

Kustova and Paducheva (1994) suggested mathematical definition of the elementary movements using the only example. Using this definition, Pankov and Dolmatova (2008) proposed a draft of
3. Algorithmic Programming Language TaskLang

We developed the software “Language Education System” (LES) for creating tutorials and complex examinations on natural languages. Philologists can use LES to compose tutorials and exams independently from developers of LES. Since not all philologists know the programming languages, a special algorithmic language has been developed; the author of the tutorial or exam can quickly learn it and create tasks using it. We call the developed language TaskLang. Programming in TaskLang consists of (Pankov & Dolmatova, 2009):
- defining primary objects;
- forming extended objects;
- composing random tasks;
- forming of examination.

All this we do in the interpreter of TaskLang – “Language Education System” (LES). User can write a set of instructions in TaskLang (TaskLang program) in special editor. Each program execution generates a new random task.

There are two types of objects: primary and extended (set of homogeneous primary objects). A primary object is a string. This string can identify various types of information: text, graphics, and sound. If an extended object is used, then a primary object is substituted (randomly) from the corresponding set. If we use an extended object in the task several times, it takes the same value.

You can query the second value of the same object, and then it takes the same value. In case of a random graphic task, the textual response is a special function that displays an invitation to enter a text.

Function describing the word-formation algorithm

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<tr>
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<th>Syntax</th>
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<tr>
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<tr>
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</table>

4. Procedure for generating an extended task

First, the TaskLang program is loaded from a binary file. Then an instance of the Parser class is created, and the text of the TaskLang program is transferred to it. Next, the TaskLang interpreter parses the program text. In the parser, a TaskLang expression is analyzed (Figure 1). First, we enter the random number table with a seed offset. Then an instance of the ParserEnvironment class is created. It declares lng, answer, and default variables. Then the ParseLanguage subroutine is called, where ParserEnvironment is passed as a parameter. After that, the current position of the cursor in the Listing TaskLang program is checked. If it is less than the length of Listing, an error message is displayed in Listing. If not, then the randomly generated task text, the correct answer, and the default value for the input field are output. Consider the ParseLanguage subroutine (Figure 1). The value of the Escaped flag is set, indicating whether the next character of the TaskLang text will be screened. Further, in the cycle, the program performs a symbol-by-symbol processing and the ready TaskLang text of the random task is returned.
The subroutine `ParseExpression` extracts from the TaskLang program expressions containing special constructs and functions in TaskLang, processes them and returns the result in the form of text, which will be further included in the corresponding section of the TaskLang task (Figures 2, 3).
5. Language Education System

Applications in Language Education System have a modular structure. Each module is an isolated part of the set of task types that are required in order to develop a tutorial or complex exam application. The editor, the tutorial, and the tester use a common module factory in their work, which provides access to the modules using the IEditor, ITutorial, and ITester interfaces, respectively (Figure 4). This library uses two main modules - a module of textual tasks (a random text generator) and a module of graphic tasks (a scene generator), accessed through the IBolt interface. The module of textual tasks uses the implementation of the TaskLang interpreter, and the graphic tasks module, in turn, uses the implementation of the TaskLang interpreter with support for graphical functions that are located in the namespaces RandomTextGenerator and SceneGenerator, respectively.
To process collision, we used Box2D engine in order to enhance user experience with scenes. For graphical output, we used OpenGL library.

Figure 4. Language Education System components

There are three types of LES users: a philologist (as teacher or examiner), a learner and an examinee. The philologist has the opportunity to compose his/her own tutorial or exam (Figure 5), that is: to give the name of the tutorial or exam; set parameters such as wrong answer reactions in tutorial and time limits of the exam; create a task of some type; to compile a task tree from these tasks. The philologist also recruits learners or examinees and monitors the results of exam by viewing the report and submitting the final examination score. The learner can study language by completing the tasks. The examinee can take the language exam by completing the tasks, and get acquainted with the results of the exam after it is completed.
6. Conclusion

The software “Language Education System” combines the following ideas:
- development of randomly generated tasks of all types (textual, graphic, audio) with properly generated responds (textual, actions with graphic objects, voice) in tutorials and exams;
- possibility for using total physical response approach in tutorials;
- easy-to-use for philologists for designing their original tutorials and exams independently from LES developers.

State Language Department of Kyrgyz Republic recommended using LES in educational institutions. LES was used for developing complex exam on Kyrgyz language that was demonstrated in a number of universities, schools and the Institute of Theoretical and Applied Mathematics of the National Academy of Sciences of Kyrgyz Republic. Version 1.1 of LES that was developed within the framework of the projects of the National Academy of Sciences of Kyrgyz Republic is available on http://math.aknet.kg/library/programms.html. Philologists in American University of Central Asia for developing tests and exams on Kyrgyz language use LES.

Special module for Moodle was developed; this module allows creating tasks on TaskLang in Moodle. Tasks in TaskLang in Moodle can be used not only for language courses but also for any other academic course.

References


