COLLECTING KNOWLEDGE AND LEARNING LANGUAGES WITH TOWERS OF KNOWLEDGE GAME

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Abstract: The article treats the problem of deriving and accumulating knowledge and data about people's everyday real-world knowledge as a background for the process of learning languages through games. The development of a game and the introduction of a virtual agent–assistant into the game are supposed to increase the interest among the users, to stimulate their motivation for language practice, and, at the same time, to increase the quantity and the quality of accumulated knowledge. The results from a survey, conducted among users, have been analyzed and generalized in this paper.

1 INTRODUCTION

There are three big common real-world knowledge bases: Cyc (Douglas B. Lenat 1995), Open Mind Common Sense (OMCS) (Henry Lieberman, Dustin A Smith, Alea Teeters, 2007), (Push Singh. 2001) and Thought Treasure (Mueller, E.T. 1998). Cyc is the biggest of the three, having more than 3 million entries about the world, followed by OMCS, containing nearly half a million of collected sentences. Thought Treasure comprises about 100 000 concepts and relations. There are smaller real-world knowledge bases, for example, in Bulgarian language. The use of data from the knowledge bases OMCS and Gethi (L.Dakovski, D. Budakova, 2003) is convenient, as the collected sentences there (OMCS in English and Geti – in Bulgarian) are presented in the form of knowledge and are, to some extent, easy for processing and analyzing at morphological and syntactic level. The common real-world knowledge is presented in OMCS in the form of sentences in English, reduced to about 20 models of various sentences, expressing different relations between the concepts. In Gethi simple sentence models and models at concept level are supported.

There are web-based games that aim, on the one hand, to derive knowledge, and, on the other hand, to provide entertainment to their users. For example Peek-aboom (Luis von Ahn, Ruoran Liu, and Manuel Blum.) – a game designed for segmentation of objects in pictures; Verbosity (Luis von Ahn, Mihir Kedia, and Manuel Blum) – a game for collecting commonsense real-world knowledge; and Gathi (L.Dakovski, D. Budakova, O. Obretenov, V. Georgiev) – Gathering Information – game for Gathering Descriptions, Analogues and Associations via Internet aimed at forming Rational Behavior.

The article treats the problem of deriving and collecting knowledge and data about people's everyday real-world knowledge (objects, events, analogies and associations) as a background for the process of learning foreign languages through games.

The aim, on the one hand, is to create a system, attracting the users both because of being useful for their development and because of being fun. On the other hand, what is aimed as well is the capability of the system to collect knowledge inconspicuously (without the explicit awareness of the users). Thus collecting data is not the users' purpose but a result (side effect) from their language learning activities realized through the system.

In order to achieve this goal the models, supported by the system are built simultaneously in a number of working natural languages. It is

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assumed that such a system would be of interest to users, learning one of the working languages and being familiar or speaking either one or two of the other languages. While playing, the users of the system learn and develop their linguistic skills, and the system collects knowledge and data in the background.

The introduction of a game together with the participation of an IVA in the role of an emotional assistant is expected to increase the users' interest towards the programming system, to facilitate the process of language learning, to keep their attention live for a longer time and to lead to accumulating a bigger quantity and a better quality of knowledge. In order to check these expectations, three versions of the programming system are offered.

The first version suggests forms, containing a question aimed at collecting a particular type of knowledge and they need an answer.

The second option includes a game, which stimulate either giving answers to questions or executing the tasks from the first version.

The third option is the same game combined with emotional assistance by the Microsoft intelligent virtual agent Peedy.

The results from a survey, conducted among users of the system, have been analyzed and generalized further in this paper.

2 STRUCTURE OF THE SYSTEM

The Figure 1 contains 16 basic forms. More of them allows collecting specific knowledge, e.g., collecting associations with two notions, two activities or a combination of a notion and an activity; collecting descriptions of notions etc. Some of the forms allow building a hierarchy of knowledge. For example, the forms, related to forming questions and answering questions of the type "What do you need to …." allow building a hierarchy of goals by means of transforming each answer into a new goal and then asking the same question for the new goal. The forms, related to comparing notions and activities are also addressed to building a hierarchy, depending on the comparative criteria, chosen by the user, such as "better", "bigger", "more useful" "more difficult" etc. The forms, related to describing notions allow building hierarchies of the type "something is" and "something consists of", i.e, hierarchies of categories and sub-categories.

Other forms allow collecting assessments of both notions and activities. Some of the assessments are emotional, need-related or rational. Others represent

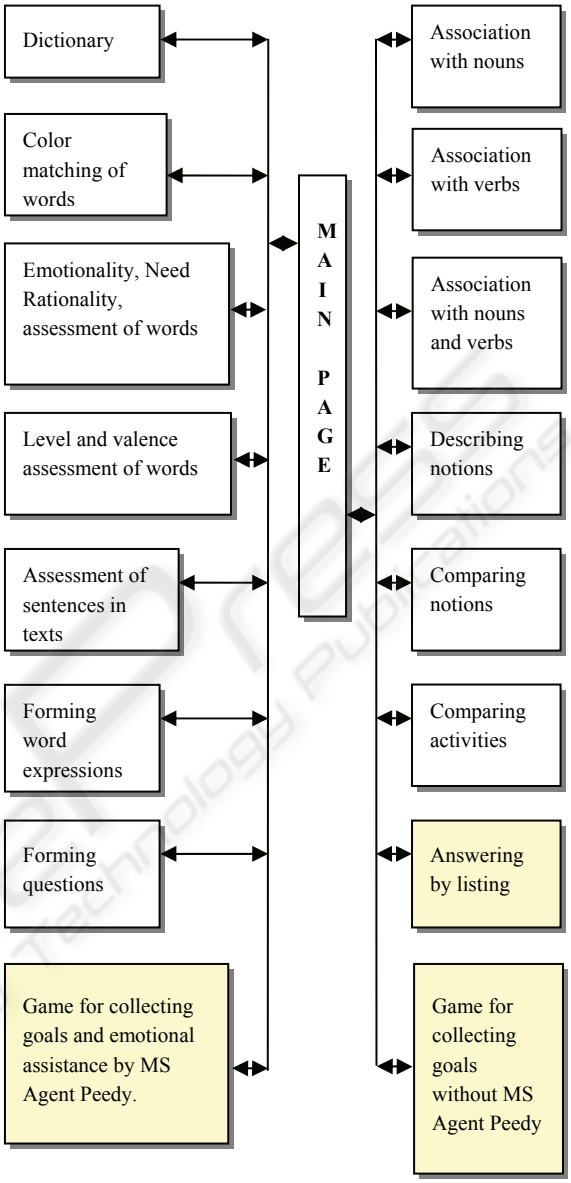

Figure 1: Structure of the programming system.

the valence of a notion (positive, negative or neutral), its level of functioning (e.g. a rude or insulting notion, a jargon, a frequently/rarely used spoken notion, a poetic one, or a term), and the particular view-point for giving the assessment (the observer's, the doer's or the affected person's view-point).

The form, offering a choice for colour matching allows the user to form a particular, "his/her own" colour match to each notion by simply dragging the mouse to a colour field, thus receiving automatically the corresponding RGB code. The users are also offered a list of colour samples and the names and

RGB codes of the most commonly used standardized colours on the web to choose the most appropriate in their opinion for the notion to be evaluated.

The form for vocabulary learning is the only one, not intended to allow collecting knowledge. The user here is shown a word given in two of the working languages by random and is supposed to enter the word in the third language. After a correct answer he/she is shown a funny picture as a reward, and he scores points in addition; after a wrong answer, respectively, he/she can see the correct word displayed together with an appropriate caricature and no points are scored. The words are accompanied by suitable pictures and sound files, illustrating the right pronunciation in each of the working languages.

The last two forms contain two versions of a game aimed at collecting hierarchies of goals related to the real world. These options will be considered in details in the further sections of this paper. The users' opinion will be studied according to different criteria.

Almost all of the forms offer the Microsoft Agent Peedy, capable of pronouncing every text or word in English. The Microsoft® Agent is a set of programmable software services that supports the presentation of interactive animated characters within the Microsoft Windows® interface.

For the realization of the program system the environment Visual Studio .NET 2005 is used, as well as the programming languages C# and JavaScript, and the Microsoft Agent character Peedy. The data bases are accomplished in MS Access. We have been developing our system by adding new options and possibilities and you can find it on: www.expertimental.net.

3 THE GAME

In order to collect a big quantity of correct knowledge and to become popular, a programming system should be useful for the users, i.e. it should be funny, interactive, it should contain a competitive element, not be very complicated, not detract the user from the main goal, be pleasant, encourage the user to enter newer and newer knowledge in the three languages, and stimulate the correct knowledge introduction.

For achieving these goals a game is realized, which could be used for collecting hierarchies of knowledge, e.g. - in the form, collecting hierarchies of goals by answering the question "What do you need to….", or in the form, collecting knowledge according to different criteria for comparing by filling in the notions to be compared. For example: A is bigger than B; B is bigger than C; C is bigger than D, etc.

The idea is to have at least two players or two teams with one or more players, i.e., two participants in the game. Questions or criteria for comparison are randomly given to them. The participants from the two teams take turns and the system monitors the process of taking turns. When the users from the first team give their answer, the second team has to approve it and vice versa. There are two special buttons - for each of the teams - for the approval of the answers. Only after being approved, an answer is saved in the database and the user receives reward points. The points are visualized in the form of three balloons appearing on the screen and moving at random speed in various directions. The users can only claim their points after they pop the balloons by clicking the mouse on each of them. The balloons disappear and the updated number of points for the corresponding team is visualized. This is a short dynamic element within the game, requiring quickness and aiming at psychological relaxation of the user.

The second team is in turn after that. The team turns are predefined by the program through enabling or disabling the approval buttons for each team. If the game continues this way only, then the teams would gather the same amount of points. However, while a team is in turn, it can decide to "build a tower". When "a tower" is announced, each of the approved answers becomes the next question for the team, giving it. In "a tower" mode the teams do not take turns and the reward points are five, not three as they are in the case with no tower announced (ticked). The aim is to build the highest possible towers of goals. When a team is not able to continue building the tower, the tick is removed from the tower check-box and the other team is in turn.

The reward points are used to open a picture, which is cut into 64 pieces and originally hidden. Each of the teams opens its own picture. Five points are needed to open just one of the 64 pieces of the hidden image. Thus for opening the whole picture 320 points are required.

Both teams can use their points to open parts from their hidden picture at each moment of the game. Depending on the team in turn, points from its score will be taken off and pieces from its picture will be opened. Thus each team can click on the pieces, already opened by the other team, respectively. As a result, the game can continue for a

very long time and the teams can compete with each other all the time until one of the pictures is revealed. The winner is the team, which completely opens its picture first. The shortest game is when a team collects the 320 points needed to open their picture entirely.

A further addition to the game will be to make a piece already opened by one of the players worth more points for the other player to open.

The advantage of the game is that it is easy and encourages introducing knowledge due to receiving reward points by answering questions and approving answers. A way of validating knowledge is thus suggested by the requirement for receiving approval from the enemy team. As the two teams compete with each other, they would not allow introducing nonsense. The game evokes curiosity from the users to see what the hidden image is. There is a competitive element – which team will open their picture first. There is a bit of dynamics and relaxation while receiving points when a player has to click on the balloons, flying randomly (chaotically) on the screen.

4 THE EXPERIMENT

The aim is to check if the users like the programming system and to find out which option is considered to be the most appropriate. 25 users were asked to test the system. They were offered three versions of the developed program for collecting goals by answering the question "What do you need to…". The users were supposed to evaluate the versions by the following criteria: entertainment, interactivity, intelligence, and adoption, as shown in Figure 2.

The three versions of the programming system will be further denoted shortly as it follows:

1. questions-answers; - a version in which the users directly answer questions, written in a database beforehand.

2. game without MS Peedy; - this is the game, described above, without the MS parrot Peedy.

3. game with MS Peedy; - the same game but this time Peedy participates actively by prompting the next move, giving advice on the way to become a winner, calculating the number of points up to a moment, showing curiosity about the hidden picture, announcing the reward points, being happy with each of the caught balloons, compassioning the players in case of a difficult question etc.

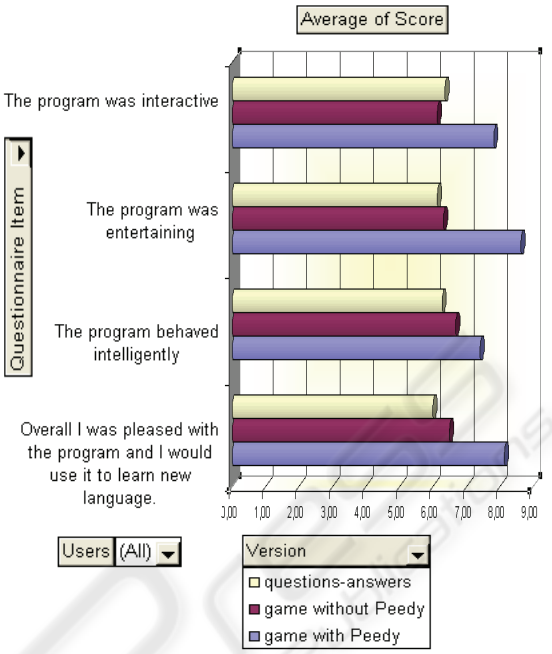

Figure 2: Experimental results.

The three versions of the programming system were to be evaluated according to each of the criteria by the numbers from 1 to 10.

Figure 2 illustrates the results from the conducted experiment. The results show that the most interesting and preferred option is the program with the intelligent virtual agent (IVA) Peedy.

It was surprising that the biggest part of the users, who tested the program, gave equal number of points to the three options of the program according to the criterion of intelligence, i.e., they consider that the introduction of the IVA does not contribute to the intelligence of the system. It was unexpected, that there are users, who do not like the IVA at all; they say that the virtual agents are irritating and prefer turning them off. Another unexpected result is that the first option of the program – the one with direct questions and answers received a higher appraisal than expected and many users shared that if they wanted to study a language, they had better concentrate on their language practice only and avoid any other elements.

5 CONCLUSIONS

The article illustrates some initial results of the carried-out survey among users, who worked with a knowledge accumulating system as a background process to learning foreign languages. The

introduction of a game and the presence of an intelligent virtual agent (IVA) within the game acting as an emotional assistant increase to a certain extent the users' interest in the system and keep them involved for a longer period of time.

Evaluation has been given of three versions of the program system.

The first version suggests forms, containing a question aimed at collecting a particular type of knowledge and they need an answer.

The second option includes a game, which stimulate giving answers to questions from the first version.

The third option is the same game combined with emotional assistance by the Microsoft intelligent virtual agent Peedy.

The experiment shows that there are different types of users, with different preferences, understanding and priorities. They are classified here conditionally and absolutely subjectively as ambitious, emotional, and demanding-conventional.

The ambitious users are the ones who just want to study without distractions and without playing games. Sometimes, just for a break, they are inclined to pass into the category of the emotional users and play for a while, but definitely with the Peedy version of the game.

The emotional users are those, who prefer to play and learn with the help and in the company of the MS Agent Peedy. These are the more communicative and happy users.

The third category of users is the group of the demanding traditionalists. On the one hand they are accustomed to the standard text interfaces and prefer them. On the other hand, the ease of communication with the new user interfaces somewhat frightens them. Therefore they tend to move to the category of the so-called here ambitious users.

It was therefore decided to support the three versions of the system – direct question-answers; game without an IVA and game with an IVA.

It is expected that with accumulating more knowledge about the world we know and with building a more complicated behavioral system for an IVA, the users will appreciate their intelligence.

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