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# SECTION I

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# ADAPTATION OF INTERACTION WITH CHATTERBOTS FOR USE IN THE EDUCATION OF CHILDREN

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**ABSTRACT**

One mean of obtaining information on the Web, which complements or replaces other forms of access, is with the use of Chatterbots. To use this technology, several factors must be considered in its development, especially when oriented at children, such as choice of technology, design and assemble knowledge in a database, with the help of many professionals of different areas to understand and adapt the system. In this work, we emphasized the development of a Virtual Learning Companion, calling Buti, to provide information of healthy lifestyle for children and preteens, which have similar cognitive development, but are differently from adults. Initially, the system's interaction was created taking in consideration the existing systems, which have a passive characteristic, centering the interaction from the user to the system. From tests carried through the help of psychologist and taking in consideration the relation with the concepts of the human development defended by theoreticians of the education area, we verified the necessity of adjustments in the system's interaction for this public. Complementary to this modification, the use of Affective Computing was made; applying personality and emotion, in order to obtain a better relationship between system and user.

**KEYWORDS**

Interaction; Interface; Chatterbot; Children; Lifestyle.

## 1. INTRODUCTION

The information and communication technologies create new possibilities for use in various areas, with education being a potential opportunity to work with researches that benefit learning. The communication promotes interaction between people, establishing a reflection that leads to production of information and knowledge. This action can be automated by artificial intelligence applications such as chatterbots, dialogue systems or conversational agents, which, in the educational context, can be used as Virtual Learning Companions.

The learning passes for transformations, since they are associates with cultural and technological aspects that evolve for diverse ways. Educational software and the virtual environments appear as possibility to promote the processes of learning related with concepts or pedagogical theories.

They are new spaces that are created and reorganized, dynamic and interactive that must provide communication with more efficiency. The learning processes are base of research for the progress of aspects that must be incorporated the new educational technologies. The internal and external factors of an individual, the cognitive phases of human development, processes and different capacities influence in the learning.

Some worries in the production of educational systems for children are in the suitability considering the age group of users; as the systems need to follow human development to be incorporated in daily life (Kenski, 2008).

In this context, we carried out the construction of a Virtual Learning Companion, called Buti, to interact with children about nutrition and physical activities. Initial tests of the system demonstrated that children did

not perform more than three interactions without the aid of psychologists. In that case, this work shows a change in the user interaction with Chatterbots, allowing possibility a more efficient use of this system.

This article is organized into the following sections: section 2 discusses an insight into the Chatterbots and section 3 shows analysis of the interaction of children with Buti.

## 2. TRADITIONAL USER INTERACTION WITH CHATTERBOTS

Turing Test devised a way of evaluating machine intelligence that consists in a dialogue where a human judge have to find out if is talking to a person or a machine. This desire to provide natural language communication between people and machines started to become reality with ELIZA (Weizenbaum, 1966), the first system that simulated a conversation, in natural language, with wide distribution.

From there, it opened up the possibility of developing "machine dialogues" or "chatterbot" for various applications. On the Internet, chatterbots can be found in chat rooms, in online stores to help consumers, tutors in distance learning systems, FAQ's, web search, etc. However, when a dialogue is conducted only by textual means, one can miss important aspects of speech, allowing for the meaning of the message to be misinterpreted (Jaimes and Sebe, 2007).

Observing systems like Eliza[1] and ALICE[2] (Figure 1), which are based on a principle of the Imitation Game (Turing Test), we found that the beginning of the chat is different. The first system tries to communicate with a user to know if it needs some help, while the second is the user who initiates the conversation, despite a request for initial identification.

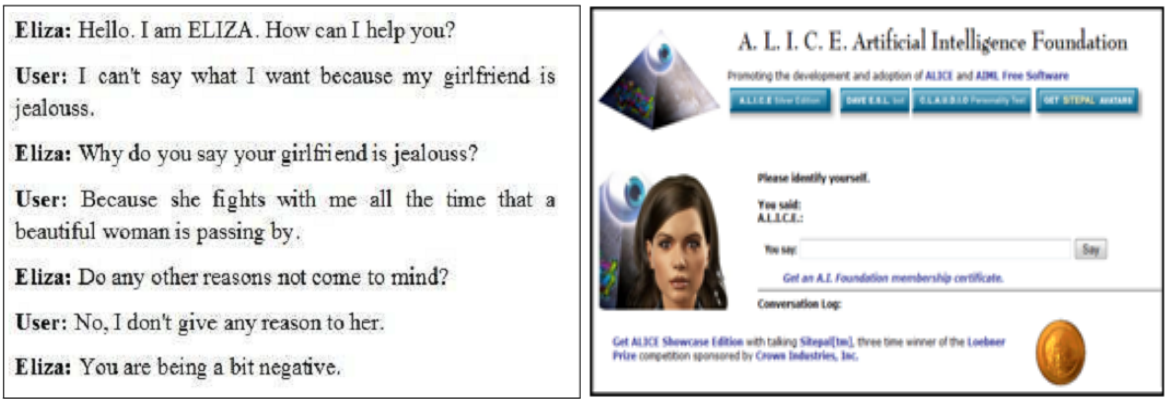


Figure 1. Interaction with the Chatterbots ELIZA (Left) and ALICE (Rigth).

## 3. BUTI –VIRTUAL LEARNING COMPANION

There are several educational projects and development of technologies to be used to support education with the idea that they can improve, or breaking geographical barriers or social and stimulate learning. The virtual learning environments are software that was developed predicting the interaction between people and objects of knowledge, elaborate productions and socialize with the user and personalized learning (Kenski, 2008).

Chatterbots used for education are called Virtual Learning Companion (VLC), which can be integrated into a Virtual Learning Environment. This kind of integration provides an environment more attractive and dynamic to the student.

Buti, the chatterbot created, was developed in the context of the research project "Building a Virtual Learning Companion Program for the Promotion of Cardiovascular Health in Childhood and Adolescence" (CVA-PSCV). This virtual companion goal is to monitor the treatment of cardiovascular problems and

[1] http://nlp-addiction.com/eliza/
[2] http://alice.pandorabots.com/

encourage children and adolescents to think about their eating habits and sedentary lifestyle. The target audience for Buti is children aged 7 to 10 years.

## 3.1 Development

The development team of the project was formed by professionals and students from cardiology, psychology, nutrition, physical education and computer science, which accompanied the various stages of the process. The construction of the virtual learning companion was based on two technologies: a markup language, called iAIML, created to support the control of the dialogues overall structure (providing more natural dialogues), treatment of unknown sentences and to improve fluency and coherence of the dialogue by choosing appropriate responses; and the use of Affective Computing (Piccard, 1997) with the computational model of emotion OCC (Ortony, 1988) in conjunction with the Big Five personality model for synthetic actors (McCrae, 1998). The design of Buti is related to the emotions that can lead to more interactions between user and system (Figure 2).

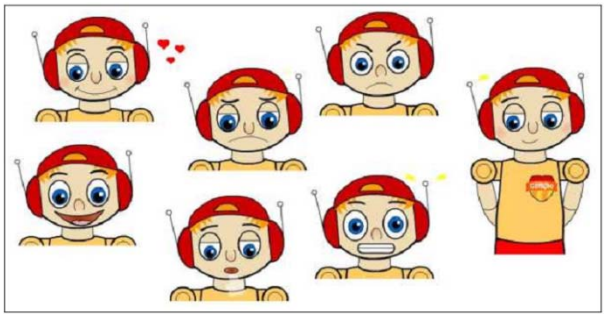

Figure 2. Expressions of Buti's Emotions, Like Love, Sadness, Angry, Fear.

Figure 3 shows the general architecture of our chatterbot with Affective Computing, with its modules and data flow during the processing of a sentence from the user. This architecture meets all the characteristics listed above.

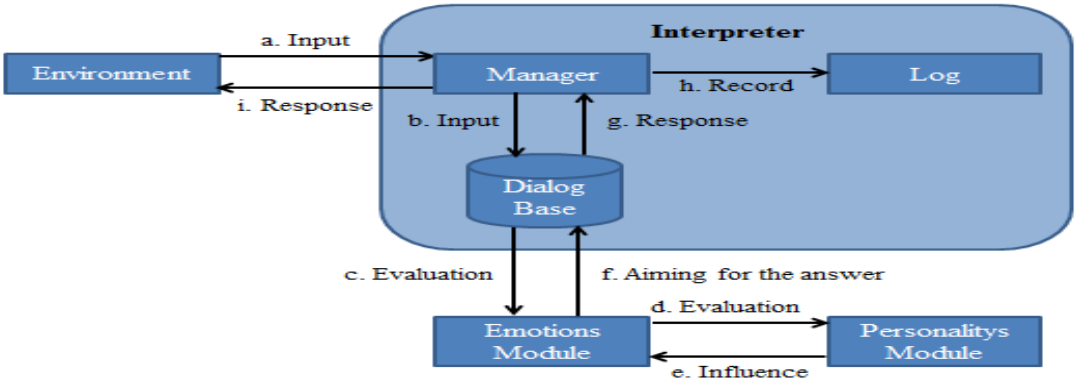


Figure 3. Architecture Chatterbots with Affective Computing

First, the user enters his sentence input (Fig. 3a). A manager component of the interpreter receives this sentence, and starts the process of pattern matching with the entries in the component "Dialog Base" (Fig. 3b). If the entry presents a characteristic (intention) that generates an emotion, the "Dialog Base" makes a call to the "Emotions module" (Fig. 3c).

The Emotions module, in turn, verifies the variation of intensity of emotion and requests information about the influence of personality on emotion present (Fig. 3d) and returns another emotion or only a variation of emotion intensity (Fig. 3e).

The Emotions Module performs the processing of emotion to be expressed, and directs the response to selection on the basis of dialogues (Fig. 3f). When you find the answer according to the emotion, the basis of

dialogues sends it to the manager (Fig. 3g), records the whole process in a log (Fig. 3h.) and sends the response to the user (Fig. 3i).

## 3.2 Interaction with Children

Human development, as expressed by theorists, has changes in phases or periods that interfere with children's learning, due to the cognitive maturity, such as: relationship with the outside world; cultural, historical and instrumental interference; mental capacity. And thus, it becomes necessary to adapt the learning system considering psycho pedagogical references.

After conducting a survey of Chatterbots applications (as explained above), it was observed that, for the most part, the conversation was directed by the user. In this context, the first prototype created (Figure 4) maintained the central characteristic of the interaction by the user


Figure 4. Initial Prototype Interaction with Centered in Child.

This initial test was conducted with three children. After initiating the dialogue, no more than three interactions were made without the help of psychologists, who accompanied the entire process. These psychologists verify that children felt intimidated by conducting the dialogue. With these results, it was observed the necessity of adapt the interface of the virtual learning companion to permit a longer interaction with children.

After the experience, interaction and structure of the system was adapted (Figure 5). In this version, the chatterbot begins to conduct the dialog. In addition, links have been incorporated with representative figures of the possible topics of conversation, since children overvalue graphics components and are driven by curiosity (Lobstein, 2006).


Figure 5. Changes in the Interaction with the System.

With these changes and from the analysis of the systems logs, it was observed that children, could converse about all the topics on the project context in which they were based (sports, heart and power, etc.), having an average of 15 interactions during 20 minutes, that is five times more interactions compared with the initial tests.

## 4. CONCLUSION

The collaboration of psychologists was paramount at all stages of project definition, due to its theoretical and practical experience in the area, and promotes an intensification of the motivation, learning, interaction, and in the use of technology to promote education effectively and efficiently.

The adequacy of the interaction arises because the children are in the process of human development, particularly with respect to language, reflection and logic. The changes produced good results compared with the traditional use of chatterbot for this public.

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