

INTELLIGENT OPEN CHALLENGES SYSTEM: A POSSIBILITY OF ADAPTATION OF PIAGET CLINICAL METHOD IN MULTI-AGENTS SYSTEMS

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ABSTRACT

The Intelligent Open Challenges System - IOCS is an intelligent system adapted from theoretical contexts of the Piaget Clinical Method, on approach development in th Laboratory of Studies in Language, Interaction and Cognition – LELIC/UFRGS and the Intelligent Systems Laboratory – LSI/UFMA. As functional feature is to simulate the role of Experimenter and be a Learning Object, when it is reutilized by other platforms. Built by three main parts: the System, the User and the Strategic Agent, linking the system to the user. This system has as a proposal to work the learning by means of challenge applications constituted by logical-mathematics tests of conception constructed according to Piaget exams, found in the “Reflective Abstraction” theory, which concerns to recognize and to register, the user reasons to face and understand the solution found, beyond to make all cognitive process in the sequence, to be visible, al well as the interaction of the agents with the user, that is a support possibility for the teacher to continue his work in informatics environment.

KEYWORDS

Piaget’s Clinical Method, Cognitive stages, Open Challenges, Multi-agents Systems, Strategic Agent

1. INTRODUCTION

According to Neal (2004), the last trends of the E-learning point towards the educational communities for the beginning of the educational objects use to think, to learn and to know, to emphasize the individual differences to be rediscover. Nowadays in the actual scientific context, the Clinical Method developed by Jean Piaget (1971) purpose analyze deeper mechanisms of the children mind in a specific problem resolution, observing their cognitive development and an understanding possibility of the logical implied in the problem. With the purpose to adapt an Intelligent System, established in the approach Multi-agents Systems (MAS), inside of the theoretical context of the standards Piaget’s Clinical Method, which is in construction of the

Intelligent Open Challenges System – IOCS (Bastos Filho, 2005), in development for Laboratory of Studies in Language, Interaction and Cognition – LELIC/UFRGS and the Intelligent Systems Laboratory – LSI/UFMA. This system has as challenge to ahead respect individuality due the cognitive mental process of each user, registering his actions and reactions of the interventions of the intelligent agents in the resolution of open conception in logical tests - in this work, called Open Challenges. The model of the IOCS is constituted by an agents groups, forming an Artificial and Human Agents Society, working in set in to accomplish the different tasks and interfere on challenge, with the common aim of observing the logic implied in the interpretation of the actions of each user, making them aware of its action in search of the understanding of the logic implied in the considered challenges (Piaget, 1977). In this way, there is the necessity of reaching a high degree of flexibility and the fitting of the user changes, satisfied with the fitting of standards of the Clinical Method in the decision of the Strategist Agent.

2. IOCS'S THEORY

The Piaget's Clinical Method is used as a way to discover the aspects of structure and working the child minds, while it systematizes the objects on which this acts for it acts and it assigns sense to these objects, through verbalization of their actions. It searches to analyze the deep mechanisms of the child thought, through verification of a development or process of mental structure in the resolution of a matter, in order to understand what made occur a determined reply, making possible the understanding of proposal problematic. Its feature is the collection of data - by means of the proposal of determined activities -, the watching and chatting with a child, mediated by the experimenter, with the purpose to follow his thought, and the analyze the data that had been registered under the optics of the IOCS'S theory.

Following this logic, this method still concerns to survey the configuration of each user reply and its interpretations, as well as their open challenge aspect.

3. INTELLIGENT OPEN CHALLENGES SYSTEM

IOCS is an intelligent system, based on approaching of Multi-agents System and adapted from Piaget's Clinical Method patterns, using open conception logic tests, denominated in this work "Open Challenges". Its feature is to simulate the role of experimenter and be a learning object, when is reutilized in other platforms

The Open Challenges are also learning objects, programmed in the Action Script language, constituted by the logic mathematic application in the playful increment, according to with Piaget's tests that work the Arithmetic's Logic Relations and the Space Relation Order, found in the Reflection Abstraction Piaget's theory (Piaget, 1995).

3.1 IOCS's Main Actors

It is constituted for three main actors: System, Strategic Agent and User. Next, the definition of these actors will be given.

3.1.1. System

Its function is make possible a development of cognitive process in the User possible, under the application of Open Challenges. It may occur in two moments:

a) When the system applies the challenges contained in Multi-agents Platform to the User, provoking the unchaining to it of the reflection constructive process. This process is formed by three stages, gradual, to observer, to make to understand, to understand thought (Bastos Filho, Silveira, Axt. 2004b).

In the stage of “To Observer”, the user, by his abstractions, will make an observation and analysis of the proposed challenge, as well as of the elements and the logic implied.

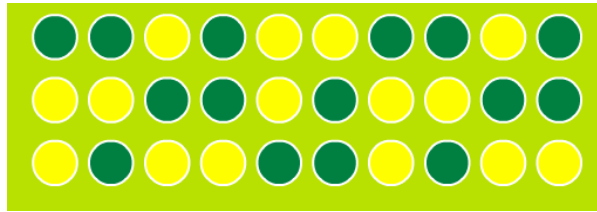


Figure 01. Interface Observation.

In the stage “To make for understanding”, the System will give a stimulating challenging to the User, with sequences to give continuity to the logic, questions based on the against-argument, or presenting new challenges, in order to unbalance him making the User projects certain coordination of hypothetical actions on the challenges, being possible to visualize the understanding or only success in the action.

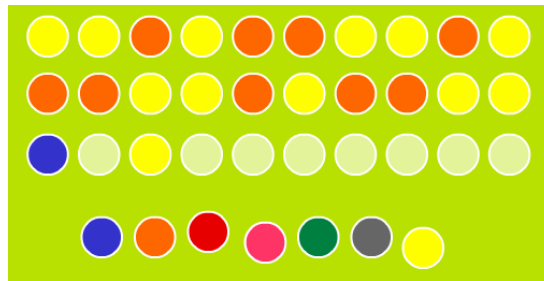


Figure 02. Interface for understanding.

In the stage “Understanding in the Thought”, the System requests the User to generalize the logic implied in the former challenges in order to observe how much these was on the logic understanding, by means of the creation of new challenges; working reflections on reflections and demanding the “Take of Explicit Conscience”.

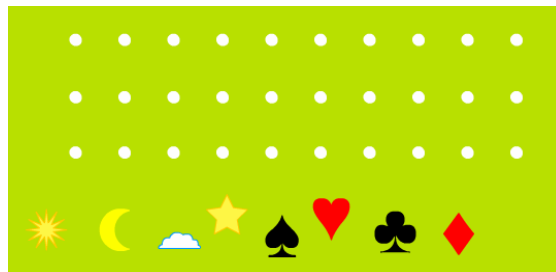


Figure 03. Interface understanding in the Thought.

b) When the System interacts with the User, by Strategist Agent, it takes to relative situations to the Take of Conscience of action.

3.1.2. Strategic Agent

The IOCS’s architecture is based on the approaching of Multi-agents Systems, introduced, by Distributes Artificial Intelligence, having as its first model programmed by Java TM language. It is formed by a Human Agents Society, composed for: User, Agent of Protocol, Modeling Agent, Strategic Agent, and Challenger Agent, working together in the accomplishment of different tasks and interfering on the challenge, with the common objective to observer of the logic implied in the interpretation of each User actions.

The Agent of Protocol is the agent responsible for registering the actions of the User, gotten by Interface during the process of construction of the solution of the challenge.

The Agent of Modeling acts in background, analyzing the actions of the user, searching repetitive standards and classifying them to accomplish the information modeling. This agent creates a profile of each user for the Strategist Agent, making possible with that this gets given for a posterior taking of decision.

The Agent of Challenges manages the databases of challenges (storage of the challenges and its periods of training) and of questions (place that stores questions, or grouped questions in levels of association with the stages of the challenges), in accord with the strategy selected by the Strategist Agent.

The Strategist Agent has function of experimenter of the Clinical Method in the IOCS, regarding itself, as a "Virtual Experimenter". They keep functionalities of control to an interaction of the System with the User, by means of its interventions in the challenge. It evaluate the profile of the User, informed for the Agent of Modeling, with the intention to generate a standard of decision contained in ones of the stages of the Interface, acting, as a researcher for the System. The Agent of Challenges creates a process of problem for the User presenting to it the appropriate challenge, or also against-arguing with a new question, in accordance with the strategy previously selected, in order to provoke cognitive unbalance, acting as a educator, giving continuity to the interaction (Axt, 2000).

3.1.3. User

The User in the interaction with the System will be able to develop two functions:

- a) Solving the Challenges Reflections Abstraction may make the user understanding the logic implied.
- b) Interfering in the Challenges – when asked, in a chat, any other user interfere as a human agent, questioning or clarifying a challenge.

3.2. Implementation of the System

For the interventions of the Strategist Agent in a suitable form, the decision is based on the profile of the User (Labidi, 2000), classified in accordance with the reactions of the child observed in the clinical examination of Piaget (Piaget, 1976).

SYSTEMATIZATION OF THE ACTIONS AND INTERVENTIONS OF SYSTEM IOCS				
Profile Reaction	Type of sequence Categories	Weight	Action of the system	Intervention
S P O N T A N E O U S	certain sequence	0	To launch next challenge	Intervention
	missed sequence, but with the correct colors:	-	-	-
	a) the simple and/or double alternations: AM, MM, AM, MM	1A	To launch 1° interv. (Bank A)	Intervention
	b) simple alternations: AM, AM, AM	2A	To launch 1° interv. (Bank A)	Intervention
	c) it does not present simple nor double alternations	3A	To launch 1° interv. (Bank A)	Intervention
	Sequence with colors that were not in the original sequence:	-	-	-
	d) using only two colors	4A	To launch 1° interv. (Bank A)	Intervention
	e) using two colors more than	5A	To launch 1° interv. (Bank A)	Intervention

Figure 04. Part of the table of Decision of the Strategist Agent.

When this User does not provokes any effort in the reply; Fantastic report, when the User answers without reflecting, inventing a situation not context inside of the challenge; Suggested belief, when the User answers to the challenge suggestion for the Strategist Agent, without reflecting the details contained in the problematic, testifying, thus, only its incomprehension in relation to exactly; Unchained belief, when the User answers to the challenge by means of its knowledge previously acquired - the reply it is an original product of its thought -, however, necessarily influenced for the questions that the System considers, forcing it to think it and systemize its knowledge in definitive direction, for a controlled situation experimentally for the Strategist Agent. Spontaneous belief, when the User answers immediately to the challenge, not needing to

reason, being the reply fruit of a previous reflection and original, developed for the proper user in its natural situations of life reality.

The table above systemizes the actions of the Strategist Agent in the search of a suitable intervention of the challenge, in accordance with the reactions of the User. These actions of the Strategist Agent are based on the Piaget's Clinical Method, adapted for computer science, by means of the register of action of users through filming and analyses made by experimenters. (Bastos Filho, 20004a).

4. CONCLUSION

The challenging feature, on a pedagogical work, aiming learning to observe and listening to the apprentices, is able to construct, from what if it's been seen and/or heard, work hypotheses of work that give consistency to the planning and heed of their necessities and interests, suggesting to the educator/researcher the necessity of construction of a similar process as the experimenter one described by Piaget.

Based on this work, the IOCS consists of an open space for learning, that works in a integrationist and adapted form aiming the construction of degrees of meanings for each user, through the application of constructed challenges based on logical-mathematical tests, in order to set probable cognitive gains, and, thus, will become a support for teaching as well as continued formation in Virtual Learning Environments.

This present research will always be in continuous improvement in order to become the System reference for future possibilities of Users action.

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