

Baiuka – An Educational Kids Game based on the Multiple Intelligences Theory that narrates Amazonian Legends

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Abstract

Baiuka is an educative game in its initial version (developed from incremental archetypes) directed to awake ecological conscience based on Amazonian legends. The final objective is to consider a model of agents in the evaluation of multiple intelligences that will assist in building more fair learning processes concerning with the power of an intelligence, using appropriate techniques to the development level of a child. In this proposal, we believe this game may contribute to stimulate different intelligences, by satisfactorily combining weaknesses, intellectual forces and pastime. This paper describes Baiuka's elaboration process, and by the first time including strategies used to evaluate multiple intelligences in a computational game.

Keywords: educational games, independent agents, multiple intelligences.

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1. Introduction

The birth of Educational Technology contributed to make education scenario to be constituted not only by teachers and book contents, but also involving in the learning process the participation and experimenting of the person in the constructions of its own knowledge. In this way, educational games can be like a catalyst element, able to create an emotional bond [Moratori 2005]. In fact, many of the times, as students get tired of trying and not to reach satisfactory results in the so called "school time", they feel constant frustration, which blocks the qualitative advances in their learning.

According to Gardner's Multiple Intelligences theory [Gardner 1994], each individual has different groups of abilities, consequently, not all of them learn in the same pace. Therefore, it is the educator's role to discover alternative ways to promote the development of the various student abilities, restructuring the relationship between student and the educator.

This article describes a game called Baiuka, which narrates Amazonian legends and uses "intelligent agents" to evaluate a child's variety of potentials, according to the multiple intelligences theory. It is expected that those evaluations could help to create classroom environments that stimulates the development of individual and group capabilities.

Beyond this introduction, this paper is divided into 5 more sections distributed in the following way: section 2 presents the Multiple Intelligences theory; section 3 presents the creative process of Baiuka's characters and plot; section 4 shows the independent agents proposal to evaluate the multiple intelligences; section 5 presents the project for the building of the game and section 6 presents the final considerations and future perspectives.

2. Multiple Intelligences

The Multiple Intelligences theory, by Howard Gardner [Gardner 1994], is an alternative to the concept of intelligence as an innate capability, general and unique, that allows to individuals a performance, best or worst, in any performance area. His unsatisfaction with single visions of intelligence made him redefine intelligence to the light of abilities biological roots to solve problems. Constructive psychologist very influenced by Piaget, Gardner distinguishes himself from Piaget [Dolle 2000] as this one believed that all symbolizations aspects came from the same semiotics function, whereas that one believes the independent psychological processes are used when the individual deals with linguistic symbols, numerical gestures and others. According to him, all ordinary individuals are able to act in at least seven different and, in a certain point, independent intellectual areas. With the advances of gardnerian theory, it is possible to establish a total of nine intelligences: verbal/linguistic, musical/rhythmic, logical/mathematical, visual/spatial, bodily/kinesthetic, interpersonal, intrapersonal, naturalistic and existential.

However, in this first version of the game Baiuka, we develop evaluation tests to the following intelligences, based on the infant development point of view:

Linguistic Intelligence: this ability manifests itself in the capability to tell original stories or to tell – precisely – their life experiences.

Logical-mathematical Intelligence: aptitude and facility to count and solve mathematical calculations, and to create practical reasoning notations.

Spacial Intelligence: Perceived through the ability to play with puzzles and other spacial games, and to pay attention to visual details;

Naturalistic Intelligence: demonstration of significant living experience related to the environment, recognizing the natural objects, and

distinguishing the vegetal, animal and mineral elements.

The theory also emphasizes the need to evaluate the different intelligences by means of their cultural manifestations, for example: instead of evaluating only a special ability, we should observe the kids during a drawing activity or while they play with a building toy system. Finally, instead of evaluation is a product from the educational process, it is actually part of it.

3. Baiuka

Baiuka's stories and characters exist from five years now. Baiuka started on a kids Internet portal, and it circulates as short stories weekly at "O Liberal Kids" (local press publication in the State of Pará). In this work, we redirect these very well accepted stories by the kids to our approach, in order to evaluate the multiple intelligences.

The word "baiúca", or simply "inn" is redesigned on Internet. Baiuka is fantasy, dreams, fun, colors, movement and content, and is a travel to the kid world, with characters came directly from the Amazon forest to the computer workspace. In the game, Baiuka is also the name of a magic object that contains the world's essence (the good and the evil) and, besides that, is the name of the first Indian tribe from primitive forest. With help of the little Erê and Naiá, players will know the Amazonian legends and its characters, read stories, learn and, of course, enjoy themselves.

Additionally, the characters, the scenario and the infant and youthful stories from Baiuka bring with them a commitment to the sociocultural and ecological consciences are the main protagonists of plots, in which Amazonian legends are reinvented and reinterpreted.

3.1 Characters

Erê: *Pajé* apprentice (*pajé* is the tupi-guarani word for shaman), is a very calm little Indian, a dreamer and a bit lazy. His acts are driven by emotion, not by reason. His spirit is naive. The *Pajé* always puts him in charge of important missions.

Naiá: Courageous, she has the blood of the amazons in her veins. She is candy, but wild. With an adventurous spirit, she uses more the reason than the emotion in her acts. Her goal is to disenchant her mother who was deceived and transformed into the "Vitória Régia" flower by the evil-doer, Zilá.

Zilá: He is the great villain of the story. He lives in the mysterious waters of the Black River and can change himself into any creature he wants with intention to deceive his adversaries.

Pajé: The first *pajé* that appeared in the land. He is wise and Erê's biggest counselor.

Eiratí: Protective drone of the Baiuka. Deceived by Zilá, is attracted by a flower (form assumed for the villain to steal the Baiuka from the Kingdom of Tupã). He goes down to Earth to look for the Baiuka and asks

for the help of the only terrestrial being that could assist it: the *Pajé*.

Miriti: Every little indian has a monkey or parrots as pets. Erê, as a *Pajé* apprentice, possesses a magic snake. Besides being a toy of *miriti* (palm tree native to Amazonian Region), this friend of Erê has a secret: it can change itself into the "big snake".

Mara: small jaguar which dots are "marajoaras" drawings. She is one of the last descendants of an ancient race of jaguars (the priestesses) who inhabited the Sanctuary of the Island of the Marajó. Assuming the form of a black jaguar, Zilá attracted Mara for the side of a river, where an alligator was ready to attack. Her mother tried to save her, but died on Mara's defense. She is taken by the waters of the river, being found by Naiá.

Totem: A very tiny, funny creature. As he is the smaller totem of the world, he is scared of everything. All the others totems are immense, to frighten the bad spirits. Although he finds himself incapable to carry through great facts, it is the only one that Zilá fears. The Totem, however, does not know this.

Peri: periquito (loverbird) that wanted to be unique, but he has got 1000 brothers and sisters just like him.

Tupã: Supreme God. The owner of Baiuka.

Jaci: Tupã's wife. Always protects Erê in his bigger difficulties.

3.2 Scenario

The characters of the Baiuka transit through the Primitive Forest, a reproduction of the Prehistoric Amazonia. All the characteristics are there: pororoca, the meeting of waters, the manguezais (mangrove swamp).

4. Independent Agents

An agent is any entity that perceives its environment through sensors (microphone, keyboard) and acts on it through exit devices (former video, loudspeaker) [Russel 2004]. We should think about an agent as a computer system that, situated in some environment, is either capable to take independent actions on that environment in order to reach its objectives. Being the owner of knowledge bases and mechanisms of reasoning, the agents must be capable to recognize a situation where they must become active itself, without the user perceives, or either, in a transparent form to the user.

We decided to use the agents who store states of the world (or reflective agent with internal state), in accordance with the classification of proposal agents by Russel [Russel 2004]: agents who carry through action in accordance with its perceptions, combined with the knowledge of the environment current state, or either, it keeps a set of internal state for choosing an action. This type of agent works through the research of a rule whose condition matches the current situation (defined through its perceptions and stored in the internal state) and then executes the action associated with this rule. The update of the internal state requires

two codified types of knowledge in the agent program: some information on how the world evolves independently of the agent; and some information on how the proper action of the agent affects the world. An agent of this type will not take its established decisions only in its rules of production, but also in the knowledge of the environment. For these agents, there is lack of autonomy, as the objectives have not been shaped, and the environment still must be determined and small.

The first step to develop an agent is one careful analyze of the environment and the tasks to determine the behavior requirements of the agents.

In our model we consider:

- Control module: put in charge based on the knowledge and the agent goals, to evaluate different alternatives of solution and to negotiate and select the best option.
- Domain of multiple intelligences: refer the available information to the agent about the reality of the evaluation of multiple intelligences.
- Perceptions: refers to ways to which the agent monitors the game.
- Action: responsible for sending messages to the profile base of the player based on the decisions of the control module.
- Social reasoning: refers to the information available to the agent on the reality of the game rules.

5. The Game

Computer educative games are programs that, even though they have been developed for leisure and fun, are used with educational purpose for bringing implicit characteristics that will help to construct or to discover knowledge [Clunie et al. 1995].

With the analysis of some available computerized educative games in the market in accordance with Clua, Lucas and Nabais [Clua et al. 2002], we observed the presence of factors that are considered during the planning of educational software: Baiuka.



Figure 1: Start Screen

In its initial version, the game publics are children from 7 to 10 years old. We try to assist the educator in accordance to the content of the Portuguese Language National Curricular Parameters from 1st to 4th grades of the Basic Teaching, to carry out tests in

the evaluation of the performance of multiple intelligences. Following the success of Baiuka stories, already tested with children, the interface will Web based (Flash), using intelligent agents (Java). The agents follow the player and collect data in order to observe the multiple intelligence tests. The game (figure 1) will arrange playful activities that approach intelligences separately or in its set, for the exercise of the verbal language, reading and text understanding.

For example, to talk about Spatial Intelligence we used the Memory Game, presenting pairs of words for the children to organize, extending the figure mounting with a small story, involving the existing words in the context of the legend that is being told.

The "Fast Game" (Figure 2) initiates with a word spoke by one of the characters of Baiuka and then the child has a time (clock) to type a word that rhymes with the first one. Although this game does not use numbers, it is valid for the stimulation of Logical/Mathematics Intelligence as demands a logical verbal fluency.



Figure 2: Fast Game

With regard to the Naturalistic Intelligence, the game used is the Emiting Sounds (Figure 3), which stimulates the students to recognize sounds of animals, allows them to hear and select the figure they consider to be the respective animal, discover more information on these, read on its habitat, characteristics, hear brief narratives on them, etc.



Figura 3: Emiting sounds game

The game is Special Domino, where the participation of the child requests that it pairs up phrases and/or words, observing the agreement of the substantives for stimulation of Linguistic Intelligence. Great part of the games used for elaboration of the exercises was removed of the Book "Games for stimulation of multiple intelligences" by Celso Antunes [Antunes 1998].

There are other games being chosen, that aim to develop the pedagogical aspects. These games occur in the scene of an Amazonian tribe, who awakes the user curiosity. In this perspective, we use as a metaphor the general system level an Amazonian legend that the characters must live in (figure 4). The main plot of the game consists on leading the characters, choosing the ways offered during the narrative.



Figura 4: Legend selection screen

The following screens always show new stretches of the chosen way with new tricks offering the complement of the story that is being told. Each new stretch of the way will be composed for the possibility to continue the way without carrying out any activity, carrying out the existing activity or to exit the system. It is important to point out that all the screens of the game possess the “exit” button. As feedback to user errors, the game uses stimulation messages that make the child feels comfortable to continue playing, without fear to commit new errors, therefore this type of inhibition can cause disdain for the game.

A database obtained by the various simulations of the independent agents during the game execution is being fed, which allows the accomplishment of consultations by the teachers, as to storage and recovery. The agent will be evaluating the amount of rightness, errors and desistance in each presented challenge. The most concrete results of the feedback (of learning evaluation) about the exploration of multiple intelligences using games will only be reached with the examination of the database collected for the agents. It is the teacher’s role to use this and other resources of the game, as well as the result of the evaluation with creativity, contributing, thus, with a more significant learning, and simultaneously inserting the children in this global and informatic society.

Baiuka game is implemented total in free platform, using true standards, such as JAVA, XML and tools as MySQL, Blender, Audio Max and OSFlash.

6. Conclusion

To use the Theory of Multiple Intelligences implies fairly way to evaluate the pupil, offering, according to

Gardner [Gardner 1994], "a regular and up to date vision of the potentialities, inclinations and difficulties of each child at school". These implications are so extremely valuable when applying the computer in education, which can contribute for the development of multiple intelligences.

The educative games are today the best appreciated basic type of educational software and the ones that better uses the potentialities of the computer. It must be pointed out that the educative games are only instruments, not masters, or either, they are only useful if followed by someone that analyzes the game and the players, under diligent and critical way.

Many of the ideas on our approach can be developed in other games. Thus, we think about contributing with the study of educative games, implementing a robust and including educative game (being able to be worked in other disciplines), of friendly use. Consequently, it may find a universal use inside the basic education schools, mainly those that need information priority of the cognitive development of children, aiming to establish better education policies.

Finally, we can also point out the great demand and scarcity of good quality educative games on market. The production of good games may contribute to the increase of the use of the new technologies of information and communication in classroom, by exploring their pedagogical potentials.

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