“SIMULECS” Simulation of the laws of sine and cosine as reinforcement of classroom sessions

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Abstract:

The simulator provides a solid foundation students get to be a very important support for tutorials. Through seven sub-user will interact with this and allow you to understand the proposed exercises, which will serve later to logically solve a variety of them, related to the subject, will also be able to clarify doubts and give their views about using software, as the progress that has been obtained in using the simulator.

Key words: Ontology, Educational Software, Teaching, Education, Simulation, Semantic Web, Software Architecture and Architecture Multilevel

1 Introduction

The project seeks to develop a simulator to design and implement the laws of sine and cosine for a virtual portal that will be applied mathematics at the School District University of Technology Francisco José de Caldas, developed the following systems: Registration, which allows control users access the system, Didactic, enabling the selection within an option group exercises to achieve an understanding of the solution construction, which allows students to view the simulation respectively for the year selected, theoretically allowing the student to understand the process of development of the simulation, evaluation, which allows to know the student's weaknesses and strengths, help, which provides guidance to users on software management, interaction, which allows communication between student and teacher. Among the methodologies used to develop the simulator include: RUP (Rational Unified Process), which together with the Unified Modeling Language UML, are the most widely used standard methodology for the analysis, implementation and documentation of object-oriented systems, Kelton which provides the steps necessary to build the simulator, Galvis, a methodology for developing educational materials computerized OOHDM (Object Oriented Hypermedia Design Method), this methodology is used for the design and development of Web applications and general applications hypermedia (consisting of nodes and links), which highlights the importance of analysis and design factors such as navigation and user interface.
2 Approach of the Problem and Justification

The difficulty in learning mathematics watching from the point of view of society has increased, as it has developed a negative thought to this problem. This results in student mortality, which in some cases makes the student withdraws from the race that is studying or simply look for other options that have nothing to do with the development of it. Because of this problem is thought in the development of a simulator that would deepen the knowledge gained in basic education, in this case with the laws of sine and cosine in the area of mathematics, a subject that engages with the knowledge and management of trigonometric functions, both geometrically and analytically, and that is very useful in all fields of engineering. Using trigonometric relations allows simplification of several complex mathematical expressions and solving many engineering problems. Mastery of the basic principles of trigonometry is essential to address the areas and sub-line and network Statics.

3 Objectives

3.1 General Objective

Design and implement a simulator of the laws of sine and cosine for a virtual portal that will be applied mathematics at the School District University of Technology Francisco José de Caldas.

3.2 Objectives Specific

- Design and develop a registration system that allows control user access to the system.
- Designing and developing a training system that allows the formulation and presentation of trouble properly simulate the process that involves the law of sine and cosine.
- Designing and developing a building system that allows the student to see the simulation of the laws of sine and cosine.
- Design and develop the theoretical part, which will allow the student to understand the development process of the simulation.
- Design and develop an evaluation system that allows qualified students during their evolutionary process.
- Design and develop a support system to provide guidance to users on software management.
- Design and develop a system of interaction that enables communication between student - teacher.

4 Marco Teórico

The Law of Sines is a ratio of three equalities are always met between sides and angles of a triangle.

\[
\frac{\sin \alpha}{A} = \frac{\sin \beta}{B} = \frac{\sin \gamma}{C}
\]

**Figure 1. Law of sin.**
The law of cosines is an expression to know a side of a triangle.

The aforementioned laws are intended to generate support for the teacher, so that students can consolidate their knowledge by finding ways of learning, which in this case is proposed, which is a simulator of the laws of sine and cosine based on geometrical environment, which besides being a key tool to support the content that presents the mathematics in the School District University of Technology, is an issue that helps develop geometric reasoning, giving the student a tool to solve real life problems. The pedagogy used to the fact that students without a good concept to mathematics, using the constructivist model we make the same develop your knowledge, in this case through interaction with a simulator, in which we apply the Semantic Web, which through logical processes - resulting facilitates mathematical, holding that it is more optimal and meets user expectations. As with traditional web, the semantic web is built by a framework of technologies that support each other. Based on the book The Future of the Web, the Semantic Web is an extension of the current Web in which information is given by well-defined meaning, making it easier for computers and people to work in community. The Semantic Web is based on machines that understand the meaning of information available in it, hence the adjective semantics. The way in which the machines must understand the information is through logical process - mathematicians, humans must represent data in a formal language (logic and axiomatic), according to Berners Lee, so that machines can use it to draw logical inferences.

The first foundations have been laid: the model of RDF resource description, the ontology language OWL and SPARQL query language. These technologies are finding acceptance in several areas, notably in the health sciences, education, industry, the description of documents and people. He currently works for, have the following key elements, such as language exchange rules and semantic web services. Much of this activity is channeled through a dozen groups of W3C. In addition we use inference rules for the development of ontologies which are tested in the JENA inference engine. All the above is implemented in J2EE.

5 Methodology

5.1 Methodology Rational Unified Process (RUP):

The Rational Unified Process or RUP (Rational Unified Process). It is a software development process and with the Unified Modeling Language (UML), is the most used standard methodology for the analysis, implementation and documentation of object-oriented systems. RUP is intended to ensure production of quality software within deadlines and budgets predictable. Directed by use cases, architecture-centric, iterative (mini-project) and incremental (versions).

5.2 Methodology Object Oriented Hypermedia Design Method OOHDM:

The methodology OOHDM (Object Oriented Hypermedia Design Method), requires the development of a Web application is a four-phase process which combine different styles of development as incremental and iterative prototyping. This methodology is used for designing and developing web applications and hypermedia applications in general (consisting of nodes and links), which highlights the importance of analysis and design factors such as navigation and user interface, it is worth noting the Full object orientation of this methodology.

5.3 Alvaro Galvis Panqueva methodology for developing computer materials:
• Analysis of educational needs.
• Selection or development planning MEC.
• Cycles for selection or development of SCM.
• Design of the MECs.
• Design environment.
• Educational design of the MEC.
• Development of SCM.
• Test Pilo of MECs.
• Field trial of MECs.

6 Components

➢ **Registration Systems:** This system is responsible for managing the input of users to the system, just as is responsible for managing all personal information of students, teachers and administrators.

➢ **Training System:** This system is related to the pedagogical elements that allow the teaching process - learning best it can be as much as for teachers and students.

➢ **Help System:** Here you specify the steps and general navigation on the contents of the software.

➢ **Theoretical System:** This system has the function of providing theoretical information for all users of the system, which allows the students associated with the graphical environment and thus achieve establish the fundamental concepts of the laws of sine and cosine.

➢ **Construction System:** This system is what allows the user to simulate the performance of triangles, taking into account the laws of sine and cosine.

➢ **Interaction system:** Consists of a system and a weblog forum where teachers and students will be able to answer questions and interact to be a space for discussion about this topic.

➢ **Monitoring system:** This system will control the student in their learning during activities and simulations, where they specify the progress of each student as they interact with the simulator.

7 Results

In developing the project has been learning various methodologies and the management of several software development tools, which were fostered through research conducted in a continuous process from design development to completion, also has been promoted development of virtual platforms and simulators using new technologies, "Semantic Web", which allow increasing competitiveness within the power groups. Additionally we have developed an educational work with teachers and students from other schools who have facilitated the educational part of the simulator, giving a constructivist approach.
The end product:

8 Conclusions

- The development of educational projects with new technologies, promotes research in the field of innovation.
- The use of Semantic Web technology facilitates the process of search results by using the metadata.
- The development of educational simulators learning encourages students who are in the death rate.
- The constructivist teaching model allows students to build their knowledge base of experience that comes with interacting with educational simulators and classroom support materials.
References:


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