













ORIGINAL

Automatic Mobile Learning System for the Constant Preparation of the Student Community

Sistema automático de aprendizaje móvil para la preparación constante de la comunidad estudiantil

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ABSTRACT

Introduction: the events that occurred with the pandemic caused a drastic change in all activities with direct contact due to the high risk of contagion, with educational centers being affected by the closure measures and the imposition of virtual classes to continue with student preparation, leading many students to see the need to have a computer to take their classes, eventually showing boredom due to the lack of desire to be in front of a computer, This to a certain extent weakens their interest in learning and affects their learning because mobile devices have become more important due to the various applications that provide students with information. For this reason, we propose mobile learning that allows students to have more information, as well as interaction with different students so that they have the opportunity to learn on a constant basis.

Objective: the objective is to create an automatic mobile learning system for the constant preparation of the student community.

Method: a methodology based on a client-server model to take advantage of the various educational resources accompanied by the good support it provides the subjects for students with the interaction of a mobile application.

Results: through the operation of the system, it was visualized that the tests carried out with the students were presented with an efficiency of 96,70 %,

Conclusions: this system presents a high efficiency that allows to reinforce the subjects that need more prominence in the student's learning and progress of level through the teacher's evaluations.

Keywords: Pandemic; Mobile learning; Automatic system; Students.

RESUMEN

Introducción: los hechos ocurridos con la pandemia provocaron un cambio drástico en todas las actividades con contacto directo debido al alto riesgo de contagio, viéndose los centros educativos afectados por las medidas de cierre y la imposición de clases virtuales para continuar con la preparación estudiantil, llevando a muchos estudiantes a ver la necesidad de tener una computadora para tomar sus clases, llegando a mostrar aburrimiento por la falta de ganas de estar frente a una computadora, esto en cierta medida debilita su interés por aprender y afecta su aprendizaje debido a que los dispositivos móviles han cobrado mayor importancia debido a las diversas aplicaciones que brindan información a los estudiantes. Por ello, proponemos un aprendizaje móvil que permita a los estudiantes tener más información, así como la interacción con diferentes estudiantes para que tengan la oportunidad de aprender de forma constante.

Objetivo: el objetivo es crear un sistema automático de aprendizaje móvil para la preparación constante de la comunidad estudiantil.

Método: una metodología basada en un modelo cliente-servidor para aprovechar los diversos recursos educativos acompañado de un buen soporte que brinda los temas importantes para los estudiantes con la interacción de una aplicación móvil.

Resultados: mediante el funcionamiento del sistema se visualizó que las pruebas realizadas con los estudiantes se presentaron con una eficiencia del 96,70 %.

Conclusiones: este sistema presenta una alta eficiencia que permite reforzar las materias que necesitan mayor protagonismo en el aprendizaje del estudiante y Progreso de nivel a través de las evaluaciones del profesor.

Palabras clave: Pandemia; Aprendizaje Móvil; Sistema automático; Estudiantes.

INTRODUCTION

At the end of 2019, a tragic event occurred with the appearance of a new virus known as SARSV-CoV-2. ⁽¹⁾ Being immensely infectious, it played a leading role in all countries by manifesting its high mortality rate, which raised concern about the little control over infected people by Adnan Shereen et al. ⁽²⁾, causing at that time an isolation for all people so that they do not establish an approach or physical contact, canceling all social activities including educational institutions. ⁽³⁾

According to Campos Palma ⁽⁴⁾ with the temporary isolation imposed on all people for health and safety reasons, it undoubtedly altered the way of life of the majority of people, living with a drastic change in their day to day to cope with their workplaces, as well as their educational centers. Also, according to Marchiori Buss et al. ⁽⁵⁾ people were forced to study from home so as not to get infected with this infectious virus by, this measure was recommended by the various health organizations, where they went from face-to-face teaching to remote teaching in just a few weeks because of the health emergency. ⁽⁶⁾

From that moment, various tools for the use of digital media were implemented with the purpose of promoting continuous communication between teachers and students as mentioned Miranda Benavides et al. ⁽⁷⁾ and according to Guiot Limón ⁽⁸⁾ indicates that through online instruction according to the resources presented by each educational centers, but this measure of education under the modality virtual showed to a large extent that the students did not have the resources or were prepared to face this model, with 87 % of the students being overwhelmed by being in front of the computer at all times, not showing interest in learning by Londoño Velasco et al. ⁽⁹⁾ since in large part they would prefer to use their mobile devices to carry out the continuity of their studies in a calm way as mentioned by the author Castañeda Rodríguez et al. ⁽¹⁰⁾, for this reason it is that the availability of mobile devices on learning is an important aspect for students that should be reinforced to continue with the effective training of learning from each other with this mobile learning method as mentioned by the author Ballesteros Ballesteros et al. ⁽¹¹⁾, giving students the opportunity to obtain the necessary information at any time and to cooperate in academic groups in a dynamic way.

The objective of this research is to develop an automatic mobile learning system for the constant preparation of the student community, being able to take advantage of educational resources at any time, as well as a search support that allows effective student learning accompanied by dynamic interaction with other students that allow them to learn. Its development is based on the use of the client-server model, with the client being the mobile application that will be installed on mobile devices, while the server uses the Active Server Pages (ASP) structure together with a Microsoft database, establishing communication through a mobile communication network and the HTTP protocol that allows information transfers.

In section II, a review of the literature regarding the research carried out is carried out. In section III, the methodology of the system is carried out by presenting the block diagram. In section IV, the development of the mobile client interaction to establish communication within the network is carried out. In section V, the results achieved by the system are made. In section VI, the discussion of the system is carried out. In section VII, the conclusion and recommendation of the system are made.

Related works

Mobile learning is a constant challenge that has been improving with the addition of various tools such as mobile devices, making it necessary to maintain that structure that allows student teaching and learning by using various systems that facilitate interaction with various students. For example: According to Shen et al. ⁽¹²⁾, researchers mention that digital skills are taking a fundamental role in the daily life of all students, especially mobile devices that increasingly have more functions and internal sensors that allow student teaching to be increasingly more dynamic and flexible regarding study hours, therefore, they decided to develop a mobile

learning system through applications with a focus on deep learning. The researchers' procedure is based on a special type of recurrent networks to include a repetitive process on the data of the mobile application, as well as the data combination method that allows to specify the information for the application. As a result, they presented 90 % efficiency in the development of the mobile application, reaching the conclusion that this proposed system is an innovative system with little resource that shows the generality of its application.

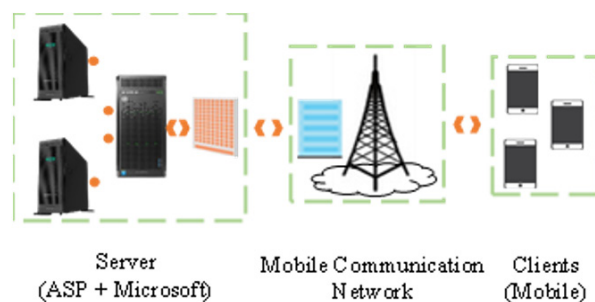
According to Zhu *et al.*⁽¹³⁾, the researchers mention that the appearance of the various digital technologies developed for communication has given the opportunity for this technology to be used for teaching and learning of students due to the new functions that improve each time and allows the interaction of students. in real time through mobile devices, therefore, they decided to develop a mobile navigation system based on constant reinforcement learning. The researchers' procedure is based on applying a deep reinforcement learning capacity based on Deep reinforcement learning for browsing mobile devices, allowing students to constantly reinforce the teachings carried out by teachers. As a result, they presented an 88,78 % efficiency in the constant learning of the student, reaching the conclusion that their proposed system meets the challenges of the student approach so that through their mobile devices they can reinforce the important subjects for their constant education.

The author Daoudi *et al.*⁽¹⁴⁾ mentions that, the researchers mention that the use of mobile devices has reached an important figure that undoubtedly influences the field of education, being able to improve the quality of teaching due to the way in which students tend to use mobile devices with a good attitude, continuously improving their learning, therefore, they decided to develop an automatic adaptive mobile interface determination system based on machine learning. The researchers' procedure is based on using Moodle as a database for learning management, as well as OPEN edX for online student teaching, for data collection they used the Google Analytics tool. As a result, they presented a 91 % efficiency in the constant learning of the student, reaching the conclusion that their learning system is based on algorithms that allow online pedagogical content for the student through their mobiles.

According to Wu⁽¹⁵⁾, the researchers mention that mobile learning is a novel method so far, which was developed due to the need to improve student teaching through technology, counting on the individualization and interaction of their mobile devices that make the learning is developed in an integral and formal way, therefore, they decided to develop a learning system by deep search algorithm oriented to the mobile platform. The researchers' procedure is supported by an improved model that provides a learning mechanism based on MLE, building a general framework for the MLE mechanism for students to access educational resources through this model. As a result, they presented a 92,40 % efficiency in the student's constant learning, reaching the conclusion that this model improves the teaching effectiveness for the student, showing good results in the evaluations due to the correct deep teaching generated by its algorithm.

METHOD

The methodology developed for the system is based on the ability to manage necessary information through mobile devices for learning available and accessible to students, in such a way that it allows them to have a constant preparation with the extensive educational resources that will strengthen their learning. In figure 1, the block diagram was made where the three parts that complement the system operation are specified.



Source: Own elaboration.

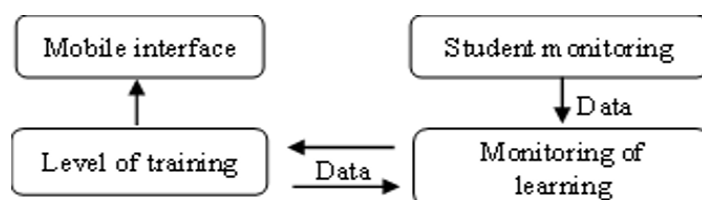
Figure 1. Block diagram of the mobile learning system

With the development of this system, the student will have the proportion of all educational provisions, as well as the information related to their academic training that will be used through their mobile devices when carrying out the process of connecting their mobile device to the Internet. communication. Therefore, this system uses a client-server model within a network-based system that allows the client through the installation of a mobile application to be within the communication network, and the ASP (Active Server Pages) server together With the Microsoft database they manage all the information about the educational materials and

reports, the reason for using these two tools is to maintain the operation between the mobile automatic learning system and the personal computer (PC) based system. Both will communicate through a mobile communication network by using a GPRS to send and receive data through an IP address, and a hypertext transfer protocol (HTTP).

Mobile customer interaction

The mobile client interaction consists of four parts as described in Figure 2, whose structure uses the Java Micro Edition (Java ME) platform for the Limited Connected Device Configuration (CLDC) technology, providing a portable and coordinated system for the set of tools given to students.



Source: Own elaboration.

Figure 2. Mobile customer interaction structure

The Mobile Interface will display the user interface that was developed for the convenience of student learning by using the Model-View-Controller developed with Java Micro Edition (Java ME) based on the Connected Limited Device Configuration technology.

The level of training will show the level of the learning field by means of an interface representation on the screen of the mobile device when using the data registered in the client-server according to the information and alternative of the student to strengthen their recent learning.

Learning monitoring shows the rules that decide the variation of the learning level according to the established classes, being the important basis for student learning due to the tools that allow communication between students and teachers. Likewise, the established classes focus on monitoring student learning and the way in which it is accepted, recording all the activities carried out by the student by taking advantage of educational resources, search support and dynamic interaction with other students.

Student monitoring, shows the control that each student has for the class request procedure upon receiving the request for their learning, therefore, if a student needs to start a new class, student monitoring processes the request and forwards it to the learning monitoring, the latter being in charge of receiving the requirement and saving the data related to the level of training on the mobile device and the server.

The operation of the system is based on using the application on mobile devices that was developed with Java ME, as shown in figure 3, displaying several tabs such as the Student Center that saves the student's personal information when assisting him. Student module details the courses that strengthen student learning. Student service details the information that educational institutions can establish and keep it up to date. Interaction with students allows the student to exchange information dynamically with other students.

RESULTS

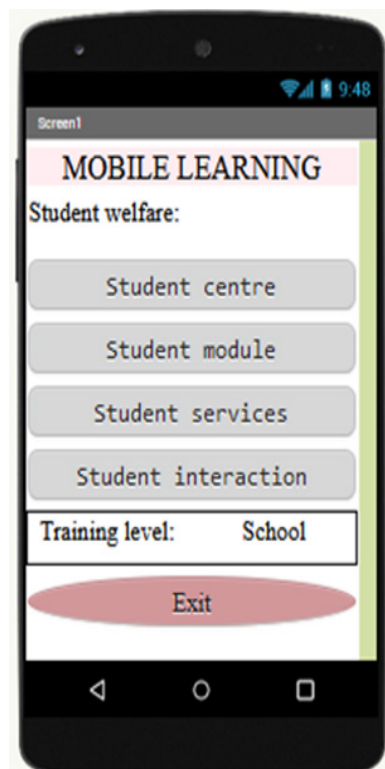
The results obtained from the system verify the correct management of the structure to reinforce student learning through the mobile application, specifying each module that causes the student to be instructed to continue preparing at any time and dynamically. with other students.

With the development of the automatic mobile learning system, it is shown that the efficiency of the system is 96,70 % in its tests carried out with students, being a high efficiency that was obtained when using this new learning methodology, contributing to the students to meet your goal of continuing to learn flexibly.

With the development of this system, it allows the student to be able to follow their level of study ability without the need to rush it, this will guarantee that the student can continue advancing with their subjects whenever they feel prepared based on the evaluations taken by the teachers, being able to share this knowledge with other students.

The development of the system chooses to carry out the internal interaction on time to avoid complications in its operation, likewise, the application automatically stores all the information collected from the student in the server database with the ability to provide all educational resources. to the student.

The development of this system generated positive results that allow it to be implemented in many educational institutions in order to support students in a new way, unlike the personal computer method that makes the student feel pressured and overwhelmed.



Source: Own elaboration.

Figure 3. Mobile device application

DISCUSSION

The development of this system will allow students to continuously take advantage of their preparation when using educational resources through the interaction of mobile learning, therefore, the applied methodology of this system is distinguished from other systems that already exist, for example, the research carried out by Shen et al.⁽¹²⁾, where the researchers decided to implement a mobile learning system through applications with a focus on deep learning. Obtaining as a result an efficiency of 90 %, but this system requires a lot of time to increase the amount of data that allows the student's interaction with the mobile application, likewise, it requires more training for the flexibility of the large amount of information.

The investigation carried out by Zhu et al.⁽¹³⁾, where the researchers decided to direct a mobile navigation system based on constant reinforcement learning. Obtaining as a result an efficiency of 88,78 %, but this system, when trying to systematically analyze the resources so that the student can learn, presents problems in its own mobile navigation and complicates the student's real-time interaction.

The investigation carried out by Daoudi et al.⁽¹⁴⁾, where the researchers decided to direct an automatic system for determining adaptive mobile interfaces based on machine learning. Obtaining as a result an efficiency of 91 %, but this system proposes a set of databases that present a graphical interface that is not advanced and complex for the student, in addition to having an additional cost to order it.

The research carried out by Wu⁽¹⁵⁾, where the researchers decided to direct a learning system by deep search algorithm oriented to the mobile platform. Obtaining as a result an efficiency of 92,40 %, but this system is limited in fully showing the search interface, therefore, its algorithm does not develop an interface so that the student can view the educational resources.

CONCLUSIONS

From the system it has been concluded that its development for the strengthening of the student, plays an important role because of the way it helps to overcome the various subjects through the evaluations that would indicate the level in which the student is.

From the system it has been concluded that its implementation in educational centers will allow the student to reinforce those subjects in which they need to learn in their spare time, strengthening their knowledge outside of class with instant interaction with teachers.

From the system it has been concluded that the list of modules specified in the mobile application details each important function that will allow the student to determine what they need to be able to advance the courses, as well as reinforce subjects and share ideas with other classmates or teachers.

From the system it has been concluded that the security of reinforcing learning is viable because mobile devices are the most used by many students, this relates it directly so that they can use this mobile learning system.

As future work, more interaction functions will be added to this system so that the training of students is continuous and flexible.

It is recommended that the teacher can clarify important points about the subjects so that the student can review and strengthen the knowledge through the application.

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