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Developing a Wireless Network for Optimum Distance Learning Assistant

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ABSTRACT

A new wireless network-based distant education auxiliary system is developed to address the issues of low operational efficiency, slow reaction times, and unstable systems. Develop the hardware component of the system's business process and enhance the functionalities of the subsystems. The subsystem encompasses course information enquiries, administration of instructors and in-person teaching processes, and plan management, among other functions. To enhance the implementation of linked hardware applications, audio and video signals are integrated in software design via the combination of signal coding technologies, using MMX technology for synchronous processing. The testing findings indicate that the developed system may significantly decrease reaction time and enhance stability. This research establishes a robust framework for the steady functioning of a distance education auxiliary methods and achieves the optimisation of a distance education auxiliary systems.

INTRODUCTION

A wider range of people are facing the educational threshold and receiving corresponding educational services from more members of society as a result of the social economy's rapid development and the emergence of numerous challenges, such as the Internet's rapid advancement and the world's population's significant ageing. Enhancing the significant function of higher education within the social context has emerged as a critical area of study at current juncture. In recent years, India's online education has advanced swiftly; nonetheless, some inadequacies persist in the current period of distance education technologies. One of the essential challenges to address is the development of resources, support services, and related matters. India's current resources are very limited, and efficient resources cannot be disseminated. The current distant education services fail to satisfy the users' requirements.

To fully comprehend the essence of distant education, several issues need thorough examination. The administration of distant education is now a crucial element for the sustainable development of distance education system in India. Consequently, the advancement of distant education has emerged as a prominent subject of discussion. Currently, several professionals have produced commendable study findings. They suggest the building of a web-based distant education assistance system for colleges and institutions. Initially, the development context, societal requirements, and practical importance of the university-based web remote education system are described. Secondly, the system's development environment, development mode, and operational environment are meticulously delineated using the object-oriented system analysis methodology and use case diagram. The system's general design plan is then presented, followed by a detailed description of the database and function designs, once the aim and requirements of the system have been analysed. Lastly, a detailed introduction to each module's realisation process is provided by combining text and a flow chart, and a detailed explanation of the system's testing procedure is provided by combining a few test cases.

Nevertheless, the methodology is very intricate, and its actual use yields suboptimal results. A distant education assistance system is built based on the SIP protocol. This research examines several network architectures in the context of distant education and

offers a hybrid network structures appropriate for multi-area along with multi-media transmissions. The operational concept of the SIP remote education system, based on a hybrid network architecture, is examined, along with the functions and particular implementation techniques of each system component. It offers a novel concept and approach for the implementation of a distant education system. However, the pedagogical efficacy of this strategy is suboptimal. They examined a novel quality education system. From the standpoint of the contemporary educational system framework, they aptly delineate the connotation and categorisation of the system of education, analyse and examine the educational mechanism, and establish an educational model through the relevant feedback mechanism, thereby providing a robust theoretical foundation for research in education. Background and importance of distant education research are examined. MVC design idea, Hibernate, Spring, Struts framework, and related database technologies are utilised to address important issues in the "distance learning teaching assistant system." A design scheme based on MVC model is suggested. Practice shows poor application efficiency. This study presents a computer lab and hairdo centralised remote control system. The system uses UDP broadcast mode to centralise control over all clients in a subnet. Unicast and time delay technologies address limited instantaneous bear ability. Window synchronisation technology supports client-controlled window location and size, enabling precise mouse positioning and system functionality.

In real-world use, nevertheless, this scheme's reaction time is lengthy. A web service-based system is created and put into use in a distant learning program. Flex, Java EE, Red5 technology creation and implementation, and B/S architecture. In this article, we examine how the design of a remote learning system can effectively address the conventional correlation between the broader issue of the educational platform. Students can create an account on the platform and log in, and through the course selection, they can meet their needs. At the same time, the platform allows students to be independent of one another across various courses. Nevertheless, the system is not very stable. There is no study on educational aid, although the three approaches discussed above are connected to the educational system. This element will be the primary emphasis of the system described in this study.

2. Wireless Network-Based remote Education Assistance system design Optimisation

2.1 Designing remote Education Assistance Hardware

The conventional auxiliary system for distant learning fails to facilitate the administration of instructors' face-to-face instruction, leading to disorganised course materials.

Consequently, the conventional system is used to sort out the system's business process, evaluate the needs for thorough analysis, and determine the functions of every system module. The above research shows that several departments share information and have intersections with the current distant education assistance system, which means that the system is quite busy. This article enhances the conventional system and thoroughly examines the effects of several modules on the administrative office's overall operations. You can see the exact outcomes in Figure 1.

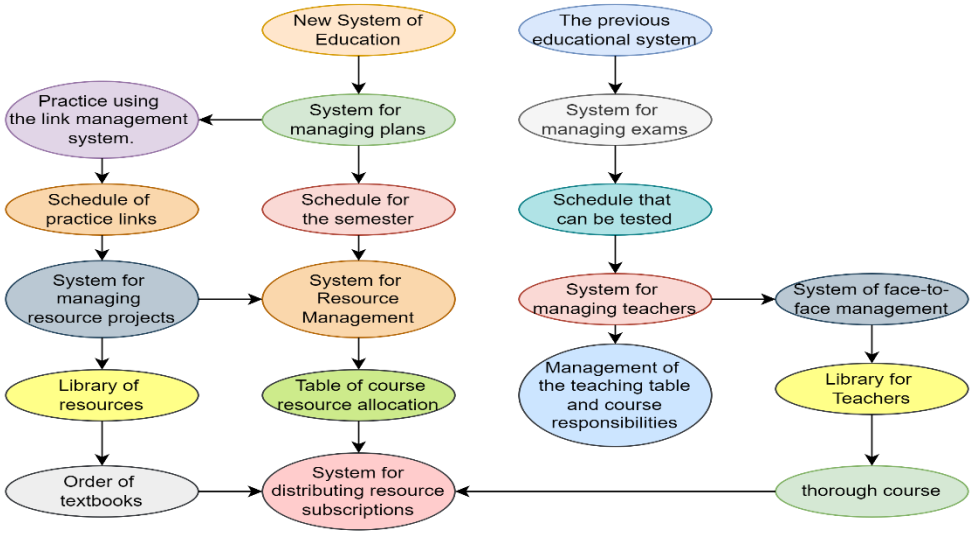

Figure.1 Distance Education Assistance Hardware framework

The aforementioned subsystems function mostly via education management processes. The whole system accommodates most remote education management needs. Current system does not meet these standards. Docking it with remote education management system data may materialise part of the education plan and balance individualised development. The graphic above shows a new whole that may help the planned system perform swiftly and precisely to eliminate human mistakes and interference. The whole system's operation procedure has to be reinforced in accordance with the unique requirements of the current educational system. Eight subsystems make up the intended system. A short introduction is given to the following subsystems:

1. Subsystem for Querying Sources

This subsystem collaborates with a distance education management system, analyses education needs, organises teaching plans, curriculum rules, and data, and gathers new semester curriculum information. Managers will get all course information to help instructors and students. The real-time information interchange and dynamic updating of each sub-module across systems records and saves the whole process. The system used by distant education administrators imports course inquiry data. Distance education management systems cannot provide other information. Course info inquiry may acquire all course details from one site. According to Figure 1, the developed system is the sole means to query courses and the foundation of the remote education assistance system.

2. Subsystem for Managing face-to-face Teaching

Modules like professional rule management along with open course management make up the subsystem. Managers may gather data by assessing schools' instructors, key openings, and branch school teaching conditions. The technology monitors face-to-face teaching among students and instructors, allowing for immediate enquiries regarding their teaching situation. Teacher workload, attendance, etc. Users' authority varies. No matter the time, branch school executives may ask about instructors' instruction.

3. Subsystem Planning Management

This module complements the remote education management system's planning module. To satisfy the individualised demands of the system, collect the college's next work plan, process it, and receive the course plan in accordance with the college for practical preparations.

4. System for Managing Resources
Preparing, publishing, and utilising materials, collecting comments, and managing educational resources are stored. Implement and manage the whole resource utilisation process to periodically update the resource database and give system resource allocation data.

5. Project Management Resource Subsystem
It is closely related to the aforementioned subsystems and can complete the mid-term evaluation of instructional materials and sustain system functioning.

6. Subsystem for Practice Management
Practices are grouped by subsystem teaching plan data. The procedure requires subsystem cooperation. Firstly, the job to make training materials needs to be well handled by doing a number of things. The entire system is built on it.

7. Exam Management Subsystem
Exam work is dynamically administered via remote education administration system. College teachers are examined in groups to enable real-time data exchange and accuracy. With the machine core, instructors' work can be monitored in real time, relevant issues can be tracked, examination issues can be protected, and the test can run smoothly.

8. Resource Allocation/Subscription Subsystem
Subscription and allocation may be done after resource allocation. Manage related work based on college criteria. This subsystem manages resource subscription and allocation, monitoring it thoroughly. It also boosts job efficiency and system. By completing the college's resource subscription along with allocation via the design system, an integrated teaching unit may minimise personnel, physical resources, and work costs. The appropriate project groups meet and debate the fundamental demands and business needs gathered by college departments to find the following solutions.

- **Module for User Management:**

This module handles new user administration operations but not self-registration. Users may only create staff with system rights. Figure 2 shows the user management module diagram.

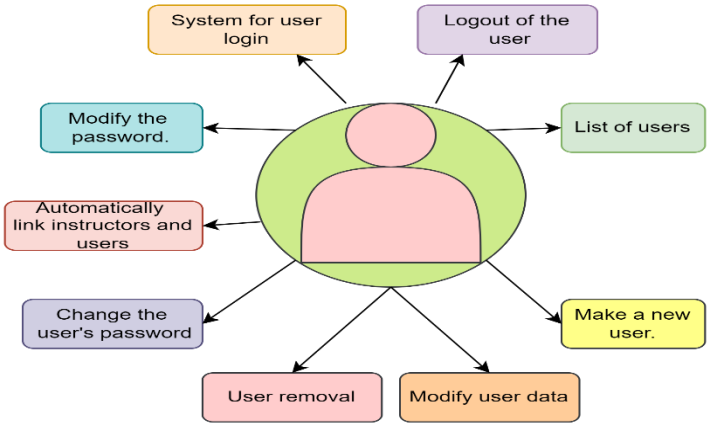

Figure. 2 User Management Module Diagram.

- **Module for Managing Roles:**

In order to add new roles to the system, the system grants matching functional rights and offers a variety of customisable role creation options for modules.

- **Module for Managing Teachers:**

The teacher list is where the teacher team module for curriculum management is chosen, and this module is mostly used to handle the relevant work of the teacher list.

- **Module on Semester Setting Management:**

To determine whether pupils are in school, the system must routinely maintain the starting semester.

- **Module for Course Inquiry:**

The system may combine user-entered criteria, create query lists, and retrieve specific information.

2.2 Optimisation of Remote Education helper Software Design
The software architecture of a remote education assistance system prioritises visual and audio signals. The system's video and audio acquisition module are crucial. Video-audio synchronisation is crucial to the system. The program consists of three modules: visual signal processing, audio signal processing, and synchronisation. See Figure 3 for details.

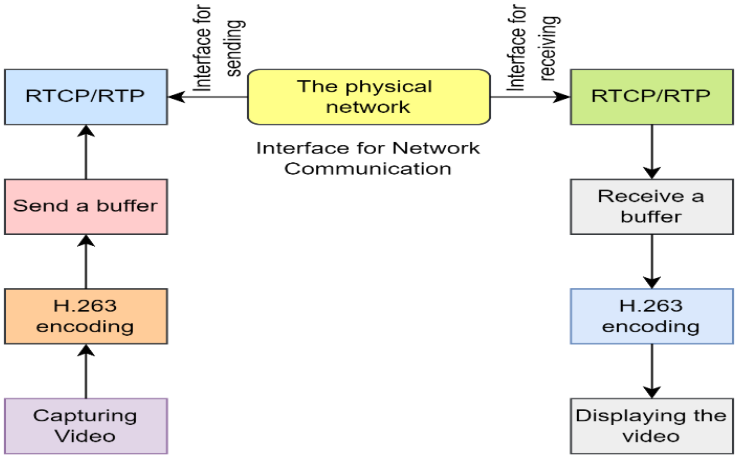

Figure. 3 Acquisition Structure Diagram for Video Signals

(1) Acquisition of Video Signals:

Figure 1 shows that camera & video acquisition card are used to acquire video signals. The entry of different videos is mostly the responsibility of the acquisition card. It may produce many signals at once and send them to the encoding block. RGB and YUV are popular data types. The two formats above can be freely converted. Here are two space conversion formulas:

$$\begin{bmatrix} Y \\ U \\ V \end{bmatrix} = \begin{bmatrix} 0.298 & 0.588 & 0.115 \\ -0.1688 & -0.3314 & 0.6 \\ 0.6 & -0.4187 & -0.0813 \end{bmatrix} + \begin{bmatrix} 0 \\ 129 \\ 129 \end{bmatrix} \quad (1)$$

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1.403 \\ 1 & -0.34414 & 0 \\ 1 & 1.773 & 0 \end{bmatrix} + \begin{bmatrix} -1.403 \\ 0.34414 \\ -1.773 \end{bmatrix} \times 129 \quad (2)$$

To address real-time video transmission demands, specialists focus on reducing algorithm complexity and computation time. The suggested technique leverages MMX for real-time transmission. MMX has been adopted by Intel. To improve CPU performance for audio, graphics, along with communications. MMX is the biggest Intel architectural upgrade since the Intel386(TM) CPU, which added 32 bits. Technology instructions may speed up graphics, picture, sound, etc. processing. MMX boosts multimedia processing lack. It can mimic 3D visuals, MPEG compression/decompression, stereo sound, etc. using its multimedia instructions.

(2) Acquisition of Audio Signals:

Figure 4 shows that sound cards and microphones are the principal audio signal collection equipment. Analogue audio is captured by the microphone and sent to sound card. Sound card energy converts audio signals to digital for easier system processing. The module is optimised for real-time audio transmission using MMX technology.

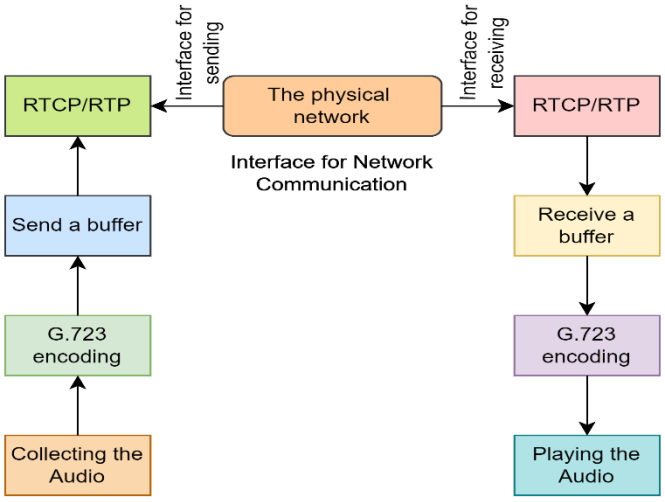

Figure. 4 Audio signal Acquisition Structure Diagram

3. Results and Analysis of Experiments

The wireless network-based remote education assistance system has to undergo simulation trials to confirm its overall efficacy. The setup used for the experiments is a DELL Latitude E6400 with an Intel Core i3M380 processor, 4 GB of RAM, and a clock speed of 2.53GHz. This paper's system was tested and found to be effective in a variety of scenarios by comparing experimental results with those of a control group that included a web-based distance education assistant system, a distance education assistant system, and a sustainable development of distance education system. Time to react and stability of the auxiliary system for distant education are the experimental indices. A more efficient application will have a lower response time. A crucial indicator of the system's usefulness is its stability. As stability improves, the system's performance in real-world applications also improves.

- Figure 5 displays the particular comparative findings of the response time (ms) of several distant education assistance systems.

According to Figure 5, out of the four systems, the developed system has the quickest system reaction time. The most important factor is that the software component of the design system employs the layered design process, which not only optimises the system but also significantly decreases the system's reaction time and overall operating efficiency.

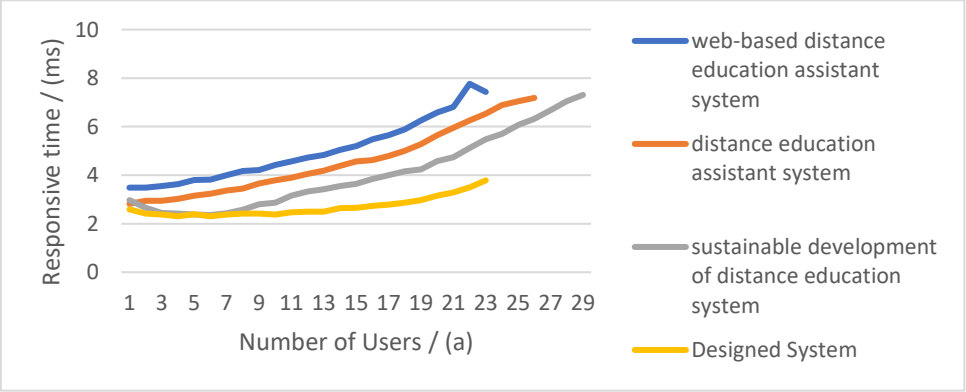

Figure. 5 Response time Comparison of several Techniques

CONCLUSION

Extensive study on various distant education assistance systems has been conducted by the proposed system. The current system's flaws and issues were carefully considered in order to develop a new system—the wireless network-based distant education assistance system. The course data query subsystem, a component of the remote education management assistance system, is

described in depth, along with its design and implementation. Here are the details of the research:

- Analysis of remote education management system status and progress. They compare and assess the functionalities and limitations of various systems.
- A wireless network-based remote education assistance system is built by assessing and upgrading the present system.
- Demand analysis and technological features are examined to enable real-time course information queries.

Distant education management is challenging, as shown by the distant education assistance system study. Each college has a distinct condition despite many attempts to enhance it. The aforementioned makes the distant education assistance system essential. The educational management assistance system, an essential addition to the educational system for management, must be built by each institution to satisfy its work demands and be compatible with the system.

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