MOBILE SYSTEM FOR CUSTOMIZED AND UBIQUITOUS LEARNING BY 4G/5G

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ABSTRACT

Mobile system effectively uses new mode of e-learning through smart mobile phones and wireless network with the ability of omnipresent learning. 4G/5G is introduced with the intension to provide customized and ubiquitous services in terms of faster communication, wider network spectrum and more flexible communications. In present traditional education system learners neither change the content of the curriculum or courses nor access latest information in customized form. The aim of this paper is to provide the Customized and Ubiquitous Knowledge to the learners through smart mobile phones. This paper mainly concentrates on video lecturing about multi disciplinary subjects through smart mobile phones, which uses the features of 4G/5G. The developed system is user-friendly and customized and can improve the electronic learning in a wide range. The system uses WiMax protocol and User profile, in order to access video lecturing and to know the requirements or user preferences multi disciplinary subjects respectively. This paper could play an active and supportive role for students, teachers and educational organization such as universities, schools and institutions which looks for proper m-learning system.

Keywords: 4G, 5G, WiMax, M-learning system, Ubiquitous

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Introduction:

Learning is a continuous life long process that not only helps to improve the knowledge of an individual in respective field but also overall development of individual, any group or society. In the traditional education or learning system teacher transfers knowledge to students in a confined classroom and neither students nor teachers have options to change the content of curriculum instantaneously. With the explosive fascination growth in mobile technology supported by wireless telecommunication technology changed the traditional classroom based teaching, and learners or students can access learning object anywhere anytime and any location. Web based technologies, wireless telecommunication technology, advanced mobile technologies and high speed internet connection provides various modern possibilities for the development of educational technology [1]. E-learning has made learning ubiquitous- ever present with the aid of personal computer (PC) and an internet connection by utilizing networks, whereas m-learning has added more portability or mobility to e-learning model with the aid of smart mobile devices.

Some of the limitations of m-learning restricted its development and popularization. M-learning has not effective or quality of the viewing content diminished due to small screen size of mobile and small keyboards are not satisfying standard ergonomics of inputs and these limits the textual communication and viewing of small chunks of data in mobile devices [2-3]. Some of the shortfalls are - (1) Mobile device screen is too small, unstable and limited memory size, (2) Lack of quality in teaching resource, (3) Reduced bandwidth, (4) High communication cost, (5) substandard format for learning courses and certification, (6) Lack of technical knowledge of teachers, (7) low standard in course material preparation and (8) Lack of integrated learning spaces.

Fourth Generation (4G) Mobile communication system is a new wireless device standard with features like improved data transfer rate, high security, customized and ubiquitous services, interactive multimedia, voice, video, wireless internet and other broadband services with high speed and capacity [4-5]. The International Mobile Telecommunications Advanced (IMT-Advanced) specifies some conditions or requirements for 4G, which includes speed of 100 Mbit/s or more while travelling and 1 Gbit/s while stationary, channel bandwidths of 5-20MHz or some time even up to 40MHz, all-IP based packet switching network and able to switch over multiple heterogeneous networks simultaneously. 5G (Fifth generation wireless systems) is emerging mobile telecommunication standard beyond 4G in terms of speed, bandwidth, data transfer rate and signaling efficiency. Next Generation Mobile Network Alliance (NGMN) defines 5G with some requirements, which includes data transfer rate more than 1 Gbit/s and should support tens of thousands of users, up to several lacks of connection simultaneously and spectral and signaling efficiency should be more than 4G.

This paper proposes a modern m-learning system. This system is developed with the aim to provide customized or personalized and ubiquitous services with aid of 4G/5G wireless communication technology. Some of the specific advantages of 4G/5G communication technology can affectively solve the shortfalls of m-learning. The system is using WiMax, User Profile Filter and many other technologies to enhance mobile learning, which makes a complete m-learning system with services like video lecturing in multi disciplinary subjects, SMS and feedback for learners.

Related Research:

M-learning is new learning model of e-learning, with the help of smart mobile phones and wireless networks. The initial Mobile learning system was based on Short Message Service, which also provided voice services along with SMS. M-learning is a new paradigm in which interaction between students and teacher improved without any barriers to classroom [6]. Brown et al. [7] conducted a case study on mobile learning environment using web2.0 and mobile devices, in order to explore how mobile technologies and social softwares can be used for collaborative learning, sharing, understanding and building virtual communities by considering different user requirements for the university students. Mobile learners can use SMS to transmit some limited amount of text between learners or to internet server and usually most of the students owns mobile phone, but only few students owns PDA[8].

Bailey et al. [9] demonstrated interactive and active learning techniques helps learners to acquire new knowledge, develop reasoning and critical thinking, responds to a problems differently and independently than others, where as in passive learning is on the teaching principle of transferring knowledge from teachers to students in verbal forms. Podcast- a downloaded series of audio or video files via computer is an effective revision tool compare to students their own note or text books and students having provision of flexibility to read notes anywhere, any time[10]. Ubiquitous learning system includes five types of situation parameters as

Personal situation sensors, Environmental sensors, Feedback sensors, Personal database, Environmental database and some models of conducting ubiquitous learning includes real world learning with online guidance, evaluation by identifying real world objects, real world observation with the help of online data searching and cooperative problem solving [11]. Using fourth generation mobile communication technology mobile learners can access learning materials like interactive courses, virtual online labs, interactive online testing and lab exercise training platform by utilizing all-IP communication networks and which uses variety of computer embedded devices in order to access multimedia information [12]. This research proposes a customized and ubiquitous learning through video lecturing for m-learning environment. Customized and ubiquitous learning system purpose is to provide an infrastructure to creating, storing, correcting and accessing video lecturing [11-13].

Customized and Ubiquitous Mobile Learning (CUML)-System Configuration:

The diagram of the CUML architecture is shown in Figure1. The system has four components as Server (video lecturing provider), Client (Learners), Content Provider Engine and Sensor Network. Each component has different tasks.

1. Server

This component provides permission or privilege to video lecturing provider to access CUML-system services. It permits authorized video lecturing provider to upload the video classes' content, SMS and send announcements using WiMax. Following are the some important function of server component.

- Administrating and maintaining all the system tasks

- Approve the registration request of learner.

- When a new video lecturing file is uploaded, sending SMS to all registered learner who are interested in that respective field.

- Initially, when a request comes from learner identify the learner interested field with the help of user profile database.

- After, first communication, store the registered user interested area information in database, so that server can avoid contacting with user profile data.

- Maps the standard format content to modalities through automatic process map.

- When user requested video file is not available in server database, content provider engine successfully searches user requested video file from web and returns to server.

- Loads the video file retrieved by content provider engine into its database for future processing of client request.

2. Client (Learner)

This component is related to the registered learners who have privileges to use the system. The learner can connect to server in order to access multi disciplinary subject's video lecturing classes. Following are the some important function of client component.

- Once registration is approved by the server, learner can login to the CUML system with valid user name and password.

- Receive the SMS from server informing new video lecturing class in respective field

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- Learner can request for video lecturing class which includes duration of 1hour or more in multi disciplinary subjects

- User can change the password whenever required

- Learners can give feed back to the video lecturing class provider through server.

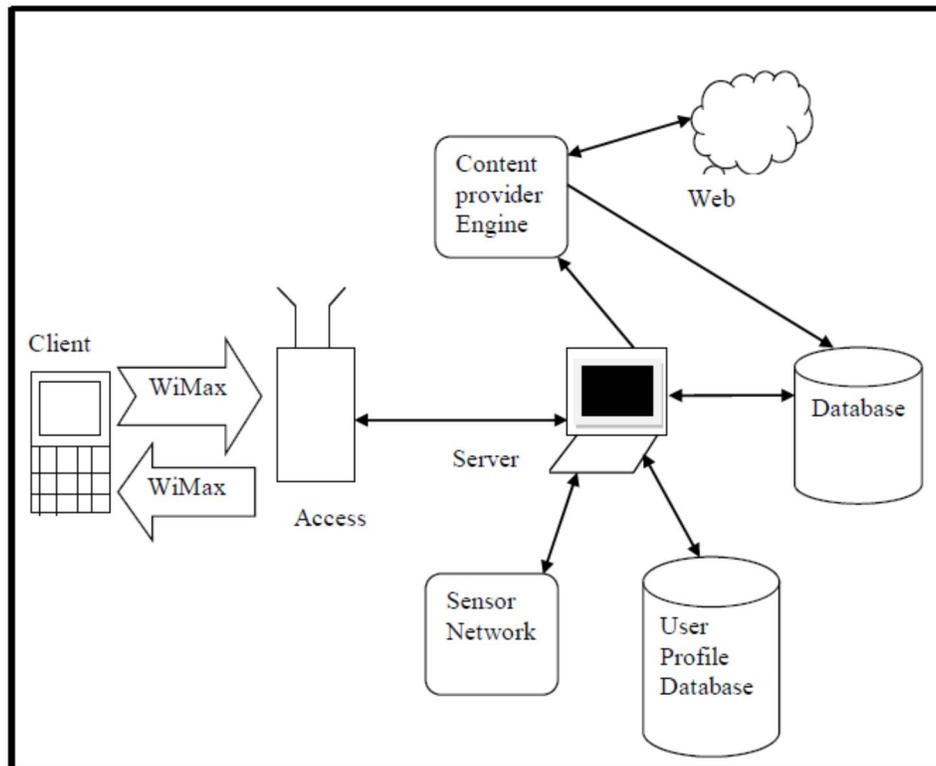- Learners can discuss about particular video lecturing class through server.

Figure 1: CUML-System Architecture

3. Content Provider Engine

This component is useful, when the server is not able to find video lecturing class file requested by the client, server passes this request to content provider engine. Content provider engine search for the file in Web and finds the file. The new file is stored in database, so that when user requests for the same file, server process the request by retrieving the file from its database. Following are the some important function of content provider engine component.

- Successfully search the video lecturing class file from the web, when server is not able to locate.

- Store the new content in server local database

- Provide the content in one standard version or format.

4. Sensor Network

This component is used to automatically sense the user personal and environmental situations [11]. Following are the some important function of Sensor Network component.

- Identify the learner's location so that location specific video lecturing is provided to user

- On-body sensor can identify level of heartbeat and blood pressure in order to provide some video lecturing class related to that

- Environmental sensor includes temperature, humidity and air ingredients using that system is able to find situations or parameters around the sensor and to provide specific video information to user.

Design of the System:

The server side component code (desktop application) was designed and implemented using

- NetBeans IDE 8.0.2 J2SE (Java 2 Standard Edition)

The client side component code (mobile application) was designed and implemented using

- NetBeans IDE 8.0.2 J2SE (Java 2 Micro Edition)

The user profile database and server database tables and DML queries are designed and implemented

using

- MySql Server 5.6

Wireless communication was designed and implemented using

- WiMax

- HC-SDMA (High Capacity Spatial Division Multiple Access)

- AMC (Adaptive Modulation and coding) Adaptive Hybrid ARQ (Automatic Repeat Request)

- MIMO-OFDM (Multi in Multi out Orthogonal Frequency Division Multiplexing)

- Open distributed Ad-Hoc Wireless Network

Content Provider Engine was designed and developed using approaches as

- String matching analysis

- Bag of words analysis

- Signature Stylometry analysis

- Fingerprint analysis

Video file formats was designed and implemented using

- GPlayer

- DicePlayer

- MoboPlayer

For user feedback Application program was implemented using

- Microsoft office 2010

Sensor Network was implemented using

- Tiny-OS

- Hybrid 4G wireless Network Protocols

Features of CUML System:

The features of CUML systems are listed below.

- The system stores videos lecturing class of multi disciplinary subjects

- Learners can get their interested subject video lecturing class

- The system allows the user to access services ubiquitously

- The content provider engine can successfully access video lecturing files, when the server not able to locate it.

- The bandwidth and speed of the video files are highly improved due to the incorporation of 4G/5G Technology

- Sensor network can sense user location, temperature, heartbeat and blood pressure in order to provide highly customized or personalized video lecturing file or information to the user.

- CUML system provides better network for user with the aid of 4G communication network technologies, which includes WiMax, HC-SDMA, AMC, Adaptive Hybrid ARQ, MIMO-OFDM and open distributed Ad-Hoc Wireless Network.

Conclusion:

M-learning provides great flexibility and freedom for the learners to lean anytime, anywhere, without any restrictions to physical barrier. The learning utilizes different hardware and software technologies and there is complete freedom of the learners to exist different location than the teacher. The proposed work in this study focused on how learners can acquire new knowledge through customized and ubiquitous video lecturing classes. The developed system is good user friendly and can improve mobile learning system. The server is accessed by the client through WiMax Wireless protocol that covers huge area compare to Wi-Fi and learners can get video lecturing classes of interested subject and can make m-learning personalized and more interesting. The server manages and administrates all the work of the system. Initially when user makes request for video lecturing server process the request by identifying user interest through user profile database. Server initially looks in its database to serve the request of client. If video file is not available server sends the request to the content provider engine. Content provider engine successfully searches user requested video file from web and returns to server. Server loads that video file in its database for future processing of client request. Sensor network can sense the client location and on-body features like temperature, blood pressure etc. and provide more personalized video lecturing file to the client. Through CUML system server sends announcement to clients, who are interested in the concerned subject, whenever that subject new video lecturing file is uploaded. Learners can give feed back to the video lecturing provider through server. The incorporation of 4G/5G communication technology features improves system speed, bandwidth, network, accessibility and availability. The emergence of 4G technologies not only provides platforms for transmission and interaction of teaching content, but also overcomes shortfalls of it and increases the possibilities of full interaction.

This paper and project described here will become active and supportive role to anyone who is interested in the field or researchers of m-learning. The most important individual might be benefited from this work are research teachers, students or educational organizations like universities or institutions.

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