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Review of Mobile Learning Technology on Engineering Students

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Abstract : Mobile learning is gaining much important in the new millennium. This research was carried out to find the acceptance level of the learners and teachers on the mobile learning environment. This mobile learning is to improve the students or learners attention and motivate them into the learning practice. The major advantage of this mobile learning is used additional or supplemental source of learning any time; anywhere; any network; on any wireless device concept of their mobile learning system and the effectiveness of video lesson using in the mobile learning. It should increase the learning interest and communication to the learner's learning experience in their studies. This paper reviews of the mobile learning technology on engineering students.

IndexTerms **– Mobile, Learning, Engineering, Technology, Student.**

I. INTRODUCTION

In recent years, the advent of mobile learning technologies have been offering cheaper and more convenient communication so that students and educators can access information and communicate with one another anytime, anywhere ubiquitously by using various mobile devices [1]. Mobile learning is a method of using wireless and mobile technologies in education by extending access to a desktop-based online environment to handheld devices such as Personal Digital Assistant (PDA)'s used as part of mobile community. Mobile learning offers another vision using handheld devices (HD) in wireless classrooms for computer supported cooperative learning. As an emerging service architecture, micro service enables decomposition of a monolithic web service into a set of independent lightweight services which can be executed independently. With mobile edge computing, microservices can be further deployed in edge clouds dynamically, launched quickly, and migrated across edge clouds easily, providing better services for users in proximity. However, the user mobility can result in frequent switch of nearby edge clouds, which increases the service delay when users move away from their serving edge clouds. To address this issue, this article investigates micro service coordination among edge clouds to enable seamless and real-time responses to service requests from mobile users [2].

Device-to-Device (D2D) caching assists Mobile Edge Computing (MEC) based caching in offloading inter-domain traffic by sharing cached items with nearby users, while its performance relies heavily on caching nodes' sharing willingness. In this work, a Blockchain-based Cache and Delivery Market (CDM) is proposed as an incentive mechanism for the distributed caching system. Under given incentive mechanisms, both D2D and MEC caching nodes' willingness is guaranteed by satisfying their expected reward for cache sharing. Besides, for the distributed CDM, content delivery related transactions are executed by smart contracts [4]. Open Source Computer Vision Library (OpenCV) Basics is an application designed with the purpose of facilitating the initiation of industrial engineering students in the field of Computer Vision, making the learning process easier, more dynamic and more direct. To this end, an application has been developed for the Android operating system with which users can make use of a wide variety of algorithms available in the OpenCV library. Background: Teaching topics related to Computer Vision can rely on the use of new technologies such as mobile applications [5].

II. BACKGROUND

S. Wang et al.,[1] a dynamic programming-based offline microservice coordination algorithm, that can achieve the globally optimal performance. However, the offline algorithm heavily relies on the availability of the prior information such as computation request arrivals, time-varying channel conditions and edge cloud's computation capabilities required, which is hard to be obtained. Therefore, we reformulate the microservice coordination problem using Markov decision process framework and then propose a reinforcement learning-based online microservice coordination algorithm to learn the optimal strategy. Theoretical analysis proves that the offline algorithm can find the optimal solution while the online algorithm can achieve near-optimal performance.

J. A. Kumar et al.,[2] results suggest (1) Behavioral intention was positively and significantly influenced by mobile learning self-efficacy, attitude, and perceived usefulness; (2) Attitude was positively and significantly influenced by subjective norm, perceived usefulness, and mobile learning self-efficacy; (3) Mobile learning self-efficacy was only influenced by perceived ease of use and (4) Habit of using WhatsApp did not influence perceived usefulness nor perceived ease of use but had a positive and significant relationship with mobile learning self-efficacy. Nonlinear relationships were also observed between (1) Behavioral intention with perceived ease of use, perceived usefulness, and subjective norm (2) Habit with perceived usefulness and mobile learning self-efficacy.

C. Verma et al.,[3] proposed a novel futuristic approach to support the educational informatics and overcome the conventional system of attitude measure. For this, we presented a significant predictive model to identify the attitude of students towards technology. The present approach not only explored the impact of the technology but also predicted an opinion of students. The concept of an online awareness model may overcome the traditional method. We have performed the descriptive and inferential statistics to predict the attitude of Indian students towards the ICTMT in university education with primary data samples. Factor Analysis (FA) using Principal Component Analysis (PCA) has extracted the prominent two components with nine features for technology benefits and six features for the technology use.

R. Zhang et al.,[4]. To achieve consensus on transactions and prevent frauds, a consensus protocol among the smart contract execution nodes (SCENE) is necessary. To minimize the latency of reaching consensus while guaranteeing its confidence level, we propose partial Practical Byzantine Fault Tolerance (pPBFT) protocol. Further, the model of cache sharing and transaction execution consensus is proposed, and we further formulate caching placement and SCENE selection as Markov Decision Process problems. Due to the complexity and dynamics of the problems, a deep reinforcement learning approach is adopted to solve the problem. The simulation results show that the proposed schemes outperform conventional solutions in terms of traffic offloading, content retrieval latency, and consensus latency.

J. Sigut et al.,[5] objective is to facilitate the assimilation of concepts related to Computer Vision by taking advantage of the camera and the processing power of a mobile device to observe in real time the effects produced on an image by many of the image processing algorithms included in OpenCV. This application is currently available to be downloaded for free through the Google Play Store so that anyone interested in the field of Computer Vision can make use of it. Application Design: The proposed approach introduces students to concepts related to Computer Vision by making use of the developed application, complementing the theoretical contents taught by the teacher with specific examples. Findings: The degree of satisfaction of OpenCV Basics users has been evaluated within the framework of the course advanced robotized systems, taught in the industrial engineering degree at the University of La Laguna.

W. -C. Lien et al.,[6] Recently, ultrasound has been increasingly used in emergency departments (EDs) due to its promising noninvasive and portable characteristics. Traditional ultrasound training is a complex process that requires knowledge gain, development of psychomotor skills, and visual perception. However, it usually takes a long time for a novice sonographer to finish an ultrasound training program, and the training may target on limited applications. The e-learning, information, and communication technology on digital devices to support learning may overcome the limitations of the traditional ultrasound training. Design and implement a mobile e-learning platform for ultrasound training, namely MEUS, to address the abovementioned issues. The MEUS provides an interactive learning environment for teachers and learners. Teachers and learners can access MEUS and receive real-time feedback anywhere and anytime through a mobile device or desktop.

J. Feng et al.,[7] develop a cooperative computation offloading and resource allocation framework for blockchain-enabled MEC systems. In the framework, we design a multiobjective function to maximize the computation rate of MEC systems and the transaction throughput of blockchain systems by jointly optimizing offloading decision, power allocation, block size, and block interval. Due to the dynamic characteristics of the wireless fading channel and the processing queues at MEC servers, the joint optimization is formulated as a Markov decision process (MDP). To tackle the dynamics and complexity of the blockchain-enabled MEC system, we develop an asynchronous advantage actor-critic-based cooperation computation offloading and resource allocation algorithm to solve the MDP problem.

M. M. Elaish et al.,[8] a mobile application named VocabGame was developed based on a set of persuasive guidelines, and it was launched in the Google Play Store. This work investigated whether the developed VocabGame can motivate native Arab students learning the English language to achieve better performance. Sixty-four students were divided equally into two groups: the control group (high-performance group) and the experimental group (low-performance group). Students in the experimental group improved their motivation level significantly after the mobile learning intervention. Our findings showed that mobile game application is helpful for those students who had poor performance initially while studying English and improves their confidence. There was also an association between the pre-test and the post-test scores according to the motivation to learn based on the analysis of the covariate analysis with η_p^2 being 0.148. A mobile application game was successfully developed to motivate Arab native students to learn English as a secondary language.

O. O. Ortiz et al.,[9] work describes a study of teaching a programming language in a C programming course by having students assemble and program a low-cost mobile robot. Writing their own programs to define the robot's behavior raised students' motivation. Working in small groups, students programmed the robots by using the control structures of structured programming. Over the course, there was a significant improvement in students' academic performance and motivation. The approach took into account four of the motivational factors that feature in the ARCS model: (1) attention; (2) relevance; (3) confidence; and (4) satisfaction. The main achievements of the approach were to be able to: (1) catch and hold students' attention throughout the course; (2) increase students' confidence in the learning process; (3) achieve a high student satisfaction level with their acquired skills; and (4) demonstrate to students the practical usefulness of the knowledge they had learned.

K. -Y. Chin et al.,[10] Teachers also agreed that QR-ULMPS was a useful tool to motivate students' learning during outdoor teaching activities. Moreover, results of the IMMS questionnaire indicated that students assigned to the proposed u-learning system achieved better results than participants learning via conventional methods. We believe that the proposed u-learning system is advantageous because it enhances student motivation and allows for higher levels of engagement, particularly during outdoor learning activities. Thus, we conclude that the proposed u-learning system can create a learning experience that both interests and engages students. Although QR-ULMPS is not mature enough to be used across a sundry of educational domains, it provides an innovative opportunity for teachers to integrate a novel teaching methodology that challenges traditional educational norms.

M. Á. C. González et al.,[11] describes the experience of the application of a mobile version of these personal environments in an educational context. It allows students the definition of their own personal environments in their mobile device and it is able to exchange information with the institutional systems. From this experience, it is possible to say the definition of mobile personal learning environments is possible, it increases learners' motivation and enriches their learning; and at the same time, it is possible to take into account what the learners do beyond the institution.

E. Granado et al.,[12] shows remote experimentation using mobile technology for didactic purposes. Students using WiFi-enabled mobile devices, such as smartphones, tablets or PDAs can interact with physical laboratory hardware. Through a mobile device interface, in real time the user can verify what's happening on laboratory hardware when they change the system parameters. Additionally, the application provides the students a tool for taking advantage of their spare time at the University. Students can perform the lab practices even when the lab facilities are closed. All user activities are stored in a database for later analysis carry out by the professor. Also, students can store their experiments when is finished in order to make an off-line result analysis.

V. Garaj et al.,[13] An extensive user requirements study was carried out to define the scope of functionality for the applications of m-learning with the potential to enhance the student performance and experience within the BSc Multimedia Technology and Design (MMTD) course at the School of Engineering and Design, Brunel University, United Kingdom. Based on participatory action research and user-centered design, the study involved 58 students attending the course at Level 2.

R. T. Castles et al.,[14] goal of this module is to introduce first-year engineering students to a portion of the mechanical engineering, electrical engineering, and computer engineering disciplines within a collaborative setting. Interestingly, while the largest portion of engineering students in the United States are enrolled in electrical and mechanical engineering programs, there is a disparity between the percentage of male engineering students and female engineering students within those disciplines relative to the overall distribution of all students among the various engineering disciplines.

III. CHALLENGES AND SURVEY ANALYSIS

The existing computation-offloading works have also some open issues:

- Security and Privacy Issues.
- Cooperative Computation Offloading.
- Dynamic Optimization.

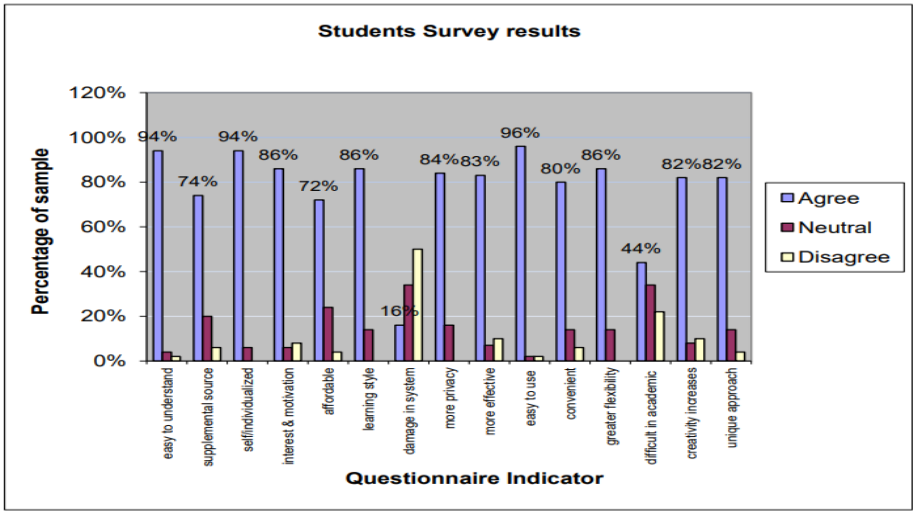

Figure 1: Student Survey results [15]

The result on students' acceptance level for mobile learning, 96% of students agree that mobile learning is easy to use in travelling, 2% of students is neutral and 2% is disagree, 94% of students says that usage of video lesson in learning is easy to understand and mobile learning is self study or individualized learning or personalized learning and 4% of students is neutral for easy to understand and 2% was disagreed. 6% of students is neutral for self study or individualized learning. Similarly, 86% of students agree that the mobile learning can change the learning style of the students and increases the interest and motivation in learning and it has greater flexibility. 50% of respondents are disagreed that the technology enabled system cannot create any damage in value system, 34% of respondents are neutral and 16% of respondents are agreed the damage in value system. The wireless handheld or mobile phone is convenient to carry their data with them all the places is agreed for 80% of students. 14% of students are neutral and 6% are disagreed. The 74% and 72% of students are agreed that the mobile learning is used as the additional or supplemental source of learning and it is more affordable. The overall opinion about the mobile learning has acceptance by the students.

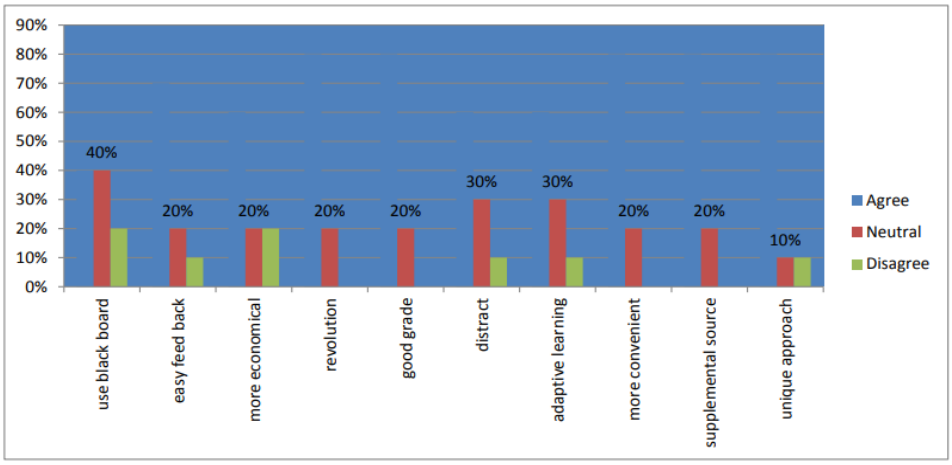

Figure 2: Teacher survey results [15]

Results of the teachers' acceptance level of mobile learning. The survey results for 10 faculties in the same department and the same college. 80% of teachers are agreed that the mobile learning is a revolution in the field of e-learning, it is used to help the student for getting good grade, usage of educational video lessons in classroom is more convenient to explain the diagram it is not possible to draw it in the chalk board, and this new method is the additional or supplemental source of learning, 20% of teachers were disagreed these indicators. 70% of teachers indicate that agree the devices are simple and quick easy way to get the feedback from the students, 20% of teachers were neutralized and 10% were disagreed. 60% of teachers have indicating that the mobile learning is the adaptive learning environment, 30% of teachers was neutral and 10% were disagreed. This new learning method is more economical has agreed for 60% of teachers and 20% were neutral and 20% were disagreed. 40% of teachers are preferred to use of black board in teaching, 40% of teachers was neutral and 20% were disagreed. It indicates most of the teachers are using the multimedia based teaching in the classroom.

IV. CONCLUSION

This paper presents review of mobile learning technology on engineering students. Results show that the learners are interested on this new device. This also provides that the concept of mobile learning can be easy to understand the video in learning and. easy to use in travelling. It has the convenient device to learn any time, anywhere, any device; any network and any data concept based on the current learning style and also provide an interactive and adaptive learning environment. The mobile learning is the best method for self study or individualized learning system. For future research, to conduct the pre and post test for students in universities and engineering colleges and compare the analysis for mlearning and other learning methods like classroom learning, e-learning.

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