Hiding Lab Exercise in the Technical Education System: A Case Study(Oculto)

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Abstract: Nowadays, it can be observed that computer laboratories in technical education system have encountered many challenges which prevent them to achieve their quality objectives. In a technical institution, the systems are maintained by the lab assistant/in-charge. One of their challenge is to monitor students' experiments in the laboratory during end semester examination and to make sure that student cannot access to previously practiced experiments during exams.

To overcome this challenge and to help the lab assistant/in-charge in further enhancing the quality of the laboratory exam, we have built an application an Oculto to hide and encrypt previous experiments from the students in the Department of Computer Science & Engineering at Anurag Group of Institutions, Hyderabad, India. The outcomes are successful and totally support the lab assistant/in-charge in additional boosting the productivity and effectiveness of the traditional practices thus helps academic institutions to reach a higher academic standard. Several directions for forthcoming improvements are possible. Among them, we can state: to be tested in the real time environment, where we can actually have the statistics of how the proposed solution improve malpractices by students and to find the impact on students' performance and support staff.

Keywords: Education, Encryption, End-examination Laboratory, Hide, and Technical Education System.

1. Introduction

Today's worldwide students' learning compels that current learning procedures have to be transformed to encounter the traditional practice of acquiring knowledge. There is a thirst for the establishment of technological environment to completely change our society to support the various types of learners. In a technical education system, one of the universal obstacles encountered by lab in-charge while conducting lab sessions is to make sure that students cannot access their previous work done in the lab. In the field of education of Science and Technology there are numerous ways to solve this problem. For example, classroom management software are commercially available in the market these days. Many researchers have discovered that type of software application improve teaching learning methodology. However this type of management applications software are expensive and cannot be altered as source code is not available. We have developed a sophisticated tool (Oculto) by using the latest security algorithms and implemented in the department of computer science & engineering at Anurag Group of Institutions, Hyderabad, India.

According to Wernher Von Braun, research is what we're carrying out when we don't know what we're doing. He thinks that commonly in classrooms mentors expect students to know what they are doing at all times where in fact there is a need for students to pursue STEM fields in order to fill the career openings of the coming [1]. According to Martin-Hansen, types of inquiry projects include open/full, guided, coupled, or structured. Open inquisition relies on a student-cantered approach where students conduct investigations, design experiments, create questions, and communicate results. Guided inquisition allows the teacher to pose a question for investigation and then letting students decide how to continue through the experiment and create conclusions. Coupled interrogation involves a teacher's question followed by students creating their own follow-up questions and procedures for the experiment and finally settling on a resolution with an assessment. Structured inquisition is mainly directed by the teacher, and is the more conventionally used model [2]. According to S. S. Rawat et al., Modern societies where knowledge and global economies are increasingly converging, crave undergraduate students to receive broad education in a range of areas and not only disciplinary courses for a given course of study. With the economic growth, rapid advances in technology and intellectual science, and a global movement toward outcomes-based program require changes in the traditional model of engineering education design and delivery [3]. As of yet, there is no legitimized framework for designing instructional development programs that would equip engineering educators to make those changes. Existing programs vary considerably in scope and effectiveness across countries and institutions. This work targets at assisting lab instructor in any technical education system for delivering effective learning environments engineering students. The aim of Anurag Group of Institutions is to inculcate two sets of skills in the students: engineering skills

and professional skills. According to Jon G Penner, students prefer strategies promoting active learning to traditional lectures. Each faculty member should engage in self-reflection, exploring their personal willingness to experiment with alternative approaches to instruction [4]. Chelsea Sabo, from University of Sheffield Hallam, United Kingdom, adds that outstanding project-based learning focuses on projects that include the following factors [5]:

- Student capability to adapt to the learning process,
- Understanding that work is central rather than peripheral to the curriculum,
- Challenging issues or questions that lead students to in-depth exploration of authentic topics,
- Important tools and skills like technology for learning,
- Products that explain dilemmas, solve problems, or present knowledge generated through research,
- Multiple products that permit frequent feedback,
- Performance-based assessments that communicate high expectations, rigorous challenges, and
- Collaboration in some form.

Bonwell and Eison [6] discuss the active learning highlights student actions such as reading, writing, discussing, problem solving, and similar classroom engagements as project-based learning. H. S. Saini and S. S. Rawat [7] have discussed that Institution has established four innovation centres namely robotics and industrial automation research centre, solar power applications, software research and development, and machine vision for improving engineering education.

Above section discusses the introduction and significance for incorporating engineering advancements. The rest of the paper is organized as follows. Section two discussed the related work on encryption techniques. Section three formulates the proposed approach for building Oculto system. Section five give the results with different screen shots of Oculto system. We conclude in the section five.

2. Literature Survey

Md. Alam Hossain [8] compared different Encryption algorithms based on their performance on the following factors: (a) Encryption Time (b) Decryption Time (c) Software Specification (d)Hardware Specification (e)Key Management. They concluded that AES algorithm consumes least time while RSA consumes longest time. According to Chang L. and GuangMing X. [9], the process of design about file encryption and decryption, the system of password is an important guarantee for file security. Ritu Tripathi [10] made a comparative study of symmetric and asymmetric cryptographic techniques. She discovered that in the aspect of throughput, Blowfish is considered as best as it is faster and consumes less power providing more throughputs. A secure data hiding scheme for binary images by Yu-chee Tseng [11] presented a steganography technique, which is capable of hiding a piece of critical information in a host message which is a binary image. This scheme can provide a higher security, embed more information and maintain a higher quality of the host image than available schemes.

Although there many tools available for encryption. But each of them have their own flaws and disadvantages. The comparison of different tools and description shown in Table 2.1.

Table 2.1 Comparison between different tools

S.No	Tool	Description
1.	VeraCrypt	It can encrypt whole hard disk volume.
2.	7-Zip	It can encrypt single file and a folder
3.	Jcrypt	It can encrypt text files with any encryption algorithm which are present in market
4.	AxCrypt	It can encrypt files and folders like 7-Zip.
5.	Eraser	It can hide the file from others.
6.	Bitlocker	It can encrypt the whole hard disk volume

Namje Park [12] identified that cloud computing service provider cannot be totally trusted due to data security reasons, risk of data security and violation of privacy factors. To solve these problems he proposed scheme which guarantees data confidentiality and fine-grained access control. Okeke Stephen [13] observed that malicious thefts and data stealing is increasing at alarming rates. Many people have lost their money and some of the companies have shut down due to the activities of dubious hackers and attackers. Suchita Tayde [14] made a research on file encryption and decryption using AES algorithm in android phone. Comparing with conventional computer, smart phone is easily carried out and provides much computer functionality, such as processing, communication, data storage as well as many computers services such as web browser, video or audio player, video call, GPS, wireless network. However, smart phone have to come long way in terms of security. Prasoon Raghav [15] discussed about securing data in cloud using AES algorithm. With the large growth of important data on cloud, cloud security is obtaining a lot of vital than even before. The expansion of the cloud users has sadly been accompanied with a growth in malicious activity within the cloud. More and more vulnerabilities are discovered, and nearly daily, new security advisories are revealed. So, in order to reduce this they proposed AES encryption for cloud to secure data.

3. Proposed Approach for Oculto

This work provides an improve way to handle and supervise end semester experiments. In a context of conducting end

laboratory examination in various technical education system, the possibility of students' involvement in malpractice can't be avoided. Though after physical verification by the lab instructor, students' can always refer to the experiments they have done during the semester. One obvious solution could be to format the system before conducting the end lab experiments. This whole activity involve the many man-hour to make the system available to the students. So there is a need to find an alternative to this problem. This is where the hiding end experiments system can be used. The lab assistant/in-charge does not have to do much of the work, thus reducing the burden on the administrator.

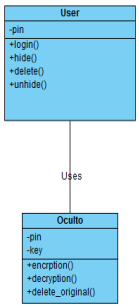

Fig. 1 Class diagram of the proposed system

Figure 1 shows the different modules are employed to represent the system. Basically, there are only two classes. User class used for logging in to application and Oculto class has two attributes pin and key. Pin is used to check authenticity of user while key is used for encryption algorithm. First the admin or lab instructor/in-charge need to register with the Oculto system and choose the PIN. After choosing the PIN user have to login to the application and then Oculto displays the categories to choose. When a file is chosen then, Oculto encrypts the file and stores in destination folder and it deletes the original file from system. These selected files are securely stored on the destination folder or server and are not accessible to students, thus preventing the manipulation of data by students. Whenever the admin wants to see the file he/she should select unhide option and then the file which is selected is decrypted and moved to desktop.

4. Simulation Results of Oculto

We have built simulated instances to assist lab instructor/in-charges to conduct the end laboratory examination smoothly. In our experimental testing, we have used Java, Windows 10 and 36 homogeneous machines at the Department of Computer Science & Engineering, Anurag Group of Institutions.

Figure 2 (a) shows the login screen of proposed system: Oculto. This can be only accessed by the admin or lab instructor/in-charge. Lab instructor/in-charge has to enter password to login and access the hidden files.

Figure 2(b) gives the options to the admin to select the files to hide and keep it in the encrypted form and delete the file from the source location. Admin also has option to unhide and delete hidden files.

Figure 2(c) shows the dialogue "File hidden successfully" after successful attempt by the admin to hide the file and the original format is deleted.

Figure 2(d) display the dialogue "File moved to Desktop" after successful attempt by the admin to unhide the selected file. The selected file will be decrypted and moved to desktop.

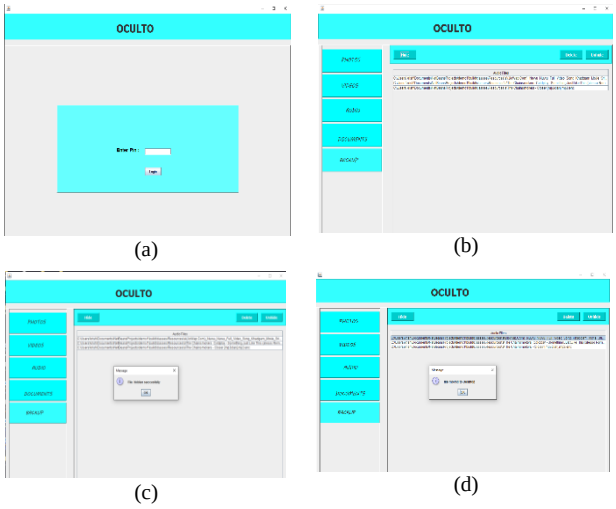

Fig. 2 Simulation of proposed system: (a) login screen (b) options to select files for hiding (c) File hidden successfully (d) File moved to desktop

5. Conclusions & Future Scope

This paper has been an effort in providing the result toward advancing the technical educational system and provides a better way to conduct and maintain end lab examination in the technical education system. The lab assistant/in-charge does not have to worry about students' copying the previous lab experiments, thus reducing the burden on the administrator. The main idea is organized into a model to represent how technology can be used in educational system to improve the efficiency and effectiveness of the traditional processes. Several directions for forthcoming improvements are possible. Among them, we can state:

- To be tested in the real time environment, where we can actually have the statistics of how the proposed solution improve malpractices by students
- To find the impact on students' performance and support staff

The system is presented as a guideline for technical educational system to improve their decision-making processes. It can also encrypt the lab experiments students' have done during the semesters. It can also act roadmap as part of their educational processes and develop how lab instructors can improve their traditional practices by getting advantages of it.

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References

[1] Werner Von Braun, Fuller, J. (2001). An integrated hands-on inquiry based cooperative learning approach: The impact of the PALMS approach on student growth. ERIC Publications: ED 453176.
[2] Mar tin-Hansen, L. (2002). Defining inquiry: Exploring the many types of inquiry in the science classroom. The Science Teacher, 69(2), 34–37.
[3] Sandeep Singh Rawat, S. Sreenatha Reddy, Devi Prasad Mishra, Salma Sultana (2015) Ascertaining the Factors Influencing Students' Performance for Engineering Pedagogy, Journal of Engineering Education Transformations. DOI: 10.16920/ijerit/2015/v0i0/59408.
[4] Penner, Jon G. (1984). Why Many College Teachers Cannot Lecture. Springfield, Ill.: Charles C. Thomas.
[5] Chelsea Sabo, A Burrows, Lois Childers (2014) Shaking Up Pre-Calculus: Incorporating Engineering into K-12 Curricula.
[6] Bonwell, C. & Eison, J. (1991) Active learning: Creating excitement in the classroom. ERIC Clearinghouse on Higher Education (#ED340272). Washington, DC.
[7] H. S. Saini, S. S. Rawat (2015) Industry Innovations for Enhanced Employability: A Case Study of Academic Industry Interaction. DOI: 10.16920/ijerit/2015/v0i0/59401.
[8]. Hossain, M. A. (2014) Analysis of Different Cryptography Algorithms, International journal of Computer Science and Engineering, 2(4), 76-82.
[9]. Chang L. and GuangMing X. (2012) Research and Implementation of File Encryption and Decryption, Advances in Intelligent and Soft Computing, 141, 165-170.
[10]. Tripathi, R. (2014) Symmetric and Asymmetric Encryption Techniques, International Journal of Computer Applications, 4(6).
[11]. Tseng, B.Y.C (2002) Secure data hiding scheme for binary images, IEEE Transactions on Communications, 50(8).
[12]. Park N. (2011) Secure Data Access Control Scheme Using Type-Based Re-encryption in Cloud Environment, Semantic Methods for Knowledge Management and Communication, 381,319-327.
[13]. Stephen, O. (2014) Cloud Data Encryption, International Journal of Computer Science and Information Technologies, 4(10).
[14]. Tayde, S. (2015) Encryption and Decryption using AES in android phone, International journal of Advances Computer Science and Information Technologies, 5 (5), 550-554.
[15]. Raghav, P. (2016) Secure data using AES algorithm, International Journal of Computer Science and Information Technologies, 6(4).

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