Alleviation of Cheating in English Academic Writing Exams Using a Developed Tracking Application

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Abstract—**Examinations play an important role in the teaching/learning processes to measure students' learning outcomes. Today, to comply with the social distancing policy, it has become a big concern for organizing the test online when the students are asked to take a test and submit an answer online. Occasionally, it is likely that students may conduct cheating during the online tests, particularly when no proctor is executed. Submission of exam answers through electronic files may create opportunity for the students to help one another or obtain the answers from the Internet. Therefore, the detection and prevention are needed to monitor the testing process to ensure that the examinations really measure the students' competence. Educational credentials must show actual students' knowledge to retain their academic value to society. This work proposed a method to develop an application that can assist instructors in detecting the students' misconduct when taking academic writing tests. To achieve this, the time spent on writing each part and the content of an essay can be tracked. This method can also be used to fulfill other methods using devices such as webcams and microphones. The information the students typed was kept during exam. Each student was requested to submit not only the answer file, but also the encrypted file recording how the students wrote the answer. Finally, the answer file and the encrypted file were checked by the instructors and then the score was given based on the answer file or both of them.**

Keywords—academic writing, cheating, examination, tracking exam answering

I. INTRODUCTION

Covid-19 is the global pandemic that immensely changes the teaching/learning paradigms around the globe. Recently, the demand for online learning has increased dramatically and become paramount to facilitate the instructors and learners to provide and share knowledge in the midst of health crisis. Despite being convenience and flexibility; however, learning online creates some difficulties for many instructors. For instance, the instructors have to adjust themselves to learn new technology for one reason; another reason is the fact that both the instructors and the students are not well-equipped with the online learning facilities. Moreover, testing is one of the major problems for numerous instructors because they do not know what the students are doing while taking an online exam. Despite advanced technology, online testing has resulted in the increased academic dishonesty in universities. Cheating on examinations in academic institutions is a worldwide issue [1]. For better or worse, researchers have proposed several methods to proctor the exams to retain scholastic integrity. These methods were classified into 3 groups: (1) no proctoring [2], (2) online human monitoring [3,4], and (3) semi-automated machine proctoring [5,6]. No proctoring does not mean that the exam takers or the students are allowed to conduct cheating. Instead, the faculties should create the procedures that increase the difficulty of cheating or minimizing cheating and thus reducing the likelihood of cheating [2]. Consequently, academic honesty could be enhanced. Online monitoring is a general approach used to monitor the exams, but it is costly. Budget has been allocated to pay staff when monitoring the test takers. Although video recording could be used to monitor exams, some researchers used snapshots instead of a video file [4], which was much larger and took up a lot of communication resources for transmission. Semi-automated machine proctoring was used for creating a robot that could transmit videos to a monitoring center if there was any suspicious behavior captured [6].

Academic English writing is an essential skill for success in schools and future careers. Writing skills do not develop naturally but they can be taught. To eliminate cheating online and offline, the proposed method greatly benefits language instructors, educators and test designers to monitor and detect shorter or longer writing texts of the students. For essay writing, teachers are the key resource to help learners to gain achievement [7]. Teachers have to teach, explain and inspire their students by utilizing new methods in writing classes to improve the effectiveness for every aspect in essay writing tasks [8]. A tracking application can help the instructors investigate the strength and weakness of their students. The created content as well as the time spent on writing a paragraph or an essay can be easily monitored. In addition, a tracking system can be useful to the instructors in the sense that they can coach their students how to write more effectively. Hence, this paper proposed an economical method that could be used to detect and prevent cheating in English academic writing

exams. The developed program could reveal and provide information how the students created their writing work, resulting in enhanced writing skills and strategies of the students.

II. MATERIALS AND METHODS

A. Instruments

Microsoft Visual Studio for C# was applied to write a program to test whether the method used to detect cheating was practical. A Windows Form Application was created. The RichTextBox, an advanced text box providing text editing and capability to view a large text file, was used to receive inputted text from a student. In addition, it could handle the TextChanged event. The program was activated and executed whenever the text in the RichTextBox was changed.

B. Methods

Fig. 1 showed the system overview which described the responsibilities of the student and the teacher.
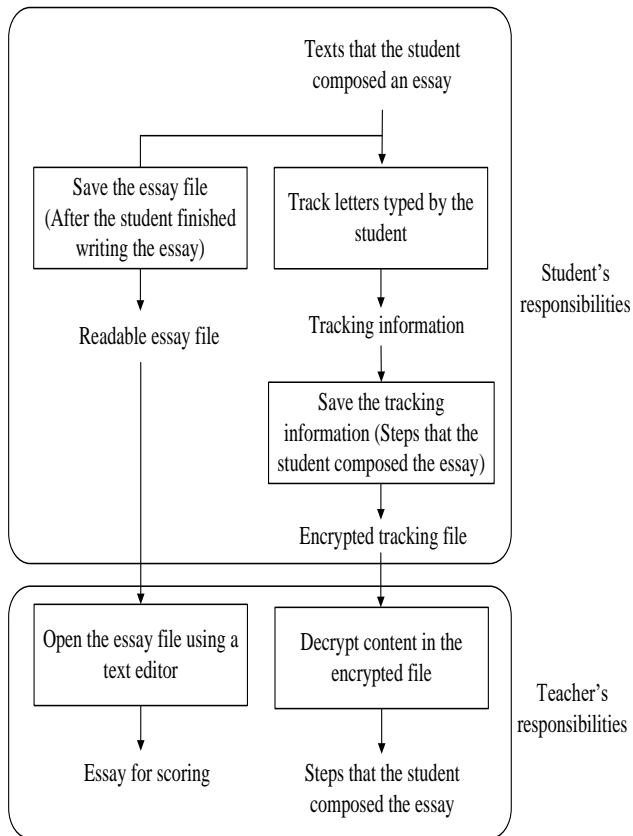

Fig. 1. System overview.

First, the student typed the text to write an essay. After having finished the text, the student saved the essay in a text file which could be read by both the student and the teacher using a text editor. During the exam, the letters that the student typed were tracked. When the student saved the essay file, the

other encrypted file containing the steps that the student wrote the essay was generated and saved. The student had to send both files to the teacher. The text file was opened by using a text editor for scoring. However, if the teacher happened to suspect that the student might conduct cheating, the teacher could decrypt the encrypted file and look into the steps that the student used to write the essay.

The algorithm used to create the system was explained in the following sections.

1) Tracking answering: The algorithm to track the answer of the student was explained as follows:

Given:
numberofkeypress: The current number of keypresses

now: The current time

updateno: The current number of updating the tracking information

C: The number of keypresses when the information is updated each time

%: Modulo operator used to compute a remainder of division

richTextBox1: RichTextBox in which the student types the answer.

Set the initial values of *numberofkeypress* and *updateno* to 0.

// When the text in the richTextBox1 was changed

private void richTextBox1_TextChanged(object sender, EventArgs e)

{

    Increment *numberofkeypress* by 1

    // Every *C* times of pressing the keyboard

    if(*numberofkeypress* % *C* Equals 0)

    {

        Set *now* to the current time.

        Increment *updateno* by 1.

        Append the string of *updateno*, *now* and the inputted

        text in the *richTextBox1* to the tracking result.

    }

}

The *C* value was used to set how often the student's answer was tracked. When the teacher needed more tracking results, the lower value of *C* was set. On the other hand, the higher value of *C* was set when obtaining fewer tracking results.

2) Find the encryption key from the last digit of the student id: The algorithm to find the encryption key from the last digit of the student id was explained as follows:

Given:

StudentID_Str: String of student id

StudentID_LastDigit_Str: String containing the last digit of a student id

StudentLastDigit: An integer obtained from the last digit of a student id

key: An integer key used for the encryption and decryption

Find the last digit in the *StudentID_Str* by using Substring() and store it in *StudentID_LastDigit_Str*.

Convert the last digit string (*StudentID_LastDigit_Str*) to an integer and store it in *StudentLastDigit*.

Set *key* to *StudentLastDigit* + 1.

The encryption key for each student was different. It depended on the last digit of the student id. However, if the last digit of student id was zero, it meant no encryption. Therefore, one was added to the *StudentLastDigit* for setting the encryption key.

3) Encryption: The function to encrypt the text was created as explained below. The function received the string (inputted text) and the encryption key.

Given:

text: Inputted text

ciphertext: Encrypted text which was transformed from plaintext

letters: An array used to keep English letters

AsciiLET: ASCII code (value) of a letter

Asciiletter: An encrypted character or letter

key: An integer key used for the encryption and decryption

private string encrypt(string text, int key)

{

Set *ciphertext* to an empty string ""

Use the command

char[] *letters* = *text*.ToCharArray();

to keep English letters of the inputted text in the array

named *letters*.

For i = 0 To Length of letters Step 1

{

AsciiLET = (int)letters[i]   // ASCII value of the letters[i]

// Subtract the *key* from the ASCII value of each letter.

Asciiletter = (char)(*AsciiLET - key*)

Convert a character or letter (*Asciiletter*) to a string.

Append the string of *Asciiletter* to the *ciphertext*.

}

return *ciphertext*;

}

4) Decryption: To decrypt the encrypted text or ciphertext, the same algorithm applied for the encryption was used. The key used for encryption and decryption was the same. The difference was the key that was sent to the decryption function was added with ASCII code (value) of each letter instead of being subtracted from it. The function to decrypt text was explained below.

Given:

text: Encrypted text or ciphertext

decryptedtext: Decrypted text which was transformed from the encrypted text

letters: An array used to keep the encrypted text

AsciiLET: ASCII code (value) of a letter

Asciiletter: A decrypted character or letter

key: An integer key used for the encryption and decryption

private string decrypt(string text, int key)

{

Set *decryptedtext* to an empty string ""

Use the command

char[] *letters* = text.ToCharArray();

to keep the encrypted text in the array named *letters*.

For i = 0 To Length of letters Step 1

{

AsciiLET = (int)*letters*[i]   // ASCII code of the letters[i]

// Add the *key* to the ASCII value of each letter.

.   *Asciiletter* = (char)(*AsciiLET + key*)

Convert a character or letter (*Asciiletter*) to a string.

Append the string of *Asciiletter* to the *decryptedtext*.

}

return *decryptedtext*;

}

5) Saving the student's answer: The student's answer was stored in one file. The encrypted student answer was stored in the other file. The first file stored the plaintext which could be read by both the teacher and the student using a text editor. The second file did not store only the encrypted version of the student's exam answer. It stored the time, steps and keystrokes that the student typed to give the answer in an encrypted version. The second file was difficult to be read and changed by the student during a short period of the exam. After the student finished writing or taking the exam, the teacher could decrypt the second file and see how the student gave the answer.

6) Opening an encrypted file: The algorithm to open an encrypted file can be explained as follows:

Given:

filePath: The path and file name

decrypt: Function to decrypt text

Open file (specified in *filePath*), read contents and store them in a string variable.

Call the decryption function named *decrypt* by passing a string (text to be decrypted) and the decryption key to obtain the decrypted result.

(Save the decrpyted text under a new file name)

III. RESULTS AND DISCUSSION

The results were divided into three parts: 1) encrypted text, 2) decrypted text and 3) a probable cheating answer.

A. Encrypted Text

Supposed that a student's answer was shown below.

> The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also triggers large impacts on social, economic, cultural and environmental aspects.

Given that the encryption key was equal to 9, which was calculated from adding 1 to the last digit of the student id, which was equal to 8. The answer and the steps of essay writing was encrypted. After finish writing or taking an exam, a student saved the essay. The encrypted file was generated and automatically saved. The text in the encrypted file was shown in Fig. 2.
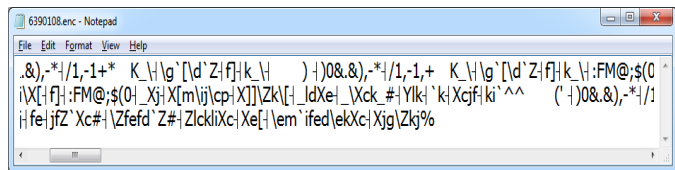

Fig. 2. Text in the encrypted file.

B. Decrypted Text

The encrypted text was decrypted and the result was shown as follows:

6390108 Ms. Piyarat P.

1) 29/7/2563 8:56:43

The epidemic of the

2) 29/7/2563 8:56:54

The epidemic of the COVID-19 presents a

3) 29/7/2563 8:57:05

The epidemic of the COVID-19 presents a critical health cris

4) 29/7/2563 8:57:14

The epidemic of the COVID-19 presents a critical health crisis that the world is

5) 29/7/2563 8:57:30

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not on

6) 29/7/2563 8:57:39

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COV

7) 29/7/2563 8:57:54

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely

8) 29/7/2563 8:58:06

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human healt

9) 29/7/2563 8:58:22

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also trigg

10) 29/7/2563 8:58:35

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also triggers large impacts on

11) 29/7/2563 8:58:50

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also triggers large impacts on social, economic, c

12) 29/7/2563 8:59:10

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also triggers large impacts on social, economic, cultural and environment

13) 29/7/2563 8:59:28

The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also triggers large impacts on social, economic, cultural and environmental aspects.

Remark: Year B.E. 2563 corresponds to year 2020.

C. A Probable Cheating Answer

The decrypted text below showed that the essay was not probably typed by the student, but it was derived or cut from another source and pasted to the answer. This was because the number of the letters in the essay was more than the number of letters that the student typed. Since the value of C was set to 20, if the student typed it by himself or herself, the result looked like that shown in the previous section which contained several times of information updating. The student's answer might be derived by searching from the Internet or getting from other students, which was not allowed in a closed book exam.

6299998 Ms. Cheating F.

1) 29/7/2563 9:17:41
The epidemic of the COVID-19 presents a critical health crisis that the world is confronting. Not only the spread of COVID-19 has adversely affected human health, but it also triggers large impacts on social, economic, cultural and environmental aspects.

Academic cheating is considered unethical and unacceptable in every social domains. Cheating is not a unique phenomenon in Thailand. Occurrences of cheating have also been found at universities in Britain, Japan, Sweden, Turkey,

and Iran [9]. In Thailand, two invigilators are normally assigned to monitor an exam. In reality, two invigilators are not sufficient enough to monitor potential cheaters in the examination room [10]. The cheating can be easily committed during an exam when there is only one teacher proctoring the exam. To facilitate and ensure the proctoring process, CCTV cameras are installed to record the incidents during the exam and subsequently, we can view the recordings of CCTV cameras to substantiate the cheating. This will help a disciplinary committee to settle the cheating cases [10]. However, for a huge exam room, a few CCTV cameras are not enough to record the cheating incidents. A webcam can also be supplemented to monitor the students while taking the test, but this requires considerable amount of budget to have the webcams installed individually.

Compared to the method using CCTV cameras and webcams, our proposed method using a software to monitor keystrokes is a cost-effective method that can efficiently keep track of how the students develop their essays. Another advantage of our approach is that the tracking information can be stored in a file which is much smaller than a video file. Although our proposed method can help reduce cheating in English academic writing exams, using CCTV cameras can be generalizable and used to monitor different types of exams including paper-and-pencil exams. In essence, we agreed with Maeda (2019) that there are other factors that contribute to students' cheating practices such as curricula, relationships with teachers, parents' attitudes, peer behavior, and institutional policies [11]. To prevent this undesirable problem, all these factors should be managed well. In the meanwhile, the use of technology should also be promoted to facilitate the proctoring process.

IV. CONCLUSION

This paper presented the method to detect the cheating. The algorithm to keep keypresses together with the encryption and decryption were applied to track exam answers. The information in the decrypted file assisted in detecting cheating for suspicious cases. The encryption was applied to prevent the students from reading and changing the content stored in the encrypted file. The changes in the encrypted file will cause the inconsistency which indicates the misconduct. The more robust encryption should be applied in the future. This proposed method can be used to fulfil other cheating detection methods using webcams, cameras, or microphones which are costly when using with many students. Last but not least, the program can also help the teachers to know and understand how the students compose academic writing tasks.

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