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Research Application Summary

Student and e–assessment authentication in distance learning

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Abstract

Distance learning has grown from the use of print media and video tapes to campus portal access and internet based access to online resources in order to take advantage of electronic benefits. Although online courses provide access to higher education through distance learning systems, they pose challenges for academic integrity. Paramount to this is contract cheating where duly registered students contracts out their coursework to writers in order to submit the purchased assignments as their own work and impersonation where a duly registered student passes his/her security information to a fraudulent, who uses it to answer the exam. Therefore, it becomes a challenge to verify the identity of a distance learner or the writer of the long distance learner assignment. To detect and verify such form of cheating, we propose a student verification model that comprises of two methods, keystroke dynamics and stylometrics analysis.The student verification model expected outcome is measurement of accuracy in authenticating students and e-assessments in distance learning.

Key words: Contract cheating, distance learning, e-assessments, keystroke dynamics, impersonation, stylometrics

Résumé

Les cours à distance sont passés de l'utilisation des médias et des cassettes vidéo à l'accès au portail d'information en ligne afin de mieux bénéficier des avantages électroniques. Bien que les cours en ligne fournissent l'accès à l'enseignement supérieur par le biais de systèmes d'enseignement à distance, ils présentent des défis pour l'intégrité académique. Les plus importants sont la tricherie contractuelle ou des étudiants dûment inscrits ont des contrats avec des professionnels qui les aident dans leurs devoirs qu'ils soumettent comme leur propre travail ; et l'usurpation d'identité ou un étudiant dûment inscrit transmet ses informations de sécurité à un fraudeur qui l'utilise pour répondre aux épreuves. Par conséquent, il devient difficile de vérifier l'identité d'un apprenant à distance ou de l'auteur de du devoir soumis à distance. Pour vérifier et détecter ces formes de tricherie, nous proposons un modèle de vérification des étudiants comprenant deux méthodes: la dynamique des frappes et l'analyse

stylo-métrique. Le résultat attendu du modèle de vérification est la mesure de l'exactitude des étudiants et leur évaluation à distance.

Mots clés: tricherie, apprentissage à distance, évaluation à distance, dynamique de frappe, usurpation d'identité, stylo-métrique

Introduction

With the advancement of Information Communication Technology (ICT), most learning institutions have embraced online learning to support education which is flexible for distance learners. However, existing online learning courses offer limited flexibility to distance learners because they must physically sit for continuous assessment tests (CATs) and end of semester examinations on the institution premise or designated testing centers. This is due to the high rate of academic dishonesty in education. Online assessments are reported to be more vulnerable to academic dishonesty and authentication attacks due to lack of physical interaction (Harmon *et al*., 2012). There are many methods of academic dishonesty (Sarrayrih and Ilyas, 2013) ranging from submitting work of others to using crib notes or hidden resources during an exam as shown in Table 1. The motivation for academic dishonesty is to secure a (higher) grade degree and the price is prestige and economic gains.

Many forms of academic dishonesty as shown in Table 1 fall within the same domain on how a lecturer /tutor can be led to believe that work submitted by a student is indeed authentic and is representative of a learner's efforts. For courses delivered in the more traditional, classroom environment, there is at least sit-ins of continuous assessment tests (CATs) and end of semester examinations that gives assurance that the work submitted by a student is representative of his or her efforts due to presence of proctors who supervise. However, in distance learning, academic dishonesty is getting more varied because of technology which has made cheating easier. In an evaluation survey, 73.6% said that cheating is easier in e-examination than its traditional counterpart (Walker and Townley, 2012). Distance learning e-assessments are reported to be more vulnerable to academic dishonesty and authentication attacks due to lack of physical interaction (Harmon *et al.*, 2012). In distance learning, there is reduced oversight and lecturers/ tutors do not have a "known baseline" against which work submitted by the student can be compared. A large number of plagiarism software's are employed to check originality of work submitted by a student in both classroom method and distance learning and hence the tools for detecting are available. However, these softwares are not able to detect cases where an assessment has been done on behalf of a duly registered student where the criteria of producing original work by the contracted person is a requirement. From Table 1, these types of dishonesty include paying for an assignment and hiring an impersonator for exam. These forms of dishonesty are not detectable by plagiarism softwares such as turnitin. Two examples of such forms of dishonesty include contract cheating and impersonation.

Literature review

Contract cheating. Contract cheating has recently emerged as a form of academic dishonesty. It involves student contracting out their coursework to writers in order to submit

the purchased assignments as their own work (Walker and Townley, 2012). In developing countries, assignment consultants have sprung up within the vicinity of institutions of higher education where they offer to undertake original course work assignments on behalf of a student at a given price. Various methods exist for addressing contract cheating as shown in Table 2.

The methods of contract cheating have concentrated on creating awareness and suggesting methods that academics can use to redesign assessments to make contract cheating

Table 1. Forms of academic dishonesty

1.	Submitting the work of others from a previous version of the course
2.	Collaborating on assignments
3.	Copying all or part of assignments from another student
4.	Using the Internet to solicit assistance – chat rooms, news groups, discussion boards, etc
5.	Submitting the same work for multiple courses
6.	Copying from another source, book, Internet, report
7.	Stealing submitted work from instructor, computer or other source
8.	Paying for an assignment
9.	Hiring impersonator for an exam
10.	Using Crib notes or hidden resources during an exam

Table 2. Different methods of addressing contract cheating

Methods	Purpose	Gaps
Detection by use of Turnitin when setting assignments to help detectives to attribute contract cheating to a source location	Method identifies the likely source on the internet contract cheating firms where the assignment came from but does not identify or verify whether the student actually did the assignment	Turnitin geographical restrictions hinders opportunities to match assignment specifications on agency sites to Turnitin
Iindividualised and unique version of an assignment specification to work on	The unique assignment is to have invisible watermarks, such as student name and email address, which can be traced to a single student	The large numbers of distance learners may not be viable to create individulised assignments
Contextual information available within auction posts, such as user name provided by student, stated location by the student, attachments	The analysis is to help investigators to automatically detect contract cheating using some intelligent systems	The information provided by student may not be accurate to hide his/her identity and also it is dependant on the uniqueness of an assignment setting

untenable for student. Additional techniques have gone into improving how a physical human detective can improve his work on identifying contract cheating is taking place and alerting the institution concerned. In developing countries, the methods of addressing contract cheating as shown in Table 2 are not viable since it is carried out in assignment consultants offices located in the vicinity of academic institutions at a cost. Internet bandwidth limitations make use of online agency detectors unviable in developing countries.

Impersonation. The impersonation threat poses the question "is the student really who they say they are?". It occurs when a duly registered student passes his/her security information to a fraudulent, who uses it to answer the exam. The methods to curb impersonation in distance learning have been developed. In general, however, use of knowledge- based authentication, token- based authentication and profile based authentication using challenge questions does not effectively address impersonation since one can share password or challenge question answer or give a token to another person. Use of fingerprint recognition, eye pattern and iris recognition requires one to purchase the sensors or have a hardware component integrated with the technology. The use of video matching to detect impersonation is workable however storage capacity and high bandwidth utilization costs will be incurred.

Student verifaction model (SVM). We propose a student verification model which uses keystroke dynamics and stylometry analysis to authenticate e-assessments in distance learning as shown in Figure 1. The choice of the techniques is because they are inexpensive, i.e., there is no purchase of additional hardware, they are intuitive to the user and text is entered continually for repeated checking. Stylometry analysis is the process of examining the characteristics of a piece of writing to draw conclusions on its authorship. In stylometry, it is accepted that authors have unconscious writing habits (Traore *et al.*, 2014).These habits become evident in for example their use of words and grammar. The more unconscious the process is, the less controllable it is. Therefore words and grammar are reliable indicator of the author. The unconscious use of syntax gives rise to the opportunity to perform author identification based on stylometrics features. The features that are extracted on students e-assignments are average word/sentence length, frequency of function words, use of punctuation, frequency of keywords and n-grams. An enrollment feature vector for each student is generated and is subjected to support vector machine and k –Nearest Neighbour classification (k-NN) where an unknown feature vector is matched against a known enrolled feature vector for a given student. Similarity match confirms the authenticity of a student.

In keystroke dynamics, keyboards are readily available and keystroke data capture is not invasive. Keystroke dynamics measure typing characteristics which are unique to an individual and difficult to duplicate (Kumar *et al*., 2014). The typing patterns of the student verification model are obtained when students are undertaking assignments on the computers. The features extracted are the average and standard deviations of the key press durations (dwell), transition times and number of key press for space, backspace, delete, insert, home, enter, arrow keys, left and right shift key. The student verification model eliminates idle key presses or inconsitencies in key presses that deviates significantly (within two standard deviations) from the student's mean and standard deviation samples of a particular letter

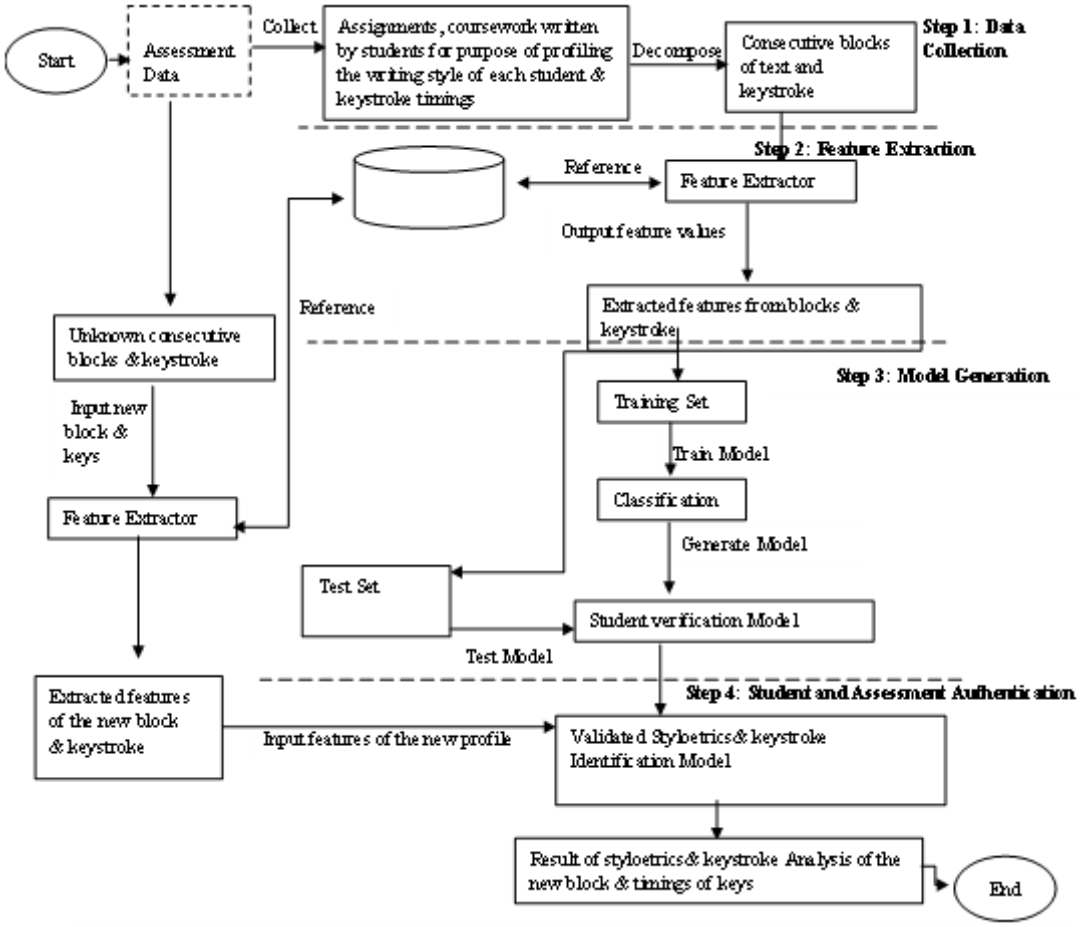

Figure 1. Student verification Model

duration and transition time. The averages and standard deviations are recalculated to obtain feature vector of a student. A feature vector is generated for each student and is subjected to pattern classification by matching a known reference template of a student to an unkown template. The two techniques are then combined to improve the accuracy of the student verification model. The student verification model is shown in Figure 1.

Conclusion

The proposed SVM will measure accuracy in authenticating students and e-assessments in distance learning. This is obtained by use of prediction parameters false acceptance rate and false reject rate. False reject rate is where SVM incorrectly identifies that a duly registered student is not the same person answering an exam or a duly registered student has not written their own assignment while false accept rate, is where SVM wrongly identifiers a fraudulent as a duly registered student answering exam or a purchased assignment as the original work of a student. The lower the difference between the two prediction parameters, the higher the accuracy of SVM.This attempts to develop methodologies addressing the

identification of authorship of student work in distance learning. This is done by continuous user authentication during e-tests and authentication of e-assignments during hand–in by students. The approaches being considered for the student verification model are stylometrics analysis and keystroke dynamics and its integration to distance learning e-assessments. These methods may be able to provide some approaches to dealing with student dishonesty not amenable to current plagiarism checking methods.

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