A Study of the Acceptance of Facial Authentication in Distance Education in Different Spanish Speaking Countries

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Keywords: Face Recognition, Online Learning, Analysis of Perceptions, Educational Results, Biometrical Recognition, Tools Moodle.

Abstract: Accurate student identification has usually been considered important in the field of e-learning. Nowadays, there are several technologies to identify students and one of them is facial authentication (by means of biometrics), which allows user identities to be authenticated and verified based on their physiological features of their faces. There is actually a high demand of students wanting to gain admission to e-learning programs. Therefore, it is crucial for this kind of education to be as adequate and recognized as any other. For this purpose, it is necessary to verify the students' identity when they are doing their homework using the Learning Management Systems (LMSs) such as Moodle platform. The main objective of this research is to analyze student perceptions about the development and implementation of facial authentication for e-learning within the Moodle platform in different Hispanic speaking countries (Spain, Dominican Republic and Colombia).

1 INTRODUCTION

Like Arenas, Domingo, Molleda et al. (2009) mention, universities are on the way to transform a classic teaching model into a new mixed teaching model, combining distance learning and face-to-face learning. Distance learning is commonly also called distance education and e-learning. Toth, Pentelenyi and Toth (2008) affirm that e-learning is a new kind of interactive learning in which the learning content is available through the network and, therefore, provides an automatic feedback about teaching activities for the students. Llamas (1986) establishes that e-learning can be explained as the ways to study that are not instructed or monitored directly in the presence of a teacher in class, but benefit from the tutors' planning and guidance through a mean of communication that permits the interrelation among students and professors.

Currently, there is a big demand for admissions into e-learning university degrees. Consequently it is necessary for distance education to be as acceptable as another sort of education. In order to achieve this requirement, it is needed to certify the students' identity when they do their exercises within the Moodle platform (Dougiamas and Taylor (2003)),

and thus, should be able to avoid educational frauds. In this sense, Moodle has turned into one of the most used platforms in universities as a preferential way to encourage interactions between professors and students (Çelik, 2010).

It is fundamental to delimit what biometrics is, to be able to implement this procedure of verification. As Jain and Flynn, (2008) indicate, biometrics is a method for recognizing people based upon physiological or behavioral characteristics. There are different typologies within biometrics, such as fingerprints, iris, voice, facial verification (García-Hernández and Paredes, 2005).

There have been some attempts to solve people authentication having in mind physical aspects of the human body, but it is through facial authentication (Tapiador, 2005) where it appears an opportunity in e-learning to verify the absence of frauds while the students do their activities on the platform. As Duró (2001) states, face-based authentication corresponds to a system that allows the identification and/or verification of a person's identity as of the morphological or behavioral characteristics, unique to each individual.

From the other side, the Project we are working in has focused on the perception Master Degree

students from different Hispanic speaking countries have had with the implementation of face-based authentication in the Open University of Madrid (UDIMA) within the Moodle platform. A questionnaire was produced for the development of the project in order to know the perceptions of the students.

2 RELATED WORKS

Lately, new information and communication technologies have merged with e-learning through the Moodle platform. The focus of our attention will be on the best renowned articles about the acceptance that facial authentication could have in different geographic regions on the platform Moodle.

Domínguez (2010) ran an article about Moodle platform in the world; regarding our territory, Spain is placed at second position throughout the world, before the United Kingdom and behind the USA. This analysis concludes that countries like Colombia or Dominican Republic are not amongst the top 10 countries with registered Moodle sites.

Rama (2010) analyzed the percentage of e-learning enrollments compared to the other kinds of education. As it can be perceived in the article, e-learning in higher education hardly reaches 10 percent of the whole Colombia enrollment. With respect to the Dominican Republic, the e-learning modality represents 11 percent of the country institutions and 6.26% of the total amount of students in the country. Comparing these data to Spain's, 15 percent of Spanish students study at the National Distance Education University (UNED), hence the fact that it is possible to assure that at least 15 percent of students are distance learning students. Moreover, the real percentage will be higher due to there are new private universities having distance education programs in Spain (UDIMA, UOC, Universidad de Cantabria, etc.) but there are not enough data to estimate the percentage of population that study at these Spanish universities

Besides et al., (2008) completed the investigation about the implementation of facial verification into Spanish education with a successful positive result. The goal they pursued was to guarantee that the students in line are who they say they are, and to know exactly the amount of time that they spend in front of the computer reading or realizing their virtual activities. In the same way of face-based authentication, Ullah et al., (2012) posed a facial authentication mechanism in order to ensure that the

students are not impersonated to improve their marks in virtual tests. Lastly et al., (2011) presented a system to check that the students are really attending virtual classes through physical biometric characteristic (face features).

On the other side, there are numerous researchers that use the webcam of computers or laptops of the students in their methods to extract images of them, to subsequently proceed with using facial authentication as of those pictures. Along these lines, there are works as Pattanasethanon, Savithi (2012) or for instance, those from the researchers Grafsgaard et al., (2013) from the North Carolina State University. They developed an investigation about the software of recognition of facial expressions where the emotions of on-line students can be evaluated with accuracy and predict the effectiveness of the tutorial sessions through the video camera of their webcam.

When comparing these analyses to ours, the main difference is that our research is focused on knowing the percentage rates that the development and the implementation of facial recognition in different Hispanic speaking countries.

3 MOTIVATION

Until now, the way of working of the students in distance education was not controlled considering that there were not any way to monitor in which situation they developed their activity. The use of this technology within education raises the possibility to verify that there are not frauds while students do their activities on the platform.

The purpose of this investigation is focused on knowing the degree of valuation and usability that the implementation of face-based authentication in e-learning through the Moodle platform in different Hispanic speaking countries, like Spain, the Dominican Republic and Colombia has in university students. To put it in another way, it is expected to know the students opinions and attitudes from each country, comparing with the remaining ones and a scale with the degree of acceptance about which kind of activity (continuous assessment, learning activities, tests) is more valued for the implementation of the tool in distance education.

The SMOLW tool was implemented as facial recognition software for the research development. It consisted of capturing photos of the student for his subsequent webcam verification. SMOWL was inserted when the student used to insert contents in glossaries and to do tests of the different lessons of the subject.

4 ANALYSIS OF THE PERCEPTION OF STUDENTS ABOUT FACIAL RECOGNITION

The poll had a size of 56 students from the course 'Advanced techniques in E-Learning' from the Master Degree on Education and New Technologies and from the course 'Technology Platforms' from the Master Degree on Digital Communication of the Open University of Madrid (UDIMA). The sample of respondents was composed of 50% of Spanish students and the rest 50% of Latin American students, in particular from Colombia and the Dominican Republic. The Spanish average age was 32.54, being 64.28% women and 35.71% men. On the other hand, the average age in Latin America was 36.75 with the same percentage of women and men.

The collection of data is another important step in the investigation since the conclusions of a study are based on such data. In most investigations, when assessing attitudes and opinions, the seven-point Likert scale is usually used: Totally disagree(1), Disagree (2), Slightly Disagree (3), Neither agree nor disagree (4), Slightly Agree (5), Agree (6) and Strongly Agree (7). The questions of the current research are answered with this scale.

Among all those questions that have been conducted, the most valuable in terms of content has been highlighted. Table 1 presents these questions, which have been raised with the Likert scale:

Table 1: Questions of the questionnaire.

	Question
1	After testing the software, do you think it is a good method to identify people?
2	Do you think it is appropriate to use facial authentication in e-learning?
3	Do you think it is fair to monitor distance education in order to avoid cheating?
4	If you could choose, would you rather realize the activities with the incorporation of this software in order to demonstrate that you have done the activity, and not be harmed in front of students that ask others to do their activities?
5	Do you think the use of this software could have caused a rise of your academic efficiency when you have been doing your activities?
6	Do you think you have taken the same time to do your activities when you knew your identity was being verified?
7	Do you think it is appropriate to apply facial authentication to the tests?
8	Do you think it is appropriate to apply facial authentication to the activities of continuous assessment?
9	Do you think it is appropriate to apply facial authentication to the learning activities?

5 RESULT OF THE ANALYSIS

In relation to the knowledge the participants of the study have about the implementation of face authentication in e-learning in different countries, it is noticeable that there are quite positive average values. Related and gathered data have been attached to the Figure 1, in order to start analyzing the impact achieved, as well as all the questions suggested in the questionnaire. Each question is presented with the average of all the respondents to have a general view. It is useful to recall that number 1 would be 'Totally Disagree' and on the contrary 7 'Strongly Agree'. Also, it is necessary to have in mind that 'SPA' refers to Spain and 'LAT' to Latin America.

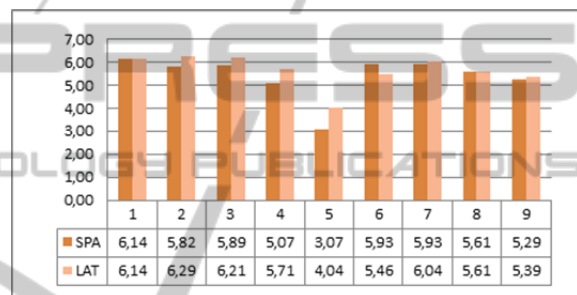|	1	2	3	4	5	6	7	8	9
SPA	6,14	5,82	5,89	5,07	3,07	5,93	5,93	5,61	5,29
LAT	6,14	6,29	6,21	5,71	4,04	5,46	6,04	5,61	5,39

Figure 1: Average responses of all the questions with the seven-point Likert scale.

If the responses of the figure 1 are analyzed for the two geographic group of students, one can observe that the use of the tool has a good acceptance in the whole geographic area that has been investigated. Although on the other hand, when analyzing the gathered data from the investigation for all the questions depending on the different geographic areas, one realizes that the implementation of facial authentication has more acceptance for the students from Latin America.

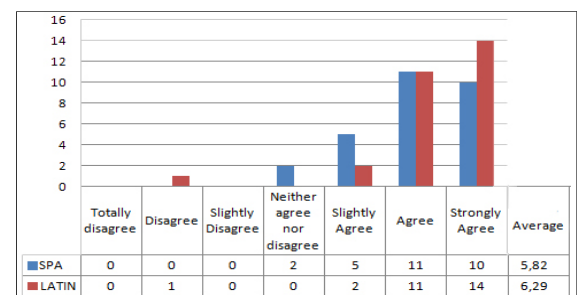|	Totally disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree	Average
SPA	0	0	0	2	5	11	10	5,82
LATIN	0	1	0	0	2	11	14	6,29

Figure 2: Do you think it is appropriate to use facial authentication in e-learning?

It is clear that for all the respondents of the

Figure 2 it is necessary the implementation of SMOWL in e-learning. Although, if the question is analyzed by areas, we find that Latin America gives a better reception and approval than Spain. If the different averages are observed, it can be seen that Latin America has an acceptance average of 6.29 out of 7 in contrast with 5.82 out of 7 of Spain.
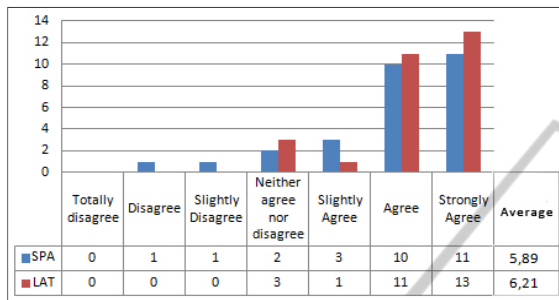
	Totally disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree	Average
SPA	0	1	1	2	3	10	11	5,89
LAT	0	0	0	3	1	11	13	6,21

Figure 3: Do you think it is fair to monitor distance education in order to avoid cheating?

In Figure 3, it is clear that for almost all the people replying the survey, it is fair to control who performs the tasks and who is a fake user. In fact, one can observe that almost all respondents agree or strongly agree with this proposal. Only two learners disagree with it. If one compares between countries, one can observe that it is perceived as fairer by learners from Latin America.

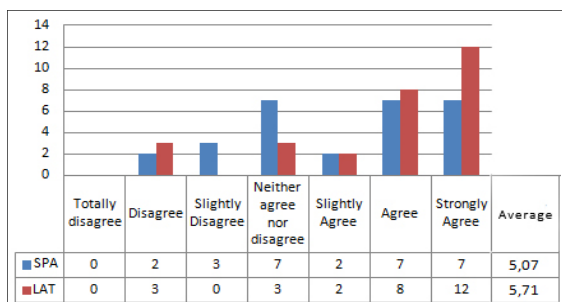|	Totally disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree	Average
SPA	0	2	3	7	2	7	7	5,07
LAT	0	3	0	3	2	8	12	5,71

Figure 4: If you could choose, would you rather realize the activities with the incorporation of this software in order to demonstrate you have done the activity, and not be harmed in front of students that ask others to do their activities?

In figure 4, we can see again how the students from Latin America are more willing to accept the use of facial authentication in online classes. One can tell intuitively that Spanish students resist the idea of these new technological methods. If we take the average of both areas, it is possible to see how Spain has an average of 5.07 while Latin America has 5.71.

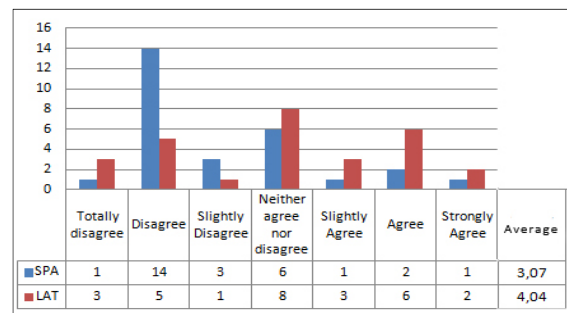|	Totally disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree	Average
SPA	1	14	3	6	1	2	1	3,07
LAT	3	5	1	8	3	6	2	4,04

Figure 5: Do you think the use of this software could have caused a rise of your academic efficiency when you have been doing your activities?

In figure 5, It is obvious that Latin American students have different more different opinions than Spanish learners and also there are not an answer that prevails in the rest of the options. From the average, Spanish students disagree with an average of 3.07 in relation to the average of 4.04 from Latin America. From this, it can be deduced that Spanish students think that the use of facial authentication does not help improving the efficiency when doing their activities, as they think they have been able to work in the same way as they would have worked without the tool.

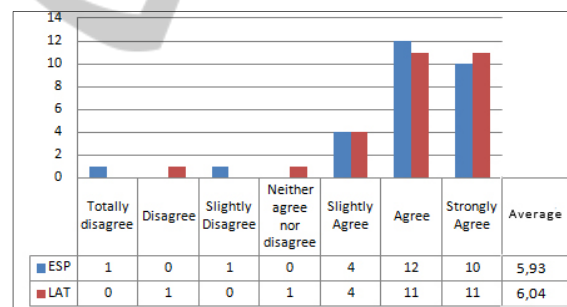|	Totally disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree	Average
ESP	1	0	1	0	4	12	10	5,93
LAT	0	1	0	1	4	11	11	6,04

Figure 6: Do you think it is appropriate to apply facial authentication to the tests?

In Figure 6, there is a high percentage of students that accept the application of facial authentication to the tests on the Moodle platform. The sample of respondents thinks it is fair to monitor and verify when the student realizes their tests to avoid cheating.

In addition to the implementation of facial authentication in the tests in Moodle, it is also necessary to accomplish the continuous assessment activities, due to this kind of activities is quite important in the course. If the Figure 7 is analyzed carefully with the average, and Latin America keeps the same percentage over Spain.
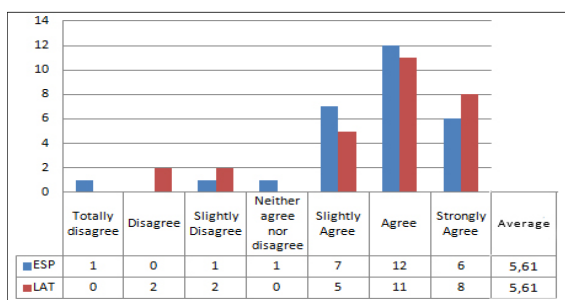
Figure 7: Do you think it is appropriate to apply facial authentication to the activities of continuous assessment?
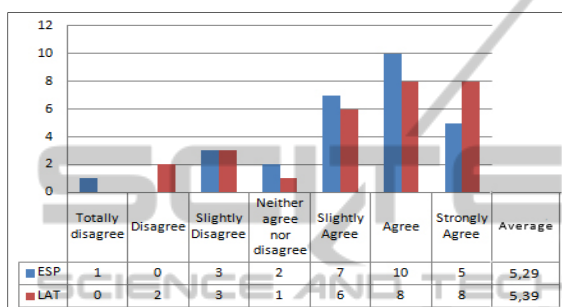

Figure 8: Do you think it is appropriate to apply facial authentication to the learning activities?

With respect to the learning activities, Figure 8 shows that the majority of the students think that learning activities should also include the facial-recognition software, although there are some students that slightly disagree.

On the other hand, if the average about the different typologies of activities we can accomplish in the platform Moodle is analyzed and compared, one can extract the order of preference of students to include facial authentication in the different kinds of activities. For students, the tests are the most important activities to include facial authentication, followed by the continuous assessment activities, and the least important ones are the learning activities.

Without any doubt, the analysis carried through the perceptions of the students from both Hispanic speaking areas shows the acceptance of the tool, although there are differences in the degree of implementation depending on the country. In particular, Latin American countries present a wider acceptance than Spain.

6 CONCLUSIONS AND FUTURE WORK

This section presents the conclusions that have been reached in the development of this project and the results obtained through the presented analysis. In addition, some future work is raised based on this research.

The analysis of the answers of the students revealed that the respondents from Latin America valued the implementation of this tool in distance education more than Spanish students. Moreover, they accepted the tests to be the main activity to be monitored in Moodle.

Comparing and analyzing the data gathered with the work of Rama (2010), one can conclude that Colombia and the Dominican Republic have higher acceptance of the tool, but at the same time there are more Spanish students signed up in distance courses than Latin Americans. One possible reason for this fact can be that Spanish are more used to online education (for now without being monitored in LMSs), and consequently they feel the facial authentication as an intrusive technology that they have not used for many curses. On the other hand, Latin American students have started online education more recently, and they find more appropriate to authenticate the student identities, since they are not still very used to LMSs without biometric authentication.

The work of this survey opens new ways and lines of research with which to continue working in the future. In the first place, it is planned to develop a Moodle plugin for SMOWL accessible for all the education community, in which instructors can configure the activities where they want students to be facially authenticated.

The work is also planned to be extended with more elaborated and extensive questionnaires in order to know the perceptions of the students in both Hispanic areas. Moreover, this research will also include an analysis of the legislation issues about privacy in the different countries. In the future, it is also important to wonder until which point biometrics permits privacy. In fact, we plan to reflect on this aspect, because any technology based on biometrics is traditionally considered to be able to dehumanize and threaten the privacy rights of people.

ACKNOWLEDGEMENTS

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