NIPES

Journal of Science and Technology Research

Journal homepage: www.nipesjournals.org.ng

An Automatic Face-Recognition Platform for Monitoring University Students'and Lecturers' Class Attendance

Ugwuja, Nnenna Esther[1] and Omankwu, Obinnaya Chinecherem Beloved[2]

[1,2]Department of Computer Science, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

[1]nnennaugwuja@gmail.com, [2]Saintbeloved@yahoo.com

Article Info

***Keywords*:**
Face-Recognition, Monitoring, Lecture attendance, Universities

Received 17 January 2023
Revised 27 January 2023
Accepted 28 January 2023
Available online 13 March 2023

https://doi.org/10.5281/zenodo.7728432

Abstract

In this study, components phase partitioning of jatropha oil biodiesel ternary system is investigated. Modified turbidimetric technique was used to investigate the constituent compositions at nine different temperatures (20 – 60) °C. Analysis of the homogeneous mixture was conducted using gas chromatographic approach. The influence of temperature on the immiscibility region and the separating capacity of the solvent (methanol) was determined from distribution coefficient (K) and solvent selectivity (S) analysis. The results revealed how the individual components of the ternary system distributed in the homogeneous solution at the different temperatures thereby displaying large two-phase envelope. However, high level of immiscibility between the extract and raffinate phases at all investigated temperatures was also observed. The results further revealed overlapping tie lines which was linked to the presence of excess methanol in the feed composition and further emphasized the fact that the tie lines overlap because other components were simultaneously distributed between the extract and raffinate phases. This study provides important property statistics for bio-based biodiesel components separation which are of interest in process design, optimization and simulation.

1.0 Introduction

It is important to provide biometric authentication with image processing that can be used for attendance. [1] Defines a biometric system as a pattern identification system that operates by getting biometric information from a person, extracts a feature set from the data acquired, and helps in comparing this feature set against the template stored in the database. There are several existing approaches for biometric facial recognition and classification where different types of algorithms can be used for face recognition. One of the most essential techniques for biometrics is face recognition. Face recognition technology is used to capture the attendance of students and lecturers. It is accomplished using a face recognition algorithm, and the algorithm we used for an automatic face-recognition platform for monitoring university students' and lecturers' class attendanceis Fisher linear discriminant. The Fisher linear discriminant algorithm is used for testing in this study for efficient face recognition. When a persons' photograph is taken, the computer can use it for recognition. In the face recognition technology, coordinates of features such as the inside corner of the eyes and outside corner of the eyes will be extracted. A list of distances such as the width of the mouth and eyes will be computed from these coordinates. Recognition of faces is not just to recognize an individual but also to find out other personal data related to an individual, such as other photos featuring the individual, blog posts, social networking profiles, travel patterns, et cetera, all through facial features alone [2]. People may not be aware of what their pictures are being used for, and it makes them not approve of how their personal information will be shared [3].

A dataset with the facial images of the student/lecturer we wanted to recognize was used. An ID for each image was set, so that the algorithm uses this ID to recognize an input image and give out an output. Images of the same person must have the same ID with the recognition set already constructed. Then applying the Fisher linear discriminant algorithm operation using the computational step of the Fisher linear discriminant creates an intermediate image that describes the original image better by highlighting the facial characteristics.

1.2Face recognition algorithms used to identify faces

Fisher linear discriminant, also known as linear discriminant analysis (LDA), was discovered by Robert Fisher in 1936 for taxonomic classification and became one of the most widely used techniques in pattern recognition [4]. Fishers' linear discriminating approach maps the feature to subspaces that separate the two classes [5]. Face identification systems are developing rapidly, and these developments drive the advancement of biometric-based identification systems with high accuracy. Human faces have diverse expressions and attribute changes such as eyeglasses, mustache, beard, and others. Fisher Linear Discriminant (FLD) is a class-specific method that distinguishes facial images into classes and creates distance between classes and intra classes to produce a better classification. According to [6], Fisher Linear Discriminant (FLD) is an example of a class-specific method, and it is a well-known method for classifying class into class-and-class matrices of classes that could be taken for classification, as it seeks to form inter-class and intra-class scatterings to produce a better ranking. Fisher linear discriminants algorithm as a class-specific method is robust about variations such as lighting direction and facial expression.

Generally, facial recognition has several stages of identifying face detection, face alignment, feature extraction, and face matching [7]. Therefore, many methods are used in facial recognition applications, one of which is the Fisher linear discriminant method which is the basis of the Fisher linear discriminant and the development of principal component analysis[8].The Fisher linear discriminant (FLD) method is used to find the average face value of each class and to, calculate the distribution matrix in the class and the spreading matrix between the classes, and find the optimal projection value of the image to obtain the face weights[9].The Fisher Linear Discriminant Method (FLD) is the most widely used method for pattern recognition.

2.0 Methodology

2.1Analysis of lecture monitoring for class attendance

The facial recognition algorithm used is the Fisher algorithm which was implemented in the face recognition library in python. Administrator activates course within allocated time and On- camera to take real image attendance. The system only requires the face of student or lecturer to increment the number of attendance in the lecture hall per course, per time allocated for the lecture. The face of the student or lecturer once directly facing the camera in the lecture hall will be capture as frame and tested against any face in the image directory; once it matches any face in the directory it will get the filename and query the database for the user attendance record and then increment attendance by 1 and store it back per course.

This platform uses OpenCV and pyaudioLibraryin pythonto capture attendance to help monitor lecture activities and attendance based on real-time live streaming video or recorded video. The system will be mounted in the administrator's office and shared with the supervisors in their respective offices via wireless hotspot where he/she can monitor attendance by the lecturer and students. Figure 1 shows the lecture monitoring in the classroom setting.

Figure1: Lecture Monitoring

2.2 Data collection

The design tools used to accomplish automatic face-recognition platform are camera-the specification is Ultra HD (3849 x 2160) resolution; Streaming ability: 30fps in Jpeg format, OpenCV, pyaudio, algorithm, and browser. This study used the following data collection techniques to gather information about the existing and proposed system, namely - interview, observation, questionnaire, internet**,** evaluation, and inspection of documents. Object-oriented analysis was used for the system analysis. The design was based on software organization as a collection of discrete objects that incorporated both data and behavior. The system was finally tested in a real-time environment for efficiency and effectiveness in application.

2.3Automatic face-recognition platform for real image attendance

Based on National Universities Commission (NUC)benchmark of 75 % attendance policy, students are expected to attend lectures at least ten times in a semester. A semester is a calendar that divides the academic year into 15-17 weeks terms and two weeks of examination [10]. In this automatic face-recognition platform, the picture of the lecturers and students taken are stored in the image directory with their user Id as the filename. The system only requires the face of the student/lecturer to increment the number of attendance per course. During lectures, the face of the student/lecturer, once directly facing the camera in the lecture hall, will be captured and matched with the picture in the directory. If it matches, it gets the filename, queries the database for user attendance, increments it by 1, and stores it back per course. In this automatic face-recognition platform we analyzed and compare the number of lectures attended by students per course in a semester and the number of times the lecturer allotted the course actually taught the students according to the lecture timetable.

3.0 Results and Discussion

3.1Analysis of the variable used

The variables of our analysis are described as lecturer 1, student 1, student 2 and student 3.

i. Variable used: Lecturer 1

Lecturer 1 is the lecturer handling CSC 411.Her course is taken twice per week. To make sure that she completes the NUC Benchmark, she must attend lectures at least 25times in a semester. She attended lectures for CSC 411 course up to 28 times a semester. This means that she is qualified to set questions for the examinations inCSC 411 because her lecture attendance is more than 75% based on NUC attendance policy. Lecturer 1 has her staff ID as UNI/STAFF/6289. This explanation is shown in Figure 2.

Figure 2: Lecturer 1 Automatic Face-Recognition

ii. Variable used: Student 1

Student 1 is the student that attended Lectures in CSC 112 just once a semester. She has her ID as 14/21986, and her name is ImmaculataOgbu. Based on the 75% NUC attendance policy, she should be disqualified from writing examinations[10]. However, theNational Universities Commission(NUC)policy has not been implemented.This explanation is shown in Figure3.

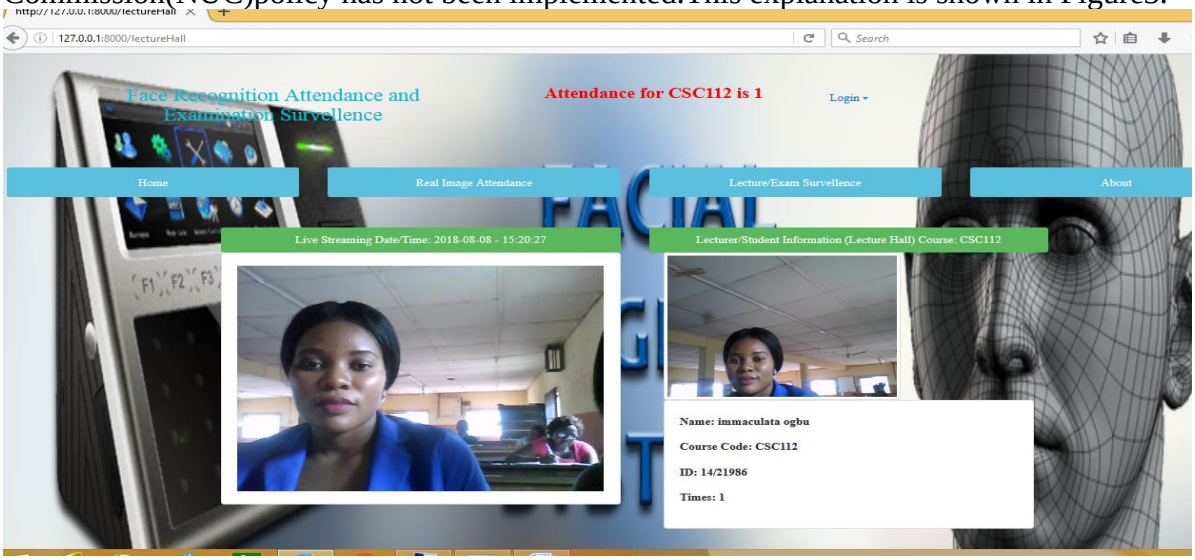

Figure 3: Student 1 Automatic Face-Recognition

iii. Variableused: Student 2

Student 2 is the student that attended lectures in CSC 211 up to 3 times in a semester. She has her ID as 14/23451. Her name is Uju Agu. This explanation is shown in Figure 4.

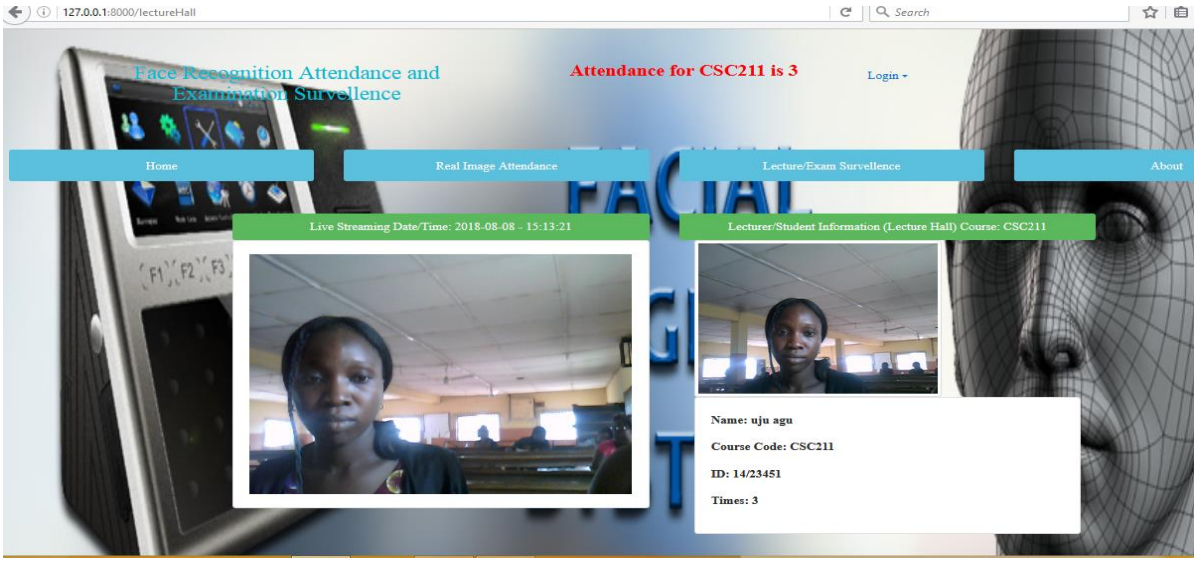

Figure 4: Student 2Automatic Face-Recognition

iv. Variable used: Student 3

Student 3 is the student that attended lectures in CSC 411 up to 10 times in a semester. He has his ID as UNI/BSC/6973. His name is James Okoye. This explanation shows that Student 3 attendance at lectures is higher than that of student1 and student 2. This is presented in Figure 5.

Figure 5: Student 3Automatic Face-Recognition

3.2 Performance evaluation

The required parameters for evaluation are Name, ID, department, college, email and password. The performance evaluation is from photo capturing, where the picture of students and lecturers is captured first, followed by recognition of the image. The accuracy of the system performance evaluation started with the Fisher linear discriminant algorithm. Face recognition application with Fisher linear discriminant (FLD) method is able to recognize faces with various expressions. Based on the evaluations that have been done on facial recognition application using Fisher linear discriminant (FLD) method, it is concluded that the application of Fisher linear discriminant (FLD)

method in face recognition has high accuracy because this method divides class specifically. The application accuracy and count increment are very accurate because the Fisher linear discriminant algorithm recognizes the user face with an accuracy of about 98.3%. During recognition process, the algorithm was trained using a dataset with the facial images of the people we want to recognize and set an ID for each image. Then, the algorithm uses this information to recognize an input image and give out an output. Finally, the real image of attendance captures the real image of students and lecturers with their attendance. We then compare the number of lecture attendance of students per course in FRT system and the number of times the lecturer allotted the course actually taught the students. By this new approach, monitoring and evaluation will be achieved by the Chief Executive or any Superior, Dean, Head of department directly from the office so long as he/she is connected to the face recognition system (FRT system).

3.3 Evaluation of thestudents attendance using FRT system.

In comparing and evaluation of the students' attendance from FRT system, we used three distinct students, Student 1, student 2 and student 3 respectively.

Table 1: Analysis

Students	Names	Registration No	Course Code	No of Attendance	Examination Scores	Total Result	Grade
Student 1	ImmaculataOgbu	14/21986	CSC112	1	23	24	F
Student 2	UjuAgu	14/23451	CSC211	3	42	45	D
Student 3	James Okoye	UNI/BSC/6973	CSC411	10	68	78	A

Table 2: Result Output from the table

Students	Names	Registration No	course code	No of Attendance	Examination Score	Total Result	Grade
Student 1	Immaculata Ogbu	14/21986	CSC112	1	23	24	F
Student 2	Uju Agu	14/23451	CSC211	3	42	45	D
Student 3	James Okoye	UNI/BSC/697	CSC411	10	68	78	A

3.4Analysis of data used

Student 1: is the student that attended Lectures in CSC 112 just once a semester. She failed the examination because her attendance is below 75%.

Student 2: is the student that attended Lectures in CSC 211 up to 3 times in a semester. She scored D in the examination because her attendance is still below 75%.

Student 3: is the student that attended lectures in CSC 411 up to 10 times in a semester. This explanation shows that Student 3 attendance at lectures is higher than that of student 1 and student 2. He scored A in the examination because her attendance is up to ten times.

4.0 Conclusion

In conclusion, this paper provided a platform used for capturing the attendance of students/lecturers at lectures and evaluates the students'/lecturers' attendance at lectures. The experiments were conducted by examining 3 (three) face images for students and one face images for the lecturer, and the testing process was done using the Fisher linear discriminant algorithm. The scope of this work is to create an automatic face-recognition platform for monitoring of students' and lecturers' attendance at lectures, and evaluates their lecture attendance using face recognition technology (FRT)for universities.

The study addresses the identified problems by providing a platform that performs automatic face recognition for real-time monitoring of students' and lecturers' attendance at lectures and provides recorded video automatically. The idea behind this paper is that the lecturers and students will sit up to their responsibilities because of an electronic system that monitors the lecture attendance and picks their images. Therefore, monitoring and evaluation should be achieved by the Dean, Head of Department, Chief Executive or any Superior. The information processed from the monitoring enables the university management to advise their staff and students in general.

5.0 Recommendation

The recommendation focuses on the issues that were not achieved across the development and implementation of the system. This work deserves further attention and the research areas that may be recommended for further improvement is that there is a need to install digital cameras in the lecture halls for the face recognition technology system to function.

References

[1] Tripathi, K. P. (2011). A comparative study of biometric technologies with reference to human interface.*International Journal of Computer Applications,14*(5), 0975-8887.

[2] *Harley, G. (2011). Facial recognition and privacy.Center for Democracy & Technology*.Retrieved 2012 from http:// www.cdt.org/blogs/harley-geiger/612facial-recognition-and-Privacy

[3] *Cackley, A. P. (2015).* Facial recognition technology commercial uses: Privacy Issues and Congress. *USA: New York Times*

[4] Okwonu, F. Z.,& Othman, A. R. (2012). A model classification technique for linear discriminant analysis for two groups.*International Journal of Computer Science, 9*(3), 125-128.

[5] Sushma, J., Sarita, S. B.,&Rakesh, S. J. (2011). Comparison between face recognition algorithm-eigenfaces, fisherfaces,and elastic bunch graph matching. *Journal of Global Research in Computer Science, 2*(7), 187-193.

[6] Sunitha, B. &Seetha, M. (2014). Enhancing the performance of SVM classification based on fisher linear discriminant. *International Journal of Research in Engineering and Technology,*3(5), 48-54.

[7] Li, Y., Yuan, W., Sang, H. &Li,X. (2013). *Combination recognition of face and ear based on two-dimensional fisher linear discriminant*. Paper presented at the 4th IEEE International Conference on Software Engineering and Service Science. Beijing, China.

[8] Xu, Y., Li, Z., Yang, J.,& Zhang, D. (2017). A survey of dictionary learning algorithms for face recognition.*IEEE Access*,pp 8502-8514.

[9] Zhang, Y.,&Wo, Y. (2014). *A fusion iris feature extraction method based on fisher linear discriminant.* Presented at the International Conference on Machine Learning and Cybernetics (ICMLC), Tianjin, China.

[10] National Universities Commission, (2021).*Reports on Linkage for Experts and Academics in the Diaspora Scheme (LEADS)*. Abuja: National Universities Commission.