

## Mobile Application Using Face Recognition for Centre of Co-Curriculum and Service Learning (CCSL)

Nurhazirah Binti Ghazali<sup>1</sup> and Mohd. Shafry Mohd Rahim<sup>1</sup>

<sup>1</sup>Faculty of Computing, Universiti Teknologi Malaysia (UTM),  
81310 Johor Bharu, Johor, Malaysia  
{nurhazirah6@live.utm.my, shafry@utm.my}

**Abstract.** Traditional username or password authentication is no longer adequate in terms of security. As more and more services are going mobile, typing a long, complicated strong password can be frustrating at times. More and more providers are switching to multifactor authentication systems to include things as hardware or software tokens and biometric authentication such as face recognition that can effectively binds a user to the service that enables a convenient and secure authentication, which is easy to use without the need of additional hardware. Throughout the years, the usage of mobile application has increased drastically and numerous amount of smartphones application with different category has been produced to entertain and ease the life of the user. For this project, Centre of Co-Curriculum And Service Learning (CCSL) were adopted as the case study. CCSL establishment is acting as a center for supervision of co-curriculum courses and service learning conducted in the Universiti Teknologi Malaysia (UTM). The centre involved occasionally and indirectly in managing co-curriculum or extra-curricular activities of student that should be administered by Office of the Students Affairs and Alumni (HEMA). The aims of this project study is to develop a mobile application that can utilize face recognition as a tool for authentication for an effortless login experience. This document presents the development process of Mobile Application Using Face Recognition for user authentication for Centre of Co-Curriculum and Service Learning (CCSL). Later in the chapters, the document focuses phase by phase on the development method using the agile model, up to the design process. The graphical user interfaces of the mobile application are displayed in the interface design of the project. Finally, the document discusses the conclusion achieved from the project literature review and implementation planning of the mobile application in the future.

**Keywords:** Face detection, Face recognition, Face authentication, Biometric Authentication.

### 1 Introduction

The most basic form of user authentication is the password authentication protocol. This method of authentication forces you to remember username or password combinations to access accounts or special sections of a website or mobile applications. While effective and in some ways, fundamentally a part of online security, password authentication protocols fail when you do not address them seriously. This means constructing a complex passwords and maintaining secrecy. This also means that entities implementing password authentication must safeguard passwords in some way. The aims of this project development is to develop a mobile application that can utilize face recognition as a tool to

login into the application for an effortless login experience. Curriculum Centre [1] was chosen as the case study to integrate user authentication for validation process. The objective of this project are to study and analyse the way of creating face recognition for identification, to develop face recognition for user identification in mobile application and to integrate face recognition for user authentication in curriculum courses mobile application system. Other than that, this project are produce to make the users class activity runs more smoothly. Luxand FaceSDK [2] will be used to implement face recognition tehniqe for user authentication and the mobile application system will be fully develop using Android Studio as the native development tool to gain a good performance rate. Before we jump to the development process, we will be looking at the application of face recognition technology in society on the next part of this paper to better understanding about why the usage of face recognition for user authentication in mobile application are proposed for this project development.

## **2 Background**

### **2.1 Application of Face Recognition Technology in Society**

A human face reveals a great deal of information to a perceiver. It can tell about mood and intention and attentiveness, but it can also serve to identify a person. Face detection is the process of identifying faces in digital images. It should not be confused with face recognition, which is the process of trying to work out who someone is from a photograph because face detection is the first part of the process. There are numerous applications of face detection. Some modern biometrics systems detect faces and then use face recognition to compare those faces to images in their databases, in order to try to identify someone without having to resort to good old-fashioned passwords.

Face recognition is one of the most important abilities that we use in our daily lives [3]. There are several reasons for the growing interest in automated face recognition, including rising concerns for public security, the need for identity verification for physical and logical access, and the need for face analysis and modelling techniques in multimedia data management and digital entertainment. Face recognition systems identify people by their face images. In contrast to traditional identification systems, face recognition systems establish the presence of an authorized person rather than just checking whether a valid identification (ID) or key is being used or whether the user knows the secret personal identification numbers (PINs) or passwords.

The security advantages of using biometrics to check identification are it eliminates the misuse of lost or stolen cards, and in certain applications it allows PINs to be replaced with biometric characteristics, which makes financial and computer access applications more convenient and secure [4]. In addition, in situations where access control to buildings or rooms is automated, operators may also benefit from improved efficiency. Face recognition systems are already in use today, especially in small database applications such as access control.

### **2.2 Luxand FaceSDK**

Luxand FaceSDK [2] is a cross-platform face detection and recognition library that can be easily integrated into the customer's application. FaceSDK offers the API (Application Programming Interface) to detect and track faces and facial features, to recognize gender and facial expressions (if a smile is present and if the eyes are open or closed), and to recognize faces on still images and videos. FaceSDK is provided with

Tracker API which allows tracking and recognizing faces in live video.

Tracker API simplifies working with video streams, offering the functions to tag subjects with names and recognize them further. The SDK provides the coordinates of 66 facial feature points (including eyes, eyebrows, mouth, nose and face contours). Luxand FaceSDK uses multiple processor cores to speed up recognition. The system detects entire faces and individual facial features, recognizes faces in still images and in real-time video streams, and allows the creation of a wide range of applications from simple automatic red-eye removal tools to biometric login solutions.

The innovative motion-based recognition system enables seamless recognition and identification of subjects appearing in video streams, allowing building attendance control, security and surveillance systems that require no prior enrolment.

### **3 Method**

#### **3.1 Project Methodology**

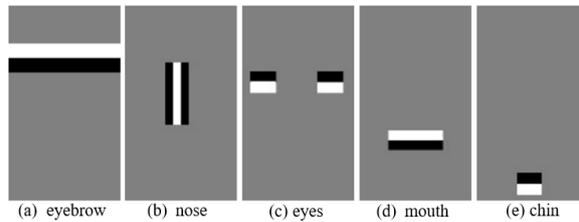
Generally, curriculum centre mobile application system will be developed in stages. There are two modules to be build which are user validation and course management. In order to construct recognition technique for face detection and face extraction for users verification on mobile application, there are several phases of project development are planned. The phases are preliminary investigation and data collection for recognition technique, design the well-suited detection technique for the mobile application, develop face recognition for user authentication, Implement the prototype with face recognition technique in mobile and evaluation.

#### **3.2 Recognition Technique**

The recognition technique used in the project development process is to identify or verify a person from a digital image or a video frame from a video source. The recognition process can be achieved by comparing the input image from the selected facial features from a face database [3]. Face detection process searches general structure of a human face like segment to determine that a certain input image contains a face or several. Human faces do not greatly differ from each other [4]; majority of all humans have noses, eyes, foreheads, chins and mouths; and all of these compose the general structure of a face as shown in the Figure1.

Each of these figures represents a general feature of a human face. The features work for several techniques either combining all the features together until a complete resemblance of a face is obtained as illustrate in Figure 2 or individually used which can resemble an eyebrow, nose, eyes, mouth and chin. During the development, Luxand FaceSDK is used for face detection. Luxand FaceSDK returns coordinates of all human faces appearing in the picture, or notifies if no face is found.

Given a still image or video of a scene, identify or verify one or more persons in the scene can be done by using a stored database of facial image. Once a face is detected and possibly chosen an aligner for it, features extraction process is used for recognition or similarity comparison. Luxand FaceSDK[2] employs sophisticated algorithms to detect and track facial features quickly and reliably. The Software Development Kit (SDK) returns the coordinates of 70 facial feature points including eyes, eye contours, eyebrows, lip contours, nose tip, and so on. The detection works in real-time on desktop and mobile, which allows performing smooth real-time tracking and transformations of facial features in live video.



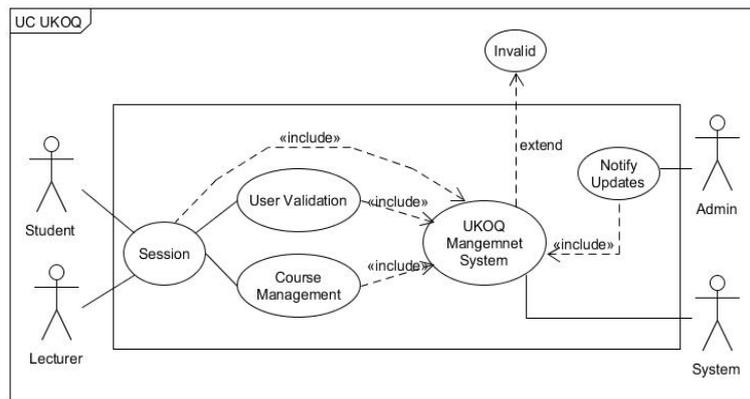
**Figure 1.** General Feature of Human Face



**Figure 2** Combination of Basic Human Face Features

## 4 System Development Design

### 4.1 System Module Design



**Figure 3.** Use Case Diagram

Figure 3 shows the use case diagram of the project. As illustrated in Figure 3, the application system have two major module, which is User validation and Course Management which is accessible to both student and lecturers that enrolled to their certain classes.

#### User Validation

User validation module allows users to enter the application system once the matching authentication information is submitted. In this module, users are able to select between two different verification systems, which are, a login with password or a login with a face recognition verification. Face recognition registration is compulsory for the first time user before they can use the face login verification. For a user that used the mobile application system for the first time, they first need to login into the system using manual normal verification before they can set up their face recognition login verification. The default manual login credential for users are their student or lecturer email and password that have been previously set from Academic Computing ID (ACID) page. Only students and lecturers that registered for the curriculum courses are able to use the application

system. In addition to that, the registered face used for face login are stored in user's phone local database for security purposes.

## Course Management

Course management module allows users; lecturer or student, to lodge and view new updates about the course. Lecturer will be able to create new updates to remind their students on what will be happening on the next class. In addition, student also have the privilege to create new updates to inform the class about the current situation of the class.

## 4.2 Database Design

The purpose of this database design is to describe the build of the application's database that is implemented in order to manage all the data that is submitted and that is needed to be manipulated or already manipulated and will be saved for record. Figure 4 shows the entity relationship diagram used for the project development.

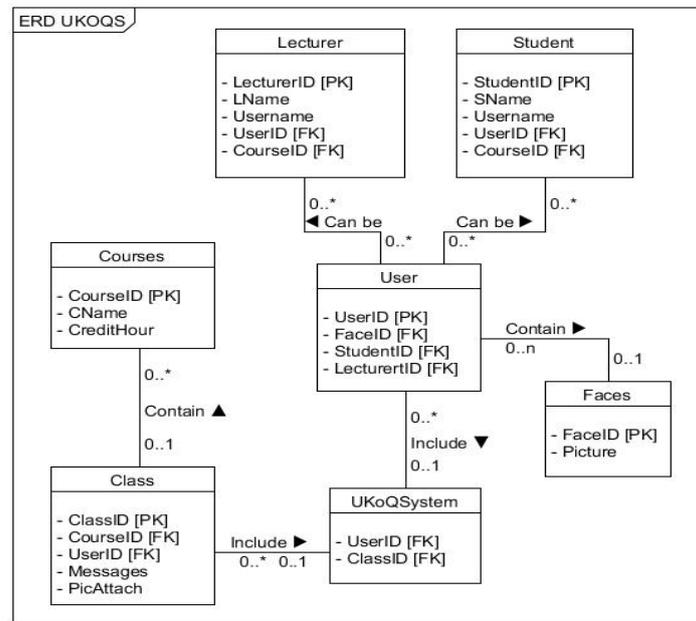


Figure 4. Entity Relationship Diagram

## 5 Result and Testing

### 5.1 Demonstrating UKOQS Management System

This section will show the Graphical User Interface that is designed for this mobile application system. Currently, the working title for this mobile application system is UKOQS.

## Login Page Module

The main menu are the first interface appeared on the screen when the user starts the session and once the application is launched as presented in the Figure 5 (a). In the main menu page, user are be able to login into the application either as a lecturer or as a student by clicking the student or lecturer button as shown in Figure 5 (b). The application then allow user to log into the application by utilizing two different login methods, which is the conventional login method or the face recognition method illustrated in Figure 5 (c - e).

The conventional login method allowed users to login into the application by entering their respective username and password, while with face recognition login method, users able to login into the application only after scanning the user's face using mobile front camera and identifying the verified users which available in the database. User can cancel the login process using back button on the phone.

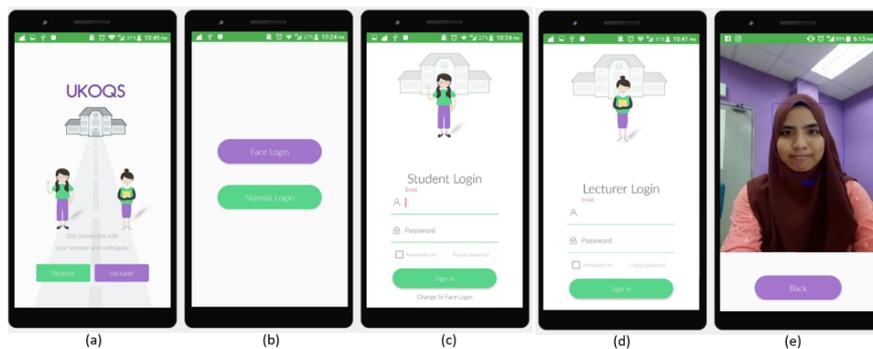


Figure 5. Login Page Module

## Home Page

Figure 6 presents the home page interface of the application. It is the first page that appear after the login process succeeded. In the home page interface section, all news and notification or announcement from the curriculum centre and the highlighted news from the subject lecturer were retrieved from the database and be displayed to all the respective students.

## Class Page

Figure 4.3 shows the class page interface for UKOQS application. In this page, all updates or news from the lecturer or other students within the class were retrieved, and displayed to the respective class members. Users were able to lodge and update which contain the process of creating, editing and deleting class updates. After the implementation and development, the testing phase is carried out to measure the user performance in usability testing and to help in improving the quality and prevents any errors regarding the mobile application. It is one of the vital phases in application development. This is to ensure that there would not be any major errors that may cause the application to malfunction once it is launched and also can help to improve the quality of the application itself.

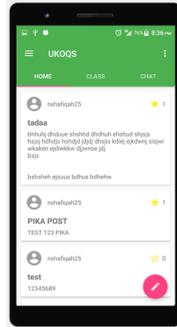


Figure 6. Home Page Module

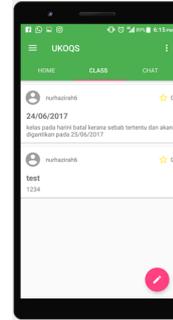


Figure 7. Class Page Module

**Acknowledgements.** I would like to use this chance to thank my thesis advisor, Assoc. Prof. Dr. Mohd. Shafry Bin Mohd Rahim for all the encouragement and guidance that he had gave me throughout my Final Year Project (FYP) development process. I also wish to express my sincere appreciation to Dr. Ajune Wanis Ismail who have helped me to correct my mistakes on completing the thesis.

## 6 Conclusion

Traditional username or password authentication is no longer adequate in terms of security and as more and more services are going mobile, typing a long, complicated strong password can be frustrating at times. This application will allow users; students and lecturers, to have a formal social application platform for communication and course management. UKOQS mobile application uses Face Recognition for user authentication which will make login experience more easier without the hassle in remembering the username and password and also saving time from key-in the username and password.

## References

10. CCSL, UTM, <http://www.utm.my/ccsl/>
11. Luxand FaceSDK, <https://www.luxand.com/facesdk/>
12. Li, S. Z., Jain, A. K.: Handbook of Face Recognition. Springer, New York (2011).
13. Sato, A., Imaoka, H., Suzuki, T., Hosoi, T.: Advances in Face Detection and Recognition Technologies. NEC Journal of Advanced Technology 2. vol. 1, pp. 28-34. (2005)