Multidisciplinary Applied Research and Innovation Vol. 4 No. 1 (2023) 035-039

MARI

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/mari
e-ISSN:2773-4773

Web-based Attendance System with Face Recognition

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DOI: https://doi.org/10.30880/mari.2023.04.01.008
Received 15 October 2022; Accepted 30 November 2022; Available online 15 January 2023

Abstract: Attendance marking is one of the methods used to monitor students' presence in lectures. Attendance is a critical aspect of a student's ability to succeed in a course. It is one of the ways to monitor their presence to ensure their participation in the lectures and class activities to enhance their academic achievement and reduce the frequency of absences without justifiable excuses. Typically, the conventional method used is through manual attendance marking on a piece of paper. This approach has been demonstrated to be forgery-prone, imprecise, and time-consuming as it primarily depends on the human factor. Thus, this paper proposes a web-based attendance system with facial recognition (WAS-FR). WAS-FR uses a live camera face detection feed to display the student details and the current approximated location of the student in each of the student's enrolled courses. It was found that 56.7% strongly agree that WAS-FR has more advantages than the normal attendance system and 66.7% think that the system is more effective and convenient in taking attendance. The system enables effective attendance marking through its functions to ensure that the students are present and located at the location that they are supposed to be, ready for the lectures, especially when lectures are being conducted online.

Keywords: biometric, facial recognition, identification

1. Introduction

In the current education system, students' attendance in class plays an important part in performance evaluation and quality monitoring. Calling names or signing documents are the traditional procedures used in most institutions, which are both time-consuming and insecure [1]. There are several problems with using a manual attendance system [2]. For example, the loss of the attendance register, a mismatch between the left book and the attendance register, incorrect input of information in the attendance register, and so on. Traditional techniques of classroom attendance have a lot of shortcomings [3]. The produced classroom attendance data is saved on digital media or paper. The archiving process is moved to digital settings where it may be kept and retrieved in a more organized manner [4].

Face detection-based identification ensures that the institution's attendance record is extremely accurate [5, 6]. The first step in preventing fraudulent attendance, such as buddy punching. Therefore,

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this project is to develop a web-based face recognition attendance system. The methodology that will be used in this project is the waterfall model. The system will help the lecturer or instructor take their student attendance more effectively and display the estimated location of the student.

2. Methodology

The waterfall model is selected in this project to develop the face recognition attendance system because of the model's rigidity, it's simple to handle, and each stage has specified deliverables and a review procedure. The waterfall model depicts the software development process in a linear sequential flow of events. Phases are processed and completed one at a time in this model. Phases do not crossover.

2.1 Planning

This first stage is the most fundamental since any miscommunication may cause the function of the website to be wrongly developed. We have to know what is our desirable website and the function that we want for our website. This project aims to develop a face recognition attendance system that will help the instructor take student attendance more efficiently. The system will also display the estimated location of the students when the students are taking their attendance.

2.2 Requirement analysis

In this Requirement Analysis stage, we collect data and specifications for the project. Then we must define the project's scope, including how the system should appear and what features should be considered as the system develops. To assist in creating the characteristics of the system and finding a solution to the difficulties, it is necessary to understand the project's particular needs. The website will have an interface where users can choose to register or log in to their accounts.

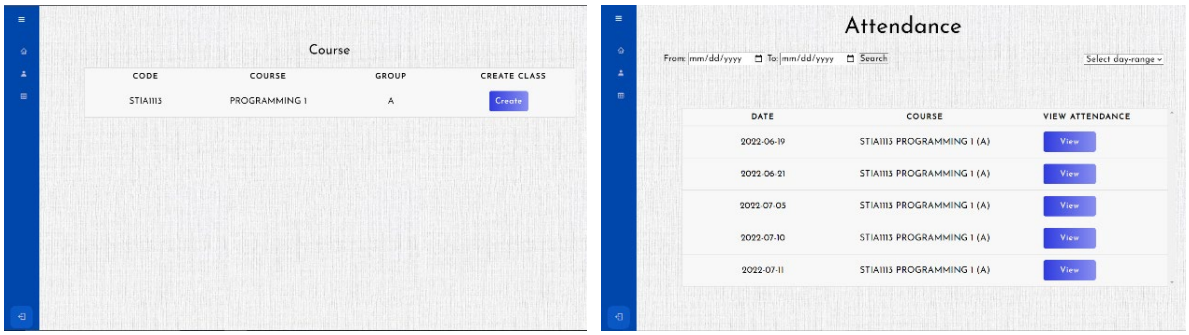

Figure 1: The instructor's interface of WAS-FR

For instructors, they can check the student summarized attendance and also their estimated location while the student can scan their attendance during the class hour as shown in **Figure 1**. Before using the attendance system, the student must register their personal information and upload a photo of themselves to the website. Once the student has done this, they can scan their attendance through the face recognition attendance system for their class attendance and the system will display the estimated location.

2.3 System design

This phase supports the identification and specification of the system's software requirements. In this project, the system was created using JavaScript in Dreamweaver, to make each interface function according to the requirement needed. Face-api. js is a JavaScript API that is used for face detection and identification on the web, built on TensorFlow. js core API framework. It is difficult to develop this system from scratch. Thus, face-api. js will be used in this system. Furthermore, Geolocation API will also be used in this system to detect the estimated location of the student. Geolocation API allows the user to give their location to web applications if the user desires. HTML is used to structure a web page

and its content. A cloud database is built to save the information including the student's image and the student information. A prototype of the system is developed. Prototyping is a method of showing the system's requirements so that the users have a better experience interacting with the system. The system has been developed using HTML, PHP, and CSS. **Figure 2** shows the main interface of the system.

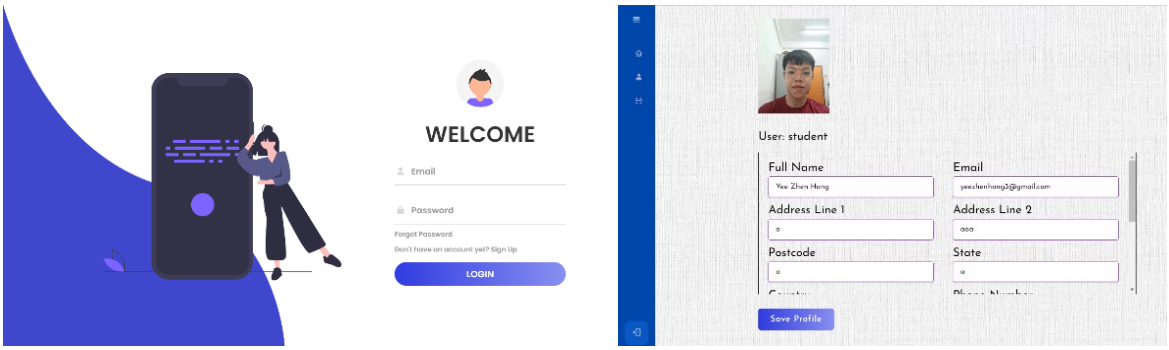

Figure 2: The interface of WAS-FR

2.4 Implementation

This phase includes the creation of software. The software would be designed in this phase as a response to the specific issues. Face recognition and estimated location source code is created and verified to deliver the right output as shown in **Figure 3**. At this point, any faults or mistakes are eliminated. We must ensure that the images collected can be compared to the registered face in the database and that the database can hold a huge amount of data during this phase. Moreover, a link to the website will be provided to students and instructors so that they can access and use the system.

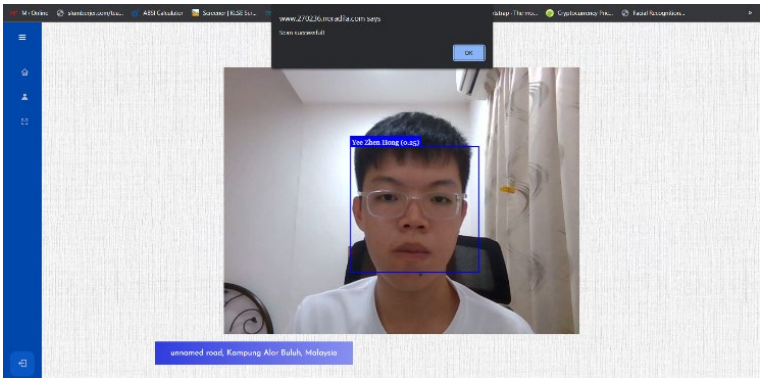

Figure 3: Face and location detection

2.5 System

The system must fulfil the document's standards and function correctly throughout this phase. Then we'll analyze the results of the tests and make changes to the system. If no changes are needed, the system is completed and ready to be distributed to the end user.

3. Results and Discussion

The evaluation method used to gather information on the field testing is through an online questionnaire which is Google Form. Developers utilize the Google Form application as a platform to collect data, and respondents reply to this survey. Google meet also has been used to have a live survey and Google Forms is provided for them to evaluate the system. The respondents of this evaluation are the student from UUM and other universities, and the instructor from UUM. The number of respondents found is approximately 30. Each of the participants must answer 2 sections, which are Demographic and Website Evaluation which contain 9 parts such as design, usability, relative advantage,

compatibility, complexity, trialability, intentions to use and recommend, and satisfaction. They will first demonstrate the system and Google Form will be given to them to answer the related question based on their observation through the demonstration.

3.1 Type of Evaluation

In the evaluation, the types of evaluation chosen are the System Usability Scale (SUS) and Diffusion of Innovation (DOI). This method will test the user's understanding and the user will utilize the system to accomplish their goals independently will be the main emphasis of the usability study. When a user interacts with a system's function, usability also relates to their happiness and experience.

3.2 Participant

There are 30 respondents from students and instructors. There are 60% female and 40% male. There are 2 respondents (6.7%) aged 18 years old, 5 respondents (16.7%) aged 20 years old, 1 respondent (3.3%) aged 21 years old, 6 respondents (20%) aged 22 years old, 11 respondents (36.7%) aged 23 years old, 3 respondents (10%) aged 24 years old, 1 respondent (3.3%) aged 25 years old and 1 respondent (3.3%) aged 32 years old. 14 respondents (46.7%) are from 5 to 6 semesters while 8 respondents (26.7%) are from 3 to 4 semesters, 3 respondents (10%) are from 1 to 2 semesters, 4 respondents (13.3%) are from 7 to 8 semester and 1 respondent (3.3%) who don't form any of the semesters. 7 (23.3%) from the School of Computing (SOC). There are 5 respondents (16.7%) from the School of Education (SOE), 4 respondents (13.3%) from the School of Economics, Finance & Banking (SEFB), 3 respondents (10%) from the School of Quantitative Science (SQS) and also the same amount of the respondents from Tunku Puteri Intan Safinaz School of Accountancy (TISSA), 2 respondents (6.7%) from School of Multimedia Technology & Communication (SMMTC) and Tunku Abdul Rahman University College (TARUC). Lastly, there is 1 respondent from the School of Law (SOL), School of Business Management (SBM), Han Chiang and UNIMAP.

3.3 Application Evaluation

In terms of the design, 19 (63.3%) respondents strongly agreed that the system is well organized and easy to find the information required. This is because they have successfully used the system to create a class, join the class and use face recognition and detect the correct location when they were using the system. In terms of usability, 21 (70%) strongly agree that the system is easy to learn and use as the system shows all the things clearly and has various functions. 17 (56.7%) strongly agree that WAS-FR has more advantages than the normal attendance system and 20 (66.7%) think that the system is more effective and convenient in taking attendance. However, only 9 (30%) expected to see the use of the system in the future.

This is due to face recognition having been around for many years, yet it has not been widely used in institutions despite the advantages that it has been shown to have. The slow development of the face recognition system that is acceptable for universities has shown that users, students or instructors can be reluctant in adopting it unless it is mandatory. Despite that, from the survey that was conducted, many of the respondents agreed that WAS-FR has the potential to be further developed and adopted in the educational institution due to its overall function and simplicity that concentrates mainly on the attendance of the students to replace the manual attendance that has been used for many years.

4. Conclusion

This project is about the development of a web-based attendance system with facial recognition (WAS-FR). Before the development of this system, there are still some educational institutions taking attendance manually and this system is to help both the student and instructor to take attendance more efficiently and effectively. In the future, the system will continue upgrading by adding more functions.

Acknowledgement

This work is supported by Universiti Utara Malaysia SoTL Research Grant (S/O code: 14757).

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