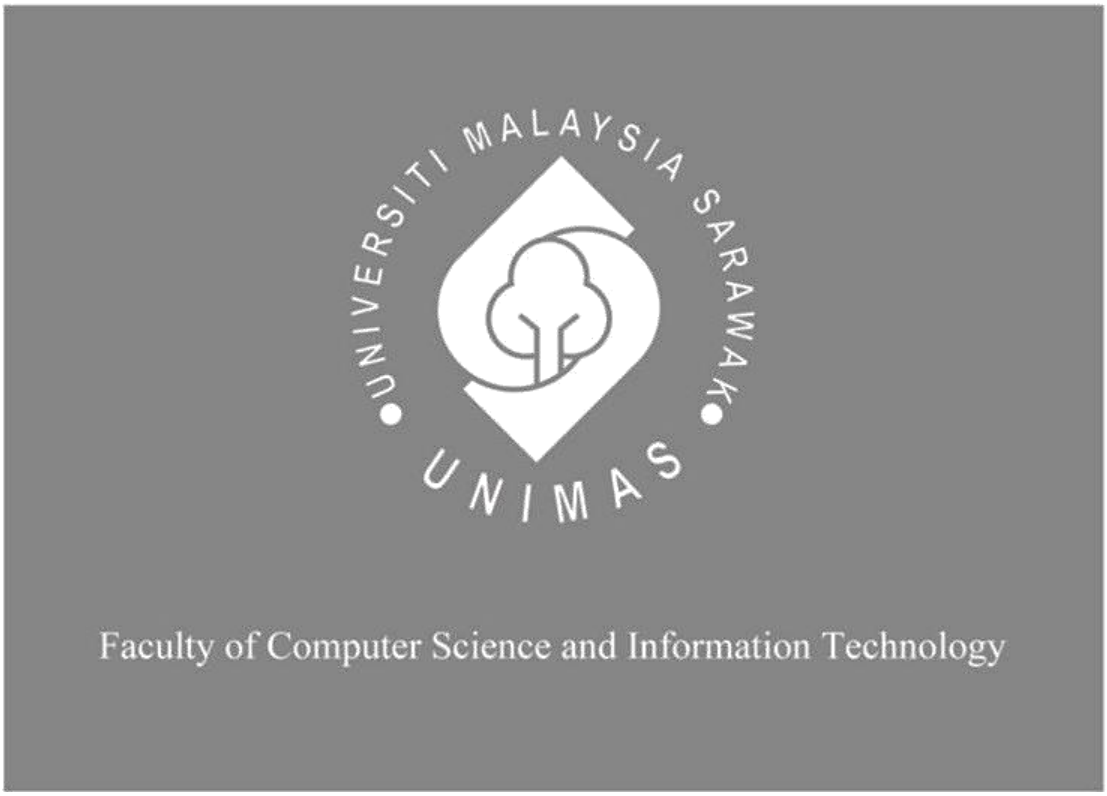

Kindergarten Facial Recognition Attendance System

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(71917)

Bachelor of Computer Science with Honours (Software Engineering)

2023

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This project is submitted in partial fulfillment of the requirements for the degree of Bachelor of Computer Science with Honours

Faculty of Computer Science and Information Technology
UNIVERSITI MALAYSIA SARAWAK 2023

UNIVERSITI MALAYSIA SARAWAK

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ACKNOWLEDGMENT

First of all, I would like to give special thanks to my supervisor, Dr Chiew Kang Leng, who gave me the opportunity to do this project under his strict supervision, and not forgetting his help, advice and encouragement, helped me finish coordinating my project, especially is in this final year project. Second, I would like to thank my family for their support. Without their financial and emotional support, this project would not have gone as smoothly as we planned. Finally, I would like to express my gratitude to Universiti Sarawak Malaysia and Faculty of Computer Science and Information Technology for providing me with the opportunity to pursue my degree and participate in my graduation project. In these four years, I have learned a lot and experienced a lot.

ABSTRACT

The traditional paper-based method of taking attendance in kindergartens poses various challenges and inefficiencies. Young students often struggle with signing their attendance, leading to inaccuracies and time-consuming processes. To address these issues, this project aims to develop a facial recognition attendance system for kindergartens. The objective is to design and implement a system that allows students to register and mark their attendance using facial recognition technology, eliminating the need for manual signatures. The system will also incorporate student information management, ensuring secure storage and administration by authorized personnel. The proposed method involves studying different facial recognition methods, analyzing requirements, designing the system, developing the solution, testing and evaluating its performance, and suggesting future improvements. By implementing this system, kindergartens can enhance attendance tracking accuracy, efficiency, and administration, providing a streamlined and reliable solution for attendance management.

ABSTRAK

Kaedah tradisional yang menggunakan kertas untuk mengambil kehadiran di taman kanak-kanak menimbulkan pelbagai cabaran dan ketidakcekapan. Kanak-kanak yang masih muda sering menghadapi kesulitan dalam menandatangani kehadiran mereka, menyebabkan ketidak tepatan dan proses yang memakan masa. Untuk mengatasi masalah ini, projek ini bertujuan untuk membangunkan sistem kehadiran pengenalan wajah bagi taman kanak-kanak. Objektifnya adalah untuk merancang dan melaksanakan sistem yang membolehkan murid-murid mendaftar dan menandakan kehadiran mereka dengan menggunakan teknologi pengenalan wajah, menghapuskan keperluan tandatangan manual. Sistem ini juga akan menggabungkan pengurusan maklumat murid, memastikan penyimpanan yang selamat dan pentadbiran oleh kakitangan yang dibenarkan. Kaedah yang dicadangkan melibatkan kajian pelbagai kaedah pengenalan wajah, menganalisis keperluan, merancang sistem, membangunkan penyelesaian, menguji dan menilai prestasinya, dan mencadangkan peningkatan pada masa depan. Dengan melaksanakan sistem ini, taman kanak-kanak dapat meningkatkan ketepatan, kecekapan, dan pentadbiran pengurusan kehadiran, menyediakan penyelesaian yang lancar dan boleh dipercayai untuk pengurusan kehadiran.

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Chapter 1: Introduction

1.1 Introduction / Background

Everything in this modern era is contactless, from education to business dealings. Making purchases for your business or make payment to someone can all be done without having to physically connect. This cutting-edge contactless technology can also be apply in attendance management. The technology that can be apply in attendance management system is facial recognition system.

Based on Smitha et al. (2020), Facial Recognition system is the most suitable system for attendance management since it detects the biometric feature for human which is non-intrusive and easily acquirable. The facial recognition system consist of two category which are verification and the identification. Face verification is a one-to-one face matching process between a face image and a face image template, and face recognition is to identify whether a user exists in the system.

Nowadays, face recognition is becoming more and more popular and has been widely used. According to an article, the author proposes a method for face recognition technology combining discrete wavelet transform (DWT) and discrete cosine transform (DCT) for classroom student attendance system. These algorithms are used to extract student facial features and then apply radial basis functions (RBFs) to classify facial objects. The system achieved 82% accuracy (Lukas et al., 2016).

In a research from Rathod et al. (2017), the Facial Recognition system is implemented using algorithms such as Support Vector Machine (SVM) classifiers and Viola-Jones and Histogram of Oriented Gradients (HOG) features. The authors consider many real-time

situations, including scaling, lighting, occlusion, and position. Peak signal-to-noise ratio (PSNR) measurements were used as the basis for quantitative analysis, which was performed using the MATLAB GUI.

There are many way to design a Facial Recognition system. Facial Recognition system have been widely used to identify and verify the facial features of users and automatically record attendance. It can save your time and more effectiveness since using contactless technology.

1.2 Problem Statement

After the Covid-19 pandemic, our lives have changed dramatically. Many agencies are adopting no-contact procedures as a precaution against a resurgence of Covid-19. People also become accustomed to a contactless life. During the covid-19 pandemic, our technology has been greatly improved, especially in cutting-edge contactless technology. However, most kindergartens still use the traditional method like paper-based ways to take attendance. This is not effective because some of the student still do not know how to sign and if let their parents to sign also will make this process become time consuming. Therefore, we need a systematic system to solve our problems.

1.3 Objectives

- To study the facial recognition methods and their performance.
- To design a facial recognition attendance system.
- To develop a facial recognition attendance system with student information management.

1.4 Brief Methodology

The methodology that will be used in this project is Rapid Application Development (RAD) Methodology. This methodology have be used because it provided easy adaptability and greater flexibility as developers easily redesign the system for existing designs. By using this methodology, the system have to repeat several process such as demonstrate, refine and build to make sure that the Facial Recognition Attendance System can detect the face with higher accuracy. The Rapid Application Development (RAD) Methodology has four main stages, which are analysis and quick design, prototype cycles, testing and implementation as shown as figure below.

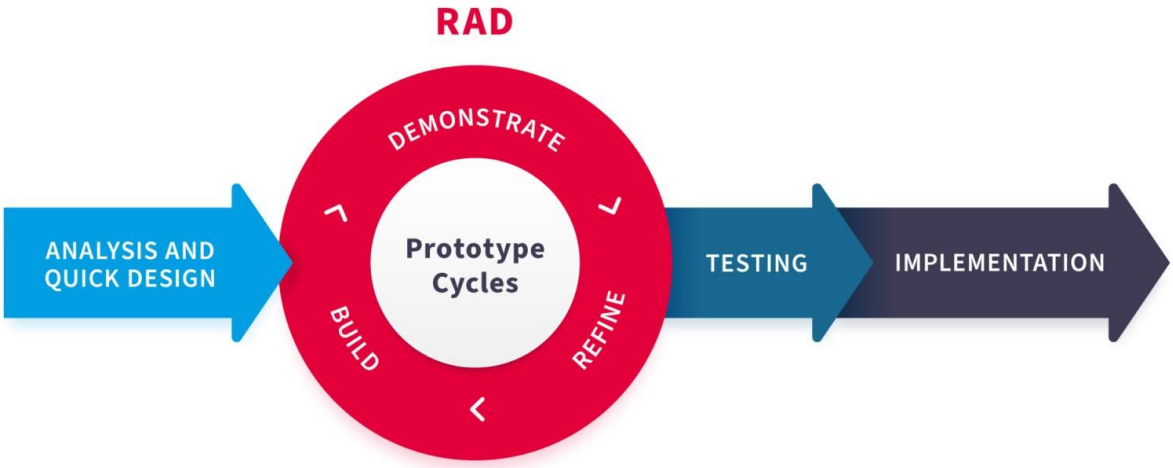


Figure 1.1 Rapid Application Development (RAD) Methodology

1.4.1 Analysis and Quick Design

The initial phase of the project is to gather target requirements. These requirements can be obtained by researching and reviewing the existing online systems of face recognition attendance systems. After the developer have collected the needs and information for this project, they will learn more about the needs of the face recognition attendance system.

Therefore, after collecting user requirements, a requirement analysis and rapid design process will be carried out.

1.4.2 Prototype Cycles

In this phase, a prototype is developed based on the requirements gathered. The first version of the prototype is presented to the stakeholders (users and supervisors) and their feedback is collected for improvement, as reviews are essential for developers to develop prototypes. Therefore, there will be a second version of the prototype after enhancements have been made to the previous version. This iteration continues until user requirements are implemented and stakeholders are satisfied with the final version of the prototype. In this project, the prototype refers to the face recognition and attendance system in kindergartens, which can verify facial features and record attendance.

1.4.3 Testing

Once the requirements are fully defined, the modification of the prototype will be terminated. This testing phase will fully test the final version of the prototype, as this is important to ensure that the Kindergarten facial attendance system will fully function as intended. If a bug is detected, some minor changes will be made.

1.4.4 Implementation

After checking and testing the final version prototype, the final system can be deployed.

1.5 Project Scope

At the end of the project, a prototype system will be developed. The system is designed for laptop devices only. This system can only take attendance when the student information have be done register and the system can allow the admin to register new student information.

1.5.1 System Environment

Table 1 below shows the software and hardware that required to develop and design the Kindergarten Facial Recognition Attendance System.

Table 1.1 The System Environment

Hardware	Software
Laptop - The device used to develop the system. - The device used to test run the system.	**Pycharm** - Python (IDE) used to develop a web or application. **Firebase Database** - The real-time database to store user information.

1.6 Significant of Project

The purpose of this project is to design and develop a facial recognition attendance system to identify and recognize kindergarten students and take attendance by using face. This

system will be more systematic if compare to the traditional ways attendance system. This system is useful as we no need to do attendance manually and more effective. With this system, it can increased security for kindergarten which can prevent unauthorized individuals from entering.

1.7 Expected Outcome

At the end of this project, a facial recognition attendance application system will be developed which able to register the new user, verify the facial features and record the attendance.

Chapter 2: Literature Review

2.1 Introduction

In this chapter, there are three existing systems have be reviewed and analyzed. A detailed analysis of the current scenario analysis of the current approach to identify problems and solutions. The proposed system is discussed and compared among existing systems including current methods.

2.2 Current Scenario Analysis

The current scenario of the attendance system for kindergarten is using the traditional method which is using paper and pen. The teacher needs to use a pen to tick the names of the kindergarten students one by one on the paper to ensure that they are present. But this method is more time consuming because all processes have to use manual control. At the same time, it is also prone to human error, as sometimes the teacher forgets to check the attendance of students who attended the class or wrongly checks the attendance of students who did not attend the class.

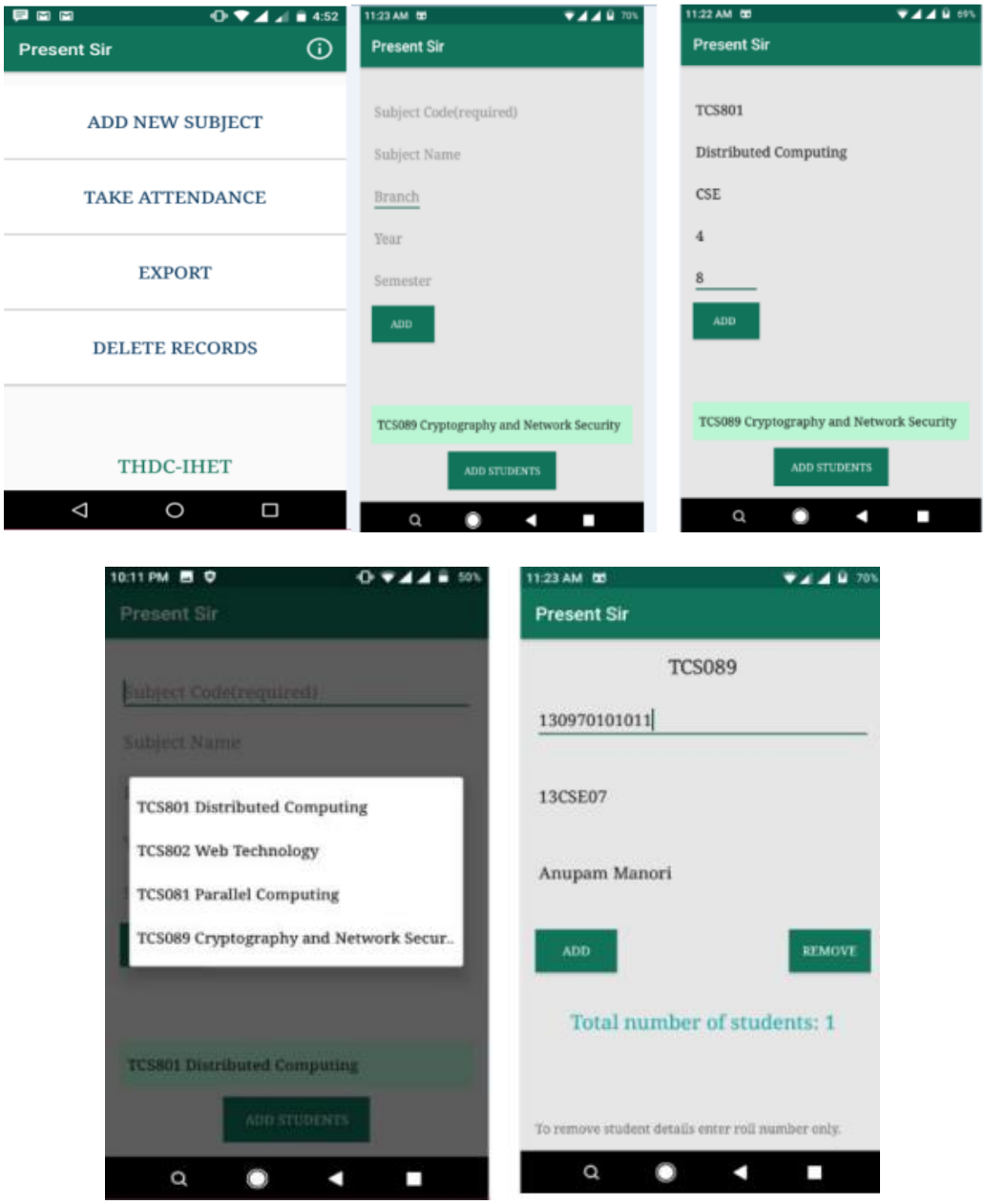
2.3 Review of the existing systems

This section evaluates and compares three existing systems. These existing systems are systems that manage and store information used in web-based applications.

2.3.1 QR Code Based Smart Attendance System

A QR Code Based Smart Attendance System was developed by Xiong Wei , Anupam Manori , Nandgopal Devnath , Nitin Pasi and Vivek Kumar from Department of Information Science and Engineering, Henan University of Technology, Zhengzhou, Henan, China (Wei et

al., 2017). In the research from Wei et al. (2017), this QR Code attendance system was developed by two combination of application to store and record the student attendance in University. The lecturer that handle the subject will be in charge of mark the attendance of student. All lecturer will be needed to download an android application that used for taking attendance and generate the attendance status. The SQLite will be used to manage the database of student attendance as shown as Figure 2.1 below.



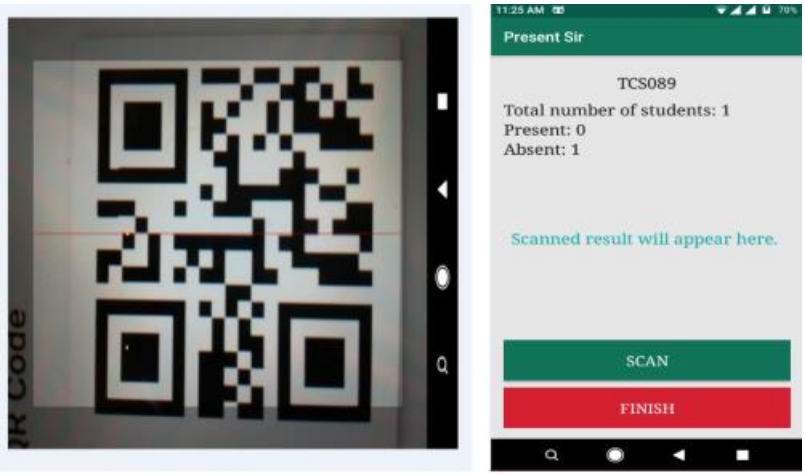


Figure 2.1 Application for Lecturer Side

Based on the Figure 2.1, the user interface for the lecturer side have be designed in simple format which the present lecturer able to add the subject, taking attendance, export and delete the records. The lecturer able to add subject by fill in the detail of the subject. The lecturer need to add the student one by one to the system based on the subject that his or she take. The lecturer need to scan the QR code for student one by one to record all the student that have attendance the class.

Figure 2.2 Application for Student Side

The Figure 2.2 shows that the application for student side just only can let students able to generate the QR code by using their role number. The lecturer will used the application to scan the bar code that generate by student.

H18

	A	B	C	D	E
1	RollNo	Name	StudentID	Apr261252	Apr261256
2	130970101011	Anupam Manori	13CSE04	1	1
3	130970101001	Aryan Vasishth	13CSE01	0	1
4	130970101002	Abhishek Pal	13CSE02	0	0
5	130970101003	Abhinav Arora	13CSE04	1	0
6	130970101004	Ajeet Singh	13CSE05	0	1
7	130970101005	Akhil Singh	13CSE06	1	1
8	130970101029	Nandgopal Devnath	13CSE19	1	1
9	130970101032	Nitin Pasi	13CSE04	1	1
10					
11					

Figure 2.3 Database of Student Attendance for particular subject

According to Figure 2.3, the SQLite will be used to manage the database of student attendance. All the data will recorded in database and can export in CSV file. The lecturer able to make a monthly attendance report based on the data recorded in CSV file.

Advantages

The advantages of this system is the system easily to learn and handle since the student just need to generate their QR attendance barcode by key in their role number. The student just need to show out the QR barcode and scan by lecturer. The processor can easily make the monthly report for student attendance based on the attendance list in CSV file.

Disadvantages

The disadvantages of this system is the lecturer will spend more time since his or she needed to add the student one by one from student list before can started scan QR attendance. This also happens during take attendance, the processor also needed to scan the QR barcode from student phone one by one. It is not the right way to do it, and it takes more time. The system also will happen human error if the student key in the system by using incorrect role number. The processor will cannot take attendance for the student since the student role number does not exist in the system. If the students forgot to bring their mobile phone, the problem will happen that the student unable to take attendance by QR barcode.

2.3.2 A New Model of the Student Attendance Monitoring System Using RFID Technology

A New Model of the Student Attendance Monitoring System Using RFID Technology was developed by Mutammimul Ula, Angga Pratama, Yuli Asbar, Wahyu Fuadi, Riyadhul Fajri and Richki Hardi from Department of Information System, Universitas Malikussaleh, Indonesia (Ula et al., 2021). According to new research Ula et al. (2021), RFID technology is an identification technology, which consists of a reader and a tag, the tag can be barcode or smart card. The reason why RFID technology is superior to other identification technologies is that no RFID tag is required when reading or rewriting data on the RFID tag, and the reader has the ability to send clean and reliable data as input to the software attendance system, which can accurately Read data in read range.