An RFID-Integrated Attendance System with Photo Verification for Classroom Efficiency

A Special Problem Proposal
Presented to
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Miag-ao, Iloilo

In Partial Fulfillment
of the Requirements for the Degree of
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Abstract

The UP System started deployment of RFID/NFC-enabled UP ID in 2019. 5 years later, we have yet to see a system that fully utilizes the technology embedded in the UP ID. In particular, we see a great potential in using it as an access key for tracking the attendance of students in their classes. Professors currently either use the traditional pen and paper or a spreadsheet in their laptops to check for attendance. The mentioned practices are prone to forgery and takes precious time away from the class period.

Our paper proposes a fully digital attendance tracking system that can be used by professors to record the attendance of their students in real time. The system uses UP ID and facial recognition for a two-layer validation process ensuring accuracy of the records. Facial recognition uses a pretrained Facenet model that surpasses human beings in multiple facial recognition tests for accuracy. The attendance process includes students aligning their face in the camera, and tapping their ID to the RFID/NFC reader. The current prototype takes only about 2-3 seconds per student to complete the whole validation and recording process, with more room for optimizations down the line.

Suggested keywords based on ACM Computing Classification system can be found at `https://dl.acm.org/ccs/ccs_flat.cfm`

Keywords: Keyword 1, keyword 2, keyword 3, keyword 4, etc.

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Chapter 1

Introduction

1.1 Overview

This section gives the reader an overview of the real world problem that needs to be solved. It describes the exigency of the proposed solution. The consequences to the affected stakeholders that the problem may bring if it not addressed. Discussion must not be too technical or too detailed.

This section ends with a discussion on the problem/s faced by or that still exist in the specific technology or field (e.g., limitations of existing software or algorithms). The problem statement would lead to the research objectives.

It is easy to include a figure in JPG or PNG format as shown in the following example. Make sure that you explain what the figure is all about, and that you refer to your figure. For example, Figure 1.1 shows a graph of the performance of Disney stock from the 1980s to 2012.

Some notes on citing references. When using APA format, the author-date method of citation is followed. This means that the author's last name and the year of publication for the source should appear in the text, and a complete reference should appear in the reference list.

Here are some examples on how to do the referencing (note author's name and years are different from commented examples). For APA citation details, refer to `http://www.ctan.org/tex-archive/biblio/bibtex/contrib/apacite/`.

- Kartch (2000) compared reaction times...

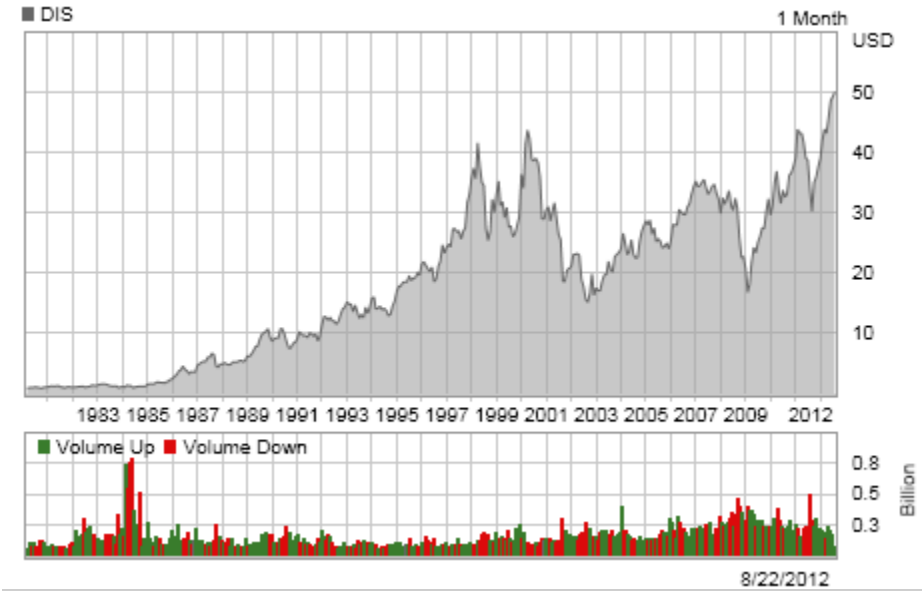

Figure 1.1: This is the figure's caption – Disney stock chart. Captions should fully describe the figure in a concise manner such that there is not need to refer to the text when figuring out the graphic.

- In a recent study of reaction times (Kartch, 2000)...
- In 2000, Kartch compared reaction times...
- Fedkiw et al. (2001) compared reaction times...
- In a recent study of reaction times (Fedkiw et al., 2001)...
- In 2001, Fedkiw et al., compared reaction times...

The following are references from journal articles (Park, Linsen, Kreylos, Owens, & Hamann, 2006; Pellacini et al., 2005; Sako & Fujimura, 2000). Here's an MS thesis document (Yee, 2000), and this is from PhD dissertation (Kartch, 2000). For a book, reference is given as (Parke & Waters, 1996). Proceedings from a conference samples are (Jobson, Rahman, & Woodell, 1995; Fedkiw et al., 2001; Levoy et al., 2000). The sample bibliography file named **myreferences.bib** is from the SIGGRAPH LaTeX template. You can use a text editor to view the contents of the bib file. It is your task to create your own bibliography file. For those who downloaded papers from ACM or IEEE sites, there is a BibTeX link that you can click; thereafter, you just simply need to copy and paste the BibTeX entry into your own bibliography file.

The following shows how to include a program source code (or algorithm). The verbatim environment, as the name suggests, outputs text (including white spaces) as is...

```
#include <stdio.h>
main()
{
     printf("Hello world!\n");
}
```

Alternatively, you can also use the *lstlisting* environment from the **listings** package.

1.2 Problem Statement

DO NOT FORGET to write the statement of the research problem here, i.e., before the Research Objectives.

A problem statement is your research problem written explicitly. The problem statement should do four things:

1. Specify and describe the problem (with appropriate citations)
2. Provide evidence of the problem's existence
3. Explain the consequences of NOT solving the problem
4. Identify what is not known about the problem that should be known.
5. Subdivide the main problem into several subproblems.

1.3 Research Objectives

1.3.1 General Objective

This subsection states the over–all goal that must be achieved to answer the problem. Address the following: Given your research challenge or opportunity, how do you intend to solve it? What is the output of your research?

1.3.2 Specific Objectives

This subsection is an elaboration of the general objective. It states the specific steps that must be undertaken to accomplish the general objective. These objectives must be **S**pecific, **M**easurable, **A**ttainable, **R**ealistic, **T**ime-bounded. Also, they are manageable and communicable.

A specific objective start with "to <verb>" for example: to design/survey/review/analyze.

Studying a particular programming language or development tool (e.g., to study Windows/Object-Oriented/Graphics/C++ programming) to accomplish the general objective is inherent in all thesis and, therefore, must not be included here.

1. To compare and contrast existing algorithms (on what problem?);
2. To develop a new algorithm (for what purpose?)
3. To analyze the algorithm (based on what criteria?)

1.4 Scope and Limitations of the Research

This section discusses the boundaries (with respect to the objectives) of the research and the constraints within which the research will be developed.

1.5 Significance of the Research

This section explains why research must be done in this area. It rationalizes the objective of the research with that of the stated problem. Avoid including sentences such as "This research will be beneficial to the proponent/department/college" as this is already an inherent requirement of all BSCS majors. Focus on the research's contribution to the Computer Science field.

The following are guide questions that may help your formulate the significance of your research.

- What is the relevance of your work to the computer science community?

  - What will be your technical contributions, in terms of algorithms, or approaches, or new domain?
  - What is your value-added compared to existing systems?

- What will be your contributions to society in general?
  - Who will benefit from your system?
  - Who are your target users and how will this system benefit them?

Chapter 2

Review of Related Literature

Attendance has become increasingly important in every organization, institution, and workplace to ensure accountability, productivity, and engagement. For example, in schools, it ensures that students are present, participating, and fulfilling their responsibilities. The traditional method of taking attendance is through a manual roll call. According to Uniyal (2022), using manual attendance is cost-effective, simple to use, and remains functional during power interruptions. However, despite these advantages, manual attendance has several flaws such as time consuming like for the roll call method, according to (Mahato & Suman, 2013, p. 5875). An average of 5 - 15 minutes is wasted for manual roll calls which is a lot of time that will be consumed during class or work time. Another one is that there is no integrity when the ledger sheets are the method of taking attendance as there is a possibility to fake another student's attendance through forging another student's name and signature plus it is also easy for the student to replace and erase someone already there.

The Biometrics - fingerprint filled some of the gaps in manual attendance. According to (Walia & Jain 2016), replacing the traditional way of taking an attendance to biometric fingerprint is a must as it fills the gaps in taking the manual attendance such as the roll call and paper based. The unique fingerprint of each person is a great idea to include in the field of attendance management. Even though a biometrics fingerprint attendance system is an ideal way to have validity, reliability, etc., there are still possible problems that may occur if we totally applied this way alone itself. According to (Truein, 2024), there is a possibility to have an issue in terms of the target's biometric recognition when the part of their finger they use to register to identify their fingerprint is wounded or injured as the current sensors are not capable to detect deeply within the wound plus dirty and dusty fingerprint may give the sensor a difficulty to analyze the

person's fingerprints' biometrics. Deployment also might be expensive as mostly the biometric fingerprint attendance system relies on hardware and peripherals, in addition to that, since biometric fingerprint will be the attendance system, meaning it must be available to each of the rooms where attendance is needed plus it is not ideal to remote settings.

According to (Truin, 2024), there is another one that is more reliable and has a higher accuracy than the fingerprint biometric attendance system and that is facial recognition. According to (Yang & Han 2020), with the use of real time video processing, it can result in a high accuracy for about 82% which is higher compared to other attendance systems. It can also reduce the truancy rates in school as the facial recognition system can easily identify who gets in and out in real time, preventing the students from cutting classes or even skipping classes.

Facial recognition

Taking students' attendance is important for monitoring their performance in class. Good attendance is usually linked to good class performance, and vice versa (Zhi, Ibrahim & Aris, 2014).

2.1 Theme 1 Title

This chapter contains a review of research papers that:

- Describes work on a research area that is similar or relevant to yours
- Describes work on a domain that is similar or relevant to yours
- Uses an algorithm that may be useful to your work
- Uses a software / tool that may be useful to your work

It also contains a review of software systems that:

- Belongs to a research area similar to yours
- Addresses a need or domain similar to yours
- Is your predecessor

2.2 Theme 2 Title

2.3 Chapter Summary

Should include a table of related studies comparing them based on several criteria.

Highlight research gaps and the research problem.

Chapter 3

Research Methodology

This chapter lists and discusses the specific steps and activities that will be performed to accomplish the project. The discussion covers the activities from pre-proposal to Final SP Writing.

3.1 Research Activities

This project aimed to create an automated attendance system with the help of RFID together with facial recognition technology. This attendance system will replace and reduce the usage of manual attendance such as the written and oral and enhance its lacking optimized features such as security, reliability, authenticity, and integrity using the student's RFID and facial biometric.

The proposed system is expected to function by tapping the RFID of the students with real time facial capture through face recognition technology. The identity of the students will be verified through the unique serial number of their RFID that will match from the system database while the face recognition will serve as the two-factor authentication. The face recognition is expected to work by capturing the students face then will be matched also through the system database. The attendance will only be valid once both student's unique serial number in their RFID and their face has been verified.

To make the system functional, several data from the students need to be collected. Those are the student's name, student number, student's unique serial number of their RFID, and their facial biometrics. Those data will be gathered either online or face to face. Students are encouraged to download any of the RFID

card readers to know their RFID's serial number but in case they are incapable of doing that. Face to face to face will be an option where we can provide a physical RFID card reader. The facial recognition data will be gathered through capturing their image or video to be more accurate.

The hardware components will be using in this system are: RFID scanner: Which will be used to read the RFID given to the students. This will also be responsible for taking the students unique serial number on their RFID ensuring the integrity of the students. USB connector: This will be used to connect the RFID scanner and the Camera Module to the Laptop or Raspberry Pi. Laptop / Raspberry Pi: This will serve as the main processing unit. The laptop or raspberry pi will be used for running the required algorithm to make the face recognition and read the RFID correctly. Overall, the laptop / raspberry pi will be in charge of handling the data. Camera Module: In charge of capturing the student's facial image while scanning the RFID to the RFID scanner. Software Python facial recognition

DO NOT FORGET to cite your references.

3.2 Calendar of Activities

A Gantt chart showing the schedule of the activities should be included as a table. For example:

Table 3.1 shows a Gantt chart of the activities. Each bullet represents approximately one week worth of activity.

Table 3.1: Timetable of Activities

Activities (2009)	Jan	Feb	Mar	Apr	May	Jun	Jul
Study on Prerequisite Knowledge			●●	●●●●			
Review of Existing Racing Strategies	●●	●●●●	●●●●	●●●●			
Identification of Best Features				●●●●	●●		
Development of Racing Strategies				●●	●●●●	●●	
Simulation of Racing Strategies				●●	●●●●	●●●	
Analysis and Interpretation of the Results					●●●●	●●●●	●
Documentation	●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●

Chapter 4

Preliminary Results/System Prototype

This chapter presents the preliminary results or the system prototype of your SP. Include screenhots, tables, or graphs and provide the discussion of results.

References

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Appendix A

Appendix Title

Appendix B

Resource Persons

Mr. Firstname1 Lastname1
Role1
Affiliation1
emailaddr1@domain.com

Ms. Firstname2 Lastname2
Role2
Affiliation2
emailaddr2@domain.net

....