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UP TAP

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A Special Problem Proposal

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Abstract

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

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

34 **Keywords:** UP System, RFID, attendance, machine learning, facial
recognition, Facenet model.

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60		fully describe the figure in a concise manner such that there is not	
61		need to refer to the text when figuring out the graphic.	2

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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.

- 86 • In a recent study of reaction times (Kartch, 2000)...
- 87 • In 2000, Kartch compared reaction times...
- 88 • Fedkiw et al. (2001) compared reaction times...
- 89 • In a recent study of reaction times (Fedkiw et al., 2001)...
- 90 • In 2001, Fedkiw et al., compared reaction times...

91 The following are references from journal articles (Park, Linsen, Kreylos,
 92 Owens, & Hamann, 2006; Pellacini et al., 2005; Sako & Fujimura, 2000). Here’s
 93 an MS thesis document (Yee, 2000), and this is from PhD dissertation (Kartch,
 94 2000). For a book, reference is given as (Parke & Waters, 1996). Proceedings
 95 from a conference samples are (Jobson, Rahman, & Woodell, 1995; Fedkiw et al.,
 96 2001; Levoy et al., 2000). The sample bibliography file named **myreferences.bib**
 97 is from the SIGGRAPH L^AT_EX template. You can use a text editor to view the
 98 contents of the bib file. It is your task to create your own bibliography file. For
 99 those who downloaded papers from ACM or IEEE sites, there is a BibTeX link
 100 that you can click; thereafter, you just simply need to copy and paste the BibTeX
 101 entry into your own bibliography file.

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

```
105         #include <stdio.h>
106         main()
107         {
108             printf("Hello world!\n");
109         }
```

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

112 1.2 Problem Statement

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

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

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

122 1.3 Research Objectives

123 1.3.1 General Objective

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

127 1.3.2 Specific Objectives

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

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

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

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

139 1.4 Scope and Limitations of the Research

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

142 1.5 Significance of the Research

143 This section explains why research must be done in this area. It rationalizes the ob-
144 jective of the research with that of the stated problem. Avoid including sentences
145 such as “This research will be beneficial to the proponent/department/college”
146 as this is already an inherent requirement of all BSCS majors. Focus on the
147 research’s contribution to the Computer Science field.

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

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

- 151 – What will be your technical contributions, in terms of algorithms, or
- 152 approaches, or new domain?
- 153 – What is your value-added compared to existing systems?
- 154 • What will be your contributions to society in general?
- 155 – Who will benefit from your system?
- 156 – Who are your target users and how will this system benefit them?

Chapter 2

Review of Related Literature

2.1 Importance of Attendance Tracking

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. 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).

2.1.1 Traditional Attendance Methods

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.

178 2.1.2 Biometric-Based Attendance Systems

179 The Biometrics - fingerprint filled some of the gaps in manual attendance. Accord-
180 ing to (Walia & Jain 2016), replacing the traditional way of taking an attendance
181 to biometric fingerprint is a must as it fills the gaps in taking the manual at-
182 tendance such as the roll call and paper based. The unique fingerprint of each
183 person is a great idea to include in the field of attendance management. Even
184 though a biometrics fingerprint attendance system is an ideal way to have valid-
185 ity, reliability, etc., there are still possible problems that may occur if we totally
186 applied this way alone itself. According to (Truein, 2024), there is a possibility to
187 have an issue in terms of the target's biometric recognition when the part of their
188 finger they use to register to identify their fingerprint is wounded or injured as the
189 current sensors are not capable to detect deeply within the wound plus dirty and
190 dusty fingerprint may give the sensor a difficulty to analyze the person's finger-
191 prints' biometrics. Deployment also might be expensive as mostly the biometric
192 fingerprint attendance system relies on hardware and peripherals, in addition to
193 that, since biometric fingerprint will be the attendance system, meaning it must
194 be available to each of the rooms where attendance is needed plus it is not ideal
195 to remote settings.

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

203 2.2 Theme 1 Title

204 This chapter contains a review of research papers that:

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

209 It also contains a review of software systems that:

- 210 • Belongs to a research area similar to yours
- 211 • Addresses a need or domain similar to yours
- 212 • Is your predecessor

213 **2.3 Theme 2 Title**

214 **2.4 Chapter Summary**

- 215 Should include a table of related studies comparing them based on several criteria.
- 216 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

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

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

255 **DO NOT FORGET to cite your references.**

256 **3.2 Calendar of Activities**

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

259 Table 3.1 shows a Gantt chart of the activities. Each bullet represents approx-
260 imately 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	••	••••	••••	••••	••••	••••	••

261 Chapter 4

262 Preliminary Results/System 263 Prototype

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

References

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²⁹³ **Appendix A**

²⁹⁴ **Appendix Title**

295 **Appendix B**

296 **Resource Persons**

297 **Mr. Firstname1 Lastname1**

298 Role1

299 Affiliation1

300 emailaddr1@domain.com

301 **Ms. Firstname2 Lastname2**

302 Role2

303 Affiliation2

304 emailaddr2@domain.net

305