



IOT enabled Recognition based attendance Management System

N.H.P. Ravi Supunya Swarnakantha
MS17904124

THE THESIS
SUBMITTED TO
SRI LANKA INSTITUTE OF INFORMATION TECHNOLOGY
IN PARTIAL FULLFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

December 2018

Declaration

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, we hereby grant to Sri Lanka Institute of Information Technology the non-exclusive right to reproduce and distribute my dissertation, in whole or in part in print, electronic or other medium. We retain the right to use this content in whole or part in future works (such as articles or books).

N.H.P. Ravi Supunya

Date: Ravi 22/01/2019

The above candidate has carried out research for the M.Sc. in Information Technology Dissertation under my supervision.

Signature of the supervisor:

Date:

[Signature]
22/01/19

Approved for MSc:

MSc. Programme Co-ordinator, SLIIT: [Signature]

Date:

2019/1/22

Acknowledgement

The entire would like to acknowledge and extend our heartfelt gratitude to the following persons who have made the completion of this huge project this much of success. This project would not have been such a great achievement without the support and guidance of key people acknowledged here. Our Supervisor Mr. Anuradha Jayakody for his vital encouragement, assistance and excellent support, Lecturer in charge of the course M.Sc. Research Project Mr. Samantha Rajapakshe for his great coordination effort, our parents and for everyone who provided uncountable help and inspiration to successfully complete my final year project.

Table of Contents

List of Figures	vi
List of Tables	ix
Chapter 1	1
1.1 Introduction.....	1
1.1 Research problem	3
1.2 Research Gap	5
1.3 Research questions.....	6
1.4 Research Objectives.....	6
1.4.1 Identify students using Radio Frequency Identification.....	6
1.4.2 Identify student using face recognition	6
1.4.3 Register courses and subjects on the system	7
1.4.4 Mark attendance on the database.....	7
1.4.5 Check whether the student attended to correct session.	7
1.4.6 Send notification emails to students.....	7
1.4.7 Generate attendance reports.	7
Chapter 2	8
2.1 Literature review.....	8
Chapter 3	23
3.1 Methodology.....	23
3.1.1 Planning.....	23
3.1.2 Analysis	24
3.1.3 Design.....	25
3.1.4 Implementation.....	28

Chapter 4	60
4.1 Results.....	60
Chapter 5	80
5.1 Evaluation and Testing	80
Chapter 6	83
6.1 Discussion.....	83
Chapter 7	86
7.1 Conclusion	86
7.2 Future works	88
Chapter 8	89
8.1 References.....	89

List of Figures

Figure 3.1.1 System overview	25
Figure 3.1.2 Flowchart of system	26
Figure 3.1.3 ER Diagram of database	27
Figure 3.1.4 Use case diagram	28
Figure 3.1.5 RFID reader and Raspberry	30
Figure 3.1.6 Raspberry Pins	30
Figure 3.1.7 RFID reader pins	30
Figure 3.1.8 Command to clone	31
Figure 3.1.9 Installation	31
Figure 3.1.10 Reading RFID values	31
Figure 3.1.11 RFID tag inside	32
Figure 3.1.12 Importing's	33
Figure 3.1.13 Set Pins	33
Figure 3.1.14 Blink LED	34
Figure 3.1.15 Get data	34
Figure 3.1.16 Writing	35
Figure 3.1.17 Install MySQL	35
Figure 3.1.18 Login to root of MySQL	36
Figure 3.1.19 MySQL connector	36
Figure 3.1.20 connecting to database	36
Figure 3.1.21 Structure of class details table	37
Figure 3.1.22 Structure of Student details table	38
Figure 3.1.23 Structure of attendance details table	38
Figure 3.1.24 Update pi	39
Figure 3.1.25 Upgrade pi	39
Figure 3.1.26 Install Cmake	39
Figure 3.1.27 Install dependencies	39
Figure 3.1.28 Install python	40
Figure 3.1.29 Install python tools	40

Figure 3.1.30 Get Open cv	40
Figure 3.1.31 Install Numpy.....	40
Figure 3.1.32 Build Open CV	41
Figure 3.1.33 Add swap space.....	41
Figure 3.1.34 Compile open CV	41
Figure 3.1.35 Install Open CV	41
Figure 3.1.36 Test Open CV	42
Figure 3.1.37 Face recognition overview	42
Figure 3.1.38 Haar Cascade features	44
Figure 3.1.39 Imports	45
Figure 3.1.40 Set class path.....	45
Figure 3.1.41 Capturing Objects	45
Figure 3.1.42 Set minimum window size.....	46
Figure 3.1.43 Important parameters	46
Figure 3.1.44 Mark detected faces	46
Figure 3.1.45 Face recognition Training	47
Figure 3.1.46 Necessary Imports.....	48
Figure 3.1.47 Path of images.....	48
Figure 3.1.48 Recognizer	49
Figure 3.1.49 Lable data.....	49
Figure 3.1.50 Train recognizer	49
Figure 3.1.51 Face recognition.....	50
Figure 3.1.52 Registering students for taking attendance	52
Figure 3.1.53 Marking attendance.....	54
Figure 3.1.54 Home page of web application	55
Figure 3.1.55 Add course details.....	56
Figure 3.1.56 View Student data	57
Figure 3.1.57 View student attendance data.....	58
Figure 3.1.58 View class time table	58
Figure 4.1.1 Home page of web site.....	60
Figure 4.1.2 Add courses.....	61

Figure 4.1.3 add a subject to the system.....	62
Figure 4.1.4 Add another subject	63
Figure 4.1.5 Success messages.....	64
Figure 4.1.6 subjects table	64
Figure 4.1.7: View class time table	65
Figure 4.1.8:Class time table	65
Figure 4.1.9: Student registration	66
Figure 4.1.10: Enter student details.....	66
Figure 4.1.11: Entering to the database	67
Figure 4.1.12: Start camera for write	67
Figure 4.1.13: Getting captures	68
Figure 4.1.14: Writing to the tag	69
Figure 4.1.15: Hardware set up	69
Figure 4.1.16: Success written	70
Figure 4.1.17: View Student data	71
Figure 4.1.18: Student data.....	71
Figure 4.1.19: Training faces	72
Figure 4.1.20: Reading RFID tags.....	72
Figure 4.1.21: Unknown faces	73
Figure 4.1.22: Known faces	74
Figure 4.1.23:Matching personage	75
Figure 4.1.24: Invalid class	75
Figure 4.1.25: Valid student	76
Figure 4.1.26: Marking attendance.....	76
Figure 4.1.27: System sent e mail	77
Figure 4.1.28: Content of e mail.....	77
Figure 4.1.29: View Student's attendance data.....	78
Figure 4.1.30: Attendance data filtering.....	78
Figure 4.1.31: Attendance details.....	79
Figure 4.1.32: Attendance report.....	79

List of Tables

Table 1.2.1 research gap.....	5
Table 3.1.1 RFID pins	29
Table 5.1.1 research Evaluation	80

Abstract

Attendance management is a very important task for each and every university or an institute. Most of the institutes doing this attendance marking manually and it is time consuming as well as it many causes to many errors. Therefore, researchers tried to come up with automated attendance systems as a result of this issue. Researchers developed different systems using finger print technology, radio frequency identification (RFID) and face recognition. Many of them used those technologies separately but it is not suitable for places like education institutes.

The purpose of the following research is to design and develop a new system using different technologies together and enable the internet of things to the system. So, this system uses face recognition and radio frequency identification together to come up with a proper solution. The system is using an online MySQL database to store entire data of the system. Python is used to program the system and Open CV is used for face recognition.

One main finding of the research is to identify the student with different angles of face after getting the RFID tag value. When getting attendance, the student should place his or her RFID tag on the reader and then the system identifies the student with the tag value. The system then retrieves student's registration details and start compare student's face with saved faces of that student. If the system identifies the student, then it checks for the subject's time slot to ensure that the student comes to the correct class. If all of them are correct, the system marks attendance for the student and sends a notification e mail to the student so the student can know his or her attendance marked successfully for the class. There is a web application also developed to register courses and subjects on the system and to view attendance details.