



94 POS Terminal using Biometrics for Attendance Management System

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Abstract— In this paper, the development of an attendance management system using biometrics is proposed. Managing employee attendance during working hours and shifts has become a difficult challenge. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. For the stated reason, an efficient attendance management system using biometrics is designed. This system takes attendance and the current date and time electronically with the help of a finger print device and the records of the attendance are stored in a database. Attendance is marked after employee identification.

For employee identification, a biometric (fingerprint) identification based system is used. This process however, eliminates the need for stationary materials and personnel for the keeping of records. Almost hundred employees were used to test the system and success rate of 94% was recorded. The manual attendance system average execution time for hundred employees was 17.83 seconds while it was 3.79 seconds for the automatic attendance management system using biometrics. The results showed improved performance over manual attendance management system. Attendance is marked after employee identification.

Keywords: fingerprints, attendance, enrollment, authentication, identification

I. INTRODUCTION

In many institutions, and academic organizations, attendance is a very important which is used for various purposes. These purposes include record keeping, assessment, and promotion of optimal and consistent attendance and time. In developing countries, a minimum percentage of attendance is required in most institutions and this policy has not been adhered to, because of the various challenges the present method of taking attendance presents. This traditional method involves the use of sheets of paper or books in taking attendance.

This method could easily allow for impersonation and the attendance sheet could be stolen or lost. Taking of attendance is time consuming and it is difficult to ascertain the number of employees that have made the minimum percentage. Thus, there is a need for a system that would eliminate all of these trouble spots.

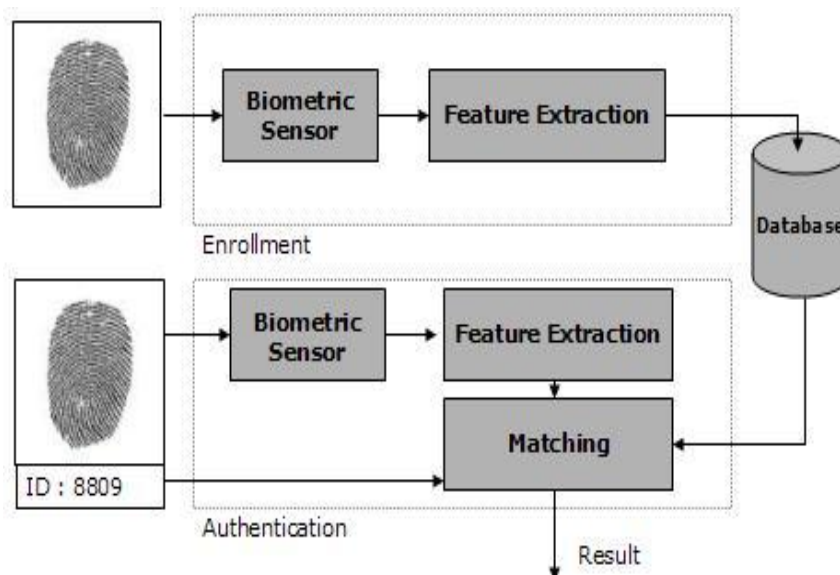


Figure 1: General view

An automatic attendance management system using biometrics would provide the needed solution. An attendance management system is a software developed for daily employee attendance in organizations. It facilitates access to the attendance of a particular employee in a particular department with a particular time. This system will also help in automatic generating reports and evaluating the attendance eligibility of an employee.

Rather than signing an attendance sheet, individuals will pass their thumb over the fingerprint scanner, the finger print is compared against a list of pre-registered users, and once a match is made, the individual will be registered as having attended that particular day as many times he/she login/logout.

The paper discusses related works in the problem domain; highlights the general overview of the proposed system; details design considerations of the system, both at the hardware and software level; discusses the operation and how the system was tested in conformity to system design and functional objectives; concludes the observations made; and makes recommendations for future improvement.

II. HARDWARE PLATFORM BUILD

A. Hardware Configuration

The hardware to be used can be divided into two categories – fingerprint device which captures the image and houses the database, runs the comparison algorithm and simulates the application function. The fingerprint device is connected to the lan continuously for automatic Updates to the server application.



Figure 2: Fingerprint Device 94 pos terminal.

Visontek 94 POS terminal with in-built finger print scanner is specially designed to address NREGA, Microfinance and PDS Segments with biometric authentication for beneficiary transactions. It is based on CCD finger print sensor with proprietary and precise algorithms which support ANSI 378 and ISO 19794 template formats for both enrollment and verification.

The 94 POS comes with seamless connectivity options like GSM/GPRS, CDMA and Ethernet. Visontek 94 POS comes with ISO 7811 for Magnetic stripe reader and ISO 7816 supported Smart Card Reader and Optional Contactless Card Reader. The fingerprint sensor is conveniently placed for user access. A built-in battery and high gain antenna make the 94POS ideal for outdoor field use.

B. Software Architecture

The software architecture consists of: the database and the application program.

Database: The database consists of tables that stores records implemented in SQLite database. However, this can be migrated to any other relational database of choice. SQLite is fast and easy, it can store a very large record and requires little configuration.

C. Application Program

The application program is developed with Linux C programming language using apache2 framework and it provides a user interface for the Attendance Management System.

The main advantage of Linux C programming is crash frequency is less. Many editors are available for programming and also we can use many system calls to program files.

D. Methodology and Flowchart

This proposed attendance management system uses fingerprint identification. In identification, the system recognizes an individual by comparing his/her biometrics with every record in the database. In general, biometric identification consist of two stages:

- Enrolment and
- Authentication

During enrolment, the biometrics of the user is captured (using a fingerprint reader, which are likely to be an optical, solid state or an ultrasound sensor or other suitable device) and the unique features are extracted and stored in a database as a template for the subject along with the student ID.

The objective of the enrolment module is to admit an employee using his/her ID and fingerprints into a database after feature extraction. These features form a template that is used to determine the identity of the employee, formulating the process of authentication. The enrolment process is carried out by an administrator in the attendance system.

During authentication, the biometrics of the user is captured again and the extracted features are compared (using a matching algorithm) with the ones already existing in the database to determine a match.

However, as it becomes more complex the computational cost increases which leads to undesirable high processing times. The flow of attendance management system is designed in a flow chart. A brief flowchart is shown in Figure 3.

III. SYSTEM ARCHITECTURE

The enrolment and registration phase is an administrative phase in which the administrator needs to log in. The user fingerprint as well as the other employee details is stored for the first time into the database for employee registration. The employee id, employee name, department name, are also registered at this phase. All data and information required for the proper recording of attendance are enrolled.

The employee enters the employee id and waits for the details, then the employee places his/her fingerprint on the fingerprint reader; the finger recognition unit compares the fingerprint features with those stored in the database.

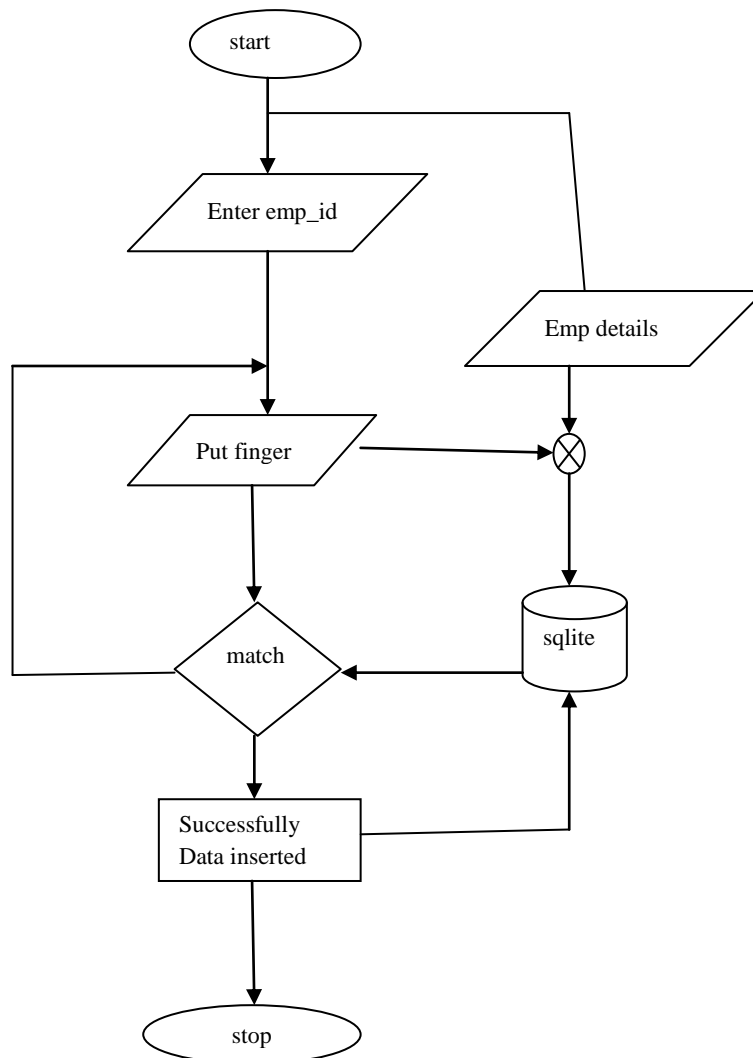


Figure 3: Flowchart of the system

The possible cases are:

- Match (of Fingerprint): captured user fingerprint features are matched with stored fingerprint templates. The user is automatically recorded with current date and clock time and the message is displayed whether the employee logs in or Logout.



Figure 4: Attendance form (match of fingerprint).

- Non-match (of fingerprint): the user is not accepted for attendance and a message is shown in the textbox that fingerprint is not found. The interface is shown in Figure 5.



Figure 5: Attendance form (Non-match of fingerprint).

IV. SYSTEM TESTING AND REPORT GENERATION

Reports are generated for each course and the total number of students for each attendance is listed and their corresponding status. An example is shown in Figure 6.

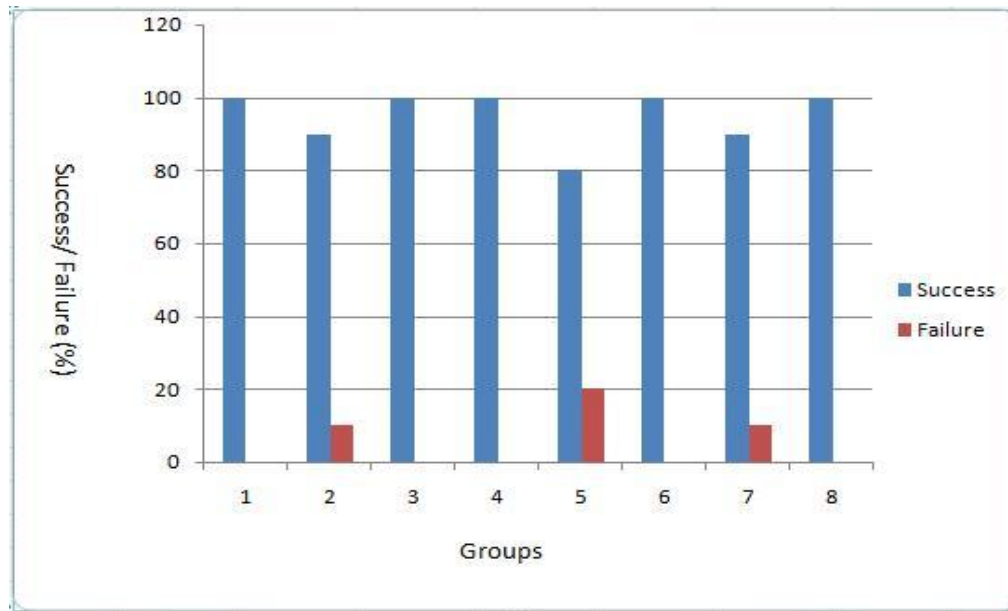
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1																									
2	NAME	DEPARTMENT	01/09	02/09	03/09	04/09	05/09	06/09	07/09	08/09	09/09	10/09	11/09	12/09	13/09	14/09	15/09	16/09	17/09	18/09	19/09	20/09	21/09	22/09	23/09
3	PAVAN KUMAR A S	ADMIN	09:18	09:08	09:11	09:08	09:21	09:14	09:20	09:12	09:16	09:21	13:39	09:22	09:21	08:54	09:04	09:09	09:06	09:20	09:10	09:06	09:03	09:05	09:08
4	SESHADRI SRIRAMULA	COMMERCIAL	10:40	10:27	10:09	10:02	10:23	10:16	10:16	10:32	10:36	10:20	09:05	18:08	18:33	10:07	10:10	10:25	10:33	10:36	10:20	10:07	10:09	10:29	10:27
5	VENU GOPAL POTHIKANO	COMMERCIAL	09:15	09:35	10:38	09:35	09:47	09:30	09:42	09:30	09:41	09:40	09:34	09:27	11:32	10:00	09:22	09:44	09:27	09:37	10:56	10:07	09:49	10:00	09:42
6	RADHA CHEBROLE	EM 1	09:20	09:10	09:05	09:11	09:08	09:09	09:14	09:14	08:45	08:43	09:00	09:03	09:05	09:10	08:56	08:54	08:58	08:54	09:11	08:57	09:02	08:44	08:56
7	SRI HARI RAJU RUDDAR	EM 3	08:56	11:15	08:55	08:54	08:53	08:58	08:54	08:49	09:11	08:56	08:57	08:49	08:51	08:50	08:50	08:56	08:52	09:10	08:58	08:50	08:52	08:44	08:56
8	KRISHNAVENI GOLLA	EM 3	09:22	09:29	09:04	09:22	09:32	09:33	09:27	09:15	09:39	09:36	09:23	09:36	09:24	09:44	09:27	09:27	09:34	09:30	09:27	09:46	09:39	10:15	09:06
9	RADHIKA BOMMAGANI	EM 3	08:58	08:55	09:09	09:16	09:13	08:39	09:10	11:16	08:56	09:15	09:16	09:18	09:06	07:08	11:38	07:22	08:50	08:48	08:46	08:24	08:47	07:05	07:00
10	VENKATESWARLU KUDUM	EM 3	08:58	09:22	09:06	09:09	09:08	09:06	09:17	09:12	09:10	09:21	09:22	09:21	09:15	09:10	09:01	09:14	10:01	09:15	09:13	08:52	09:07	13:23	09:08
11	VISHNU PRASAD MANDAP	EM 3	09:10	09:04	09:32	09:19	09:11	09:19	09:06	09:06	09:04	09:06	09:09	09:20	09:11	08:57	09:14	09:10	09:01	08:55	08:58	09:01	09:12	09:09	10:54
12	PRATHAP KUMAR BELLA	EMI LAB	09:30	11:48	09:11	09:10	09:21	08:56	09:13	09:08	08:56	08:57	09:57	09:06	08:46	09:06	09:04	09:06	09:39	09:06	09:07	08:53	08:57		
13	SRINIVAS VADLADI	EMI LAB	09:19	11:07	09:45	09:36	11:12	09:45	09:52	09:38	11:07	09:50	09:23	16:53	08:57	09:58	09:28	09:07	09:50	09:50	09:32	09:40			
14	D HARISH	ePOS	09:05	09:00	08:58	09:05	09:07	09:08	09:04	09:10	09:18	09:09	09:15	09:16	09:01	09:12	09:12	09:03	09:13	09:04	09:06	09:06	09:10	09:13	09:19
15	G RAMA KRISHNA	ePOS	09:02	08:59	08:59	09:03	09:04	09:08	09:02	09:10	09:10	09:08	09:07	09:08	09:09	08:56	09:16	08:56	09:05	09:13	09:04	09:12	08:51	08:50	09:00
16	MURALI KRISHNA EDARA	ePOS	08:55	09:01	09:02	08:57	09:00	09:03	09:15	08:55	08:59	09:03	09:02	09:08	09:02	09:02	09:06	09:05	09:02	09:00	08:57	08:58	08:55	08:55	08:56
17	NAGESWARA RAO K V S	ePOS	09:03	08:48	08:58	08:53	08:53	08:46	08:53	08:58	08:49	08:59	08:57	08:56	08:51	09:03	08:59	10:51	08:56	08:53	08:58	08:56	09:01	08:58	08:50
18	P MADHAVI	ePOS	09:13	09:18	09:04	08:57	09:09	08:59	09:11	09:03	08:44	09:02	08:59	09:05	09:16	09:00	09:02	09:09	08:55	09:03	09:12	09:05	09:06	09:09	09:02
19	S H SRI HARSHA	ePOS	08:53	09:05	09:43	19:52	09:50	08:17	08:45	08:58	08:54	08:52	08:55	08:48	08:54	09:13	08:49	08:39	08:42	08:58	08:59	08:51	08:30	09:16	08:58
20	USHA RANI M	ePOS	09:17	09:14	09:58	20:01	09:05	09:33	09:48	09:28	10:20	09:12	09:28	08:56	08:59	08:57	09:32	08:57	08:54	09:24	09:17	09:15	09:23	13:43	09:13
21	VJAYYA KUMAR BELLAM	ePOS	08:58	08:48	08:57	08:58	08:54	08:58	08:57	09:48	09:47	08:53	08:43	08:37	08:48	08:46	08:47	08:46	08:46	08:45	08:56	08:45	08:36	08:44	08:57
22	RAMESH KUMAR BARLA	HR&ADMIN	09:19	09:20	09:17	09:11	09:11	09:07	09:07	09:13	09:16	09:12	09:12	08:41	09:14	09:11	09:13	09:20	09:16	09:35	09:00	09:08	09:16	09:37	09:22
23	SURENDRA BABU URIMI	HR&ADMIN	09:26	09:11	09:19	09:36	09:07	09:12	09:29	09:16	09:17	09:13	09:05	09:07	08:34	09:19	09:11	09:20	09:19	09:01	11:31	09:08	08:54	08:52	09:06
24	NARSIMHA ACHUTHA RAO	I&A	09:01	08:50	09:14	08:52	09:26	08:54	08:44	08:42	08:42	08:52	08:45	08:42	08:56	08:44	08:42	08:50	08:47	09:00	08:58	08:53	08:55	08:55	08:54
25	NEELADRI TAMIRISA NAO	I&A	09:56	10:04	09:56	09:31	09:37	09:46	10:01	10:05	09:56	10:00	09:59	09:06	09:37	10:02	10:00	09:36	10:19	10:02	09:51	10:03	09:40	09:47	09:48
26	THIMMA RAJU B U	I&A	09:27	09:14	09:03	09:41	09:10	08:51	09:03	09:04	09:20	09:31	09:30	09:20	09:52	08:50	08:59	07:59	09:54	09:26	09:29	09:21			
27	KALYAN NETHINTI	I&T	09:14	09:16	09:10	09:14	09:02	09:09																	
28	SANDEEP KAPA	I&T	09:11	09:01	08:59	09:09	09:01	08:55	09:11	09:10	08:46	09:01	09:00	08:55	09:13	08:57	17:52	09:02	08:49	08:57	09:14	08:59			
29	GOPAL RAO KAPA	MFTG	09:55	09:50	09:59	09:52	10:00	09:52	09:54	09:42	10:33	10:03	09:50	10:33	09:55	09:45	09:45	10:02	09:48	09:44	09:59	09:36			
30	KANAGALA RAMU	Purchase Acnts	09:13	09:11	09:03	09:04	09:01	09:02	09:01	08:57	09:03	09:00	09:00	08:58	09:07	08:59	09:01	09:01	09:18	09:07	09:05	09:03	09:14	09:05	09:09

Figure 6: Reports Form for Attendance System.

The test results shows that the system is effective and it has a fast response. There was no false identification of employees, few cases of false reject which was later accepted and only pre-registered employees were authenticated. The matrix of the identified employees were enrolled for attendance automatically.

The system was tested using the employee details and fingerprints collected from employees of the Linkwell Telesystems Private Limited. In the test, there was no false acceptance i.e. a person that was not pre-registered was not falsely enrolled for attendance. There were a few false rejections during the test in which the system failed to identify some pre-registered users. The false rejects could be attributed to improper placement of the finger on the scanner and fingers that have been slightly scarred due to injuries.

The employees are divided into groups of 10 employees and a success rate of over 94% was obtained from the tests carried out. The results of the test are shown below in the chart (Table 1).



V. CONCLUSION

The system successfully takes the attendance and generate the automatic reports for every 45 minutes. The prototype successfully captured new fingerprints to be stored in the database; scanned fingerprints placed on the device sensor and compared them against those stored in the database successfully. The performance of the system was acceptable and would be considered for full implementation especially because of its short execution time and reports generation. Everyone who tested the system was pleased and interested in the product .

In this paper, we have presented a fingerprint-based attendance management system. The developed system is an embedded system that is part of a fingerprint recognition/authentication system. Templates are matched during both registration and verification processes.

The developed system is very helpful in saving valuable time of employees and admin, paper and generating report at required time. The system can record the clock in and clock out time of students and workers in a very convenient manner using their fingerprint to prevent impersonation and reduce level of absence. Also, it reduces most of the administrative jobs and minimizes human errors, avoids proxy punching, eliminates time-related disputes and helps to update and maintain attendance record.

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