

Fingerprint Authentication Based Ration Shop

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Abstract: *The system of providing basic domestic commodities on subsidy to poor families in developing countries like India is an important aspect to meet fundamental requirement of people. The existing public distribution system requires manual measurement of ration and maintenance of record of transactions. Many problems are encountered by the existing system such as, Ration distribution to unauthenticated card holders, Card holders wasting time in queues for collecting ration for hours, Lots of malpractices such as hoarding, black marketing and overcharging and maintenance of records is difficult. As solution to this problem the proposed system proposes an automatic method to distribute the commodities to authenticated card holders. The system is placed at each ration shop which is connected to the server through internet. Every time before ration collection each user has to login into the system. Once they are successfully logged in they can view the stock availability and their transaction details. To select the commodities they need to give fingerprint authentication, then user will select the commodity and quantity using android application. Automatic distribution of commodities is achieved in this way. In addition user will get SMS based alert about arrival of commodities. As a result, this new e-PDS system can reduce possible human errors and provide accurate information of public distribution system at any point.*

Keywords: *Public Distribution System, Fingerprint Authentication, Android Application, Server, Client.*

I. INTRODUCTION

A public distribution shop (PDS), also known as fair price shop (FPS) is a part of India's public distribution system established by government of India. India has 5.35 Lakh shops constituting the largest distribution network in the world. Government provides food, oil and fuel to economically challenged people at subsidized rates which are distributed to the public through these shops. The stocks for these ration shops will be bought from the farmers and then sold at subsidized rates. Every month fresh stock arrives at these shops and that needs to be distributed to public. The owner of most of the ration shops resort to malpractices and the allotted amount of ration is not distributed to authorized people. In an effort to make the public distribution system (PDS) more efficient and to counter the fraudulent activities the following features are incorporated in the present distribution system. In the initial phase of the project, system would be kept in the ration shops. Each user has to register for ration card online from respective ration

shop through web and they will be given a user login ID and password to login to their profile. An android application will be installed in the users mobile so they can view their profile anytime. The database would keep updated consumer information and provide online information of all stocks available in a particular PDS outlet for a family depending on the number of dependents in a family. Arrival of stocks to the ration shop is informed to users by sending a notification. Fingerprint authentication system used to identify a particular user makes the system secure. To take the commodities fingerprint authentication is asked and then commodity and its quantity need to be selected using android application. Automatic ration distributing mechanism is monitored through controller and internet based on user requirements.

Department of food and supplies is providing ration cards to the citizens based on their economic conditions. There are mainly two types of cards:

1. Below poverty line (BPL) cards
2. Above poverty line (APL) cards

Depending on the number of dependents in a family the system will calculate the upper limit of the rationing and will maintain these records for future references. The stocks for these ration shops will be bought from the farmers and then sold at subsidized rates. Every month fresh stock arrives at these shops and that needs to be distributed to public. The owners of most of the ration shops resort to malpractices and the allotted amount of ration is not distributed to authorized people. To counter these fraudulent activities Smart public distribution system is proposed which incorporates the following features.

- 1) Arrival of stocks to the ration shop is informed to users.
- 2) Fingerprint authentication system used to identify a particular user
- 3) The commodity and its quantity needs to be selected using android application
- 4) Predefined information about the amount of ration to be distributed to each user
- 5) Automatic ration distributing mechanism
- 6) Monitor and display the ration stock left in the inventory

II. LITERATURE REVIEW

Public distribution system in the country has undergone organic changes from the rationing system

introduced during World War II to an important social safety program to ensure food security of the country. In this section, we briefly discuss the existing works about Public Distribution System.

Sana A. Qader Perampalli, Dr. R.R. Dube [1] presents a transparent and highly scalable Ration Distribution system with biometric authentication. The conventional paper based ration card is replaced by smart card. The system is connected to the server through web. Every time before ration collection each user has to login into the system. The user need not to pay the cash money as the appropriate balance is deducted from users bank account, so there is no direct involvement of ration shop owner in transaction. The transaction details are send to users mobile.

Bhalekar Swati D , Kulkarni Rutuja R, Lawande Akshay K, Patil Varsharani V [2] , this paper proposes online smart ration card system using RFID and biometrics. RFID tag will contain the information about family members. RFID tag given to a particular customer needs show to the RFID reader. It will check whether the card is valid or not and if yes, then by using biometrics the customer authentication is performed. If the customer is authenticated then the monthly quota will get displayed according to the family members. After delivery of ration, records are maintained in the online database.

D. Ashok Kumar, T. Ummal Sariba Begum [3], a Comparative Study on Fingerprint Matching Algorithms for EVM. The three matching techniques are direct matching, minutiae matching and matching based on Ratios of distance. By conducting the evaluation on the FVC-2000 datasets and the results were observed by conducting election with the help of these matching techniques and the best matching technique is found.

Sharath Prakanti, Prabhakar S, Jain A.K in their paper address the problem of fingerprint individuality by quantifying the amount of information available in minutiae features to establish a correspondence between two fingerprint images.

III. METHODOLOGY

A. System Architecture

The proposed system consists of two units – Server unit and Client unit. The server will completely control the activities like customer identification, alerting the customers at the arrival of grains and updating the database. The admin can do any required changes at the server side. The second unit is client unit which is placed at the ration shop. The FPS user will interact to the system by this unit and also the user registration process is done by FPS owner at client unit which is connected to server through web. The overall architecture of the system is illustrated in Figure 1, where the main components are shown.

All customers have to register at the respective ration shops to Access the proposed module. For registration customer should provide details about their family numbers and their fingerprint. Arrival of stocks to the

ration shop is informed to users by sending a notification. At ration shop we are using id and password to access the database and fingerprint authentication for identification. After login into the application it asks for the fingerprint authentication. The fingerprint is verified with database at server side if valid then, customer has to enter the products they want to buy along with quantity.

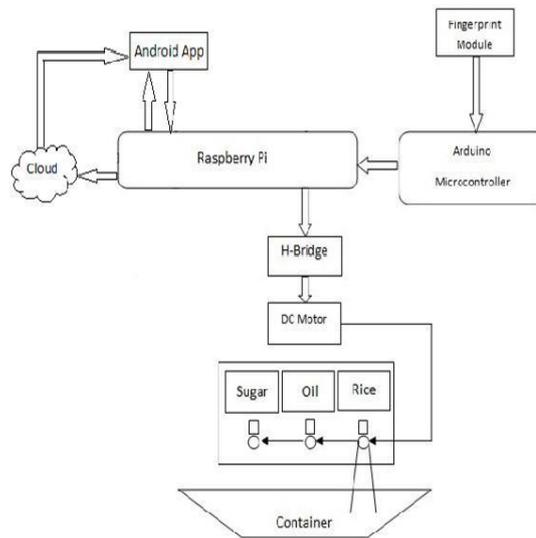


Fig 1. Block Diagram of Proposed System

B. Data Flow Diagram

The Data flow diagram for proposed system is shown in Fig.2. This system is titled smart public distribution system proposes an automatic method of distribution of commodities to authenticated card holders. Also, the details of transactions made are maintained in a database. User will be informed about the arrival of stocks by a message sent to their mobiles. The user need to access to their account through their Smartphone by putting their username and password. Once they are successfully logged in they can view the stock availability, their use and can also get the commodities on subsidy. This system works using Internet. The proposed system uses Raspberry-pi as controller. A family member is identified by his/her fingerprint template. This makes the system more secure.

Fingerprint processing includes two steps:

1. Fingerprint enrollment
2. Fingerprint matching

At the time of enrollment, user needs to provide two samples of fingerprint. Using these two samples, the fingerprint module generates a template of fingerprint which is used to authenticate the user later. The system is designed to enroll each transaction made by user into a database stored in Raspberry Pi. The user needs to select the quantity and commodity using android application. Automatic distribution of commodities is achieved by using DC motor controlled directly by Raspberry pi to open and close the valve.

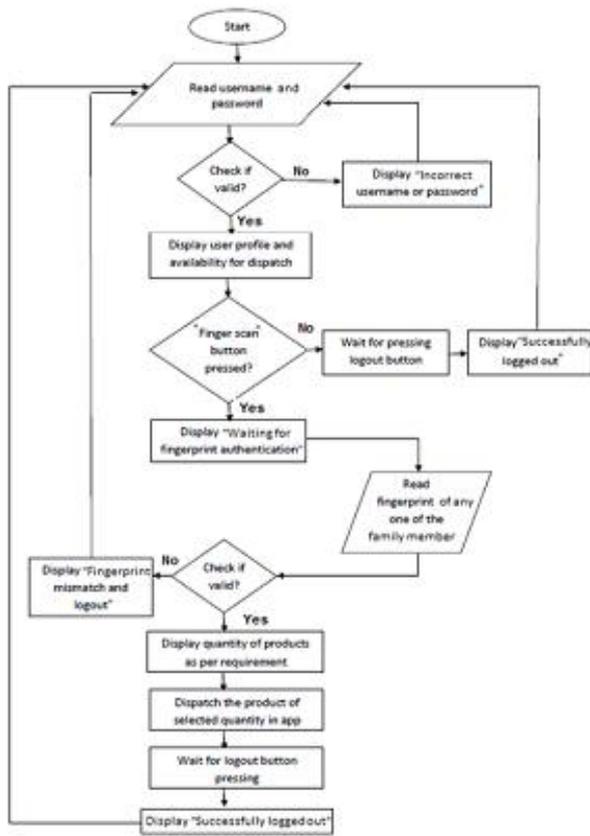


Fig 2. Dataflow diagram of proposed system

The proposed system uses minutiae extraction and matching algorithm for fingerprint authentication. Here, Minutiae are extracted from the two fingerprints and stored as sets of points in the two-dimensional plane. Minutiae-based matching essentially consists of finding the alignment between the template and the input minutiae sets that results in the maximum number of minutiae pairings. The algorithm design description is shown in Fig.3.

The first step in the minutiae extraction stage is Fingerprint Image enhancement. This is mainly done to improve the image quality and to make it clearer for further operations. In proposed system we have implemented three techniques: Histogram Equalization, Fast Fourier Transformation and Image Binarization.

Histogram equalization is a technique of improving the global contrast of an image by adjusting the intensity distribution on a histogram. In Fast Fourier Transform (FFT), we divide the image into small processing blocks (32 x 32 pixels) and perform the Fourier transform according to equation:

$$F(u, v) = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x, y) \times \exp \left\{ -j2\pi \times \left(\frac{ux}{M} + \frac{vy}{N} \right) \right\}$$

for $u = 0, 1, 2, \dots, 31$ and $v = 0, 1, 2, \dots, 31$.

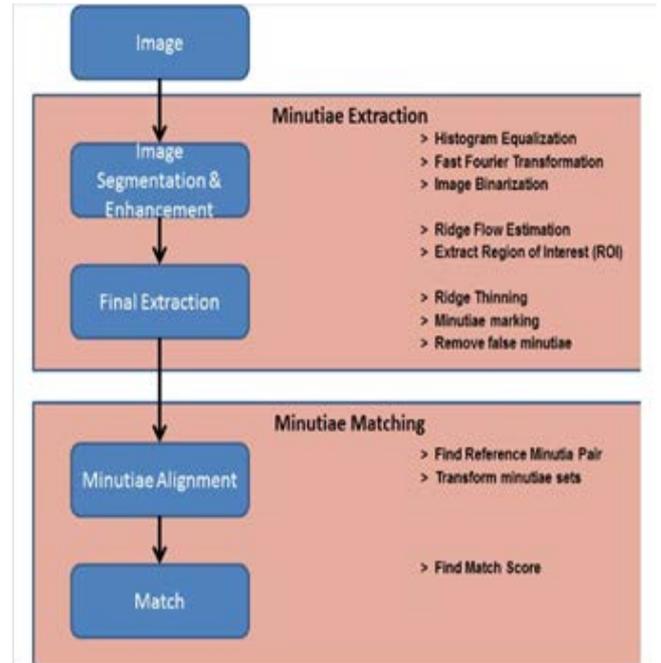


Fig 3. Detailed Design Description

we get the enhanced block according to the equation:

$$g(x, y) = F^{-1} \left\{ F(u, v) \times |F(u, v)|^k \right\}$$

where $F^{-1}(F(u, v))$ is given by:

$$f(x, y) = \frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} F(u, v) \times \exp \left\{ j2\pi \times \left(\frac{ux}{M} + \frac{vy}{N} \right) \right\}$$

For $x = 0, 1, 2 \dots 31$ and $y = 0, 1, 2 \dots 31$.

Image Binarization is a process which transforms the 8-bit Gray image to a 1-bit image with 0-value for ridges and 1-value for furrows. After image enhancement the next step is fingerprint image segmentation. In general, only a Region of Interest (ROI) is useful to be recognized for each fingerprint image. Using the following formula, get the Least Square approximation of the block direction.

$$\tan 2\beta = \frac{2 \sum \sum (g_x * g_y)}{\sum \sum (g_x^2 - g_y^2)}$$

where g_x and g_y are gradient values towards x and y -axis.

The blocks without significant information on ridges and furrows are discarded based on the following formulas:

$$E = \frac{2 \sum \sum (g_x * g_y) + \sum \sum (g_x^2 - g_y^2)}{W * W * \sum \sum (g_x^2 + g_y^2)}$$

Similarly, the minutiae extraction is done using sobel filters. After minutiae extraction false minutiae removal is

done with the help of seven conditions based on the distance between two ridges. Those minutiae points will be matched with the fresh fingerprint which is used during authentication of the user.

IV. CONCLUSION

The Smart public distribution system is an automation System and its recompenses over the present fair price shops. Fingerprint authentication makes the system more secure, it eliminates fake ration card holders and protects the interest of the common people ensuring the country's food security. By means of its performance one can reduce the corruption level. Selecting the commodity and quantity through the android app will make the system more smart and robust. It will help the country's economy to reach new heights. The automated PDS is easy to implement and requires much less hard work when compared to the other system. Using this system one can avoid the malpractices because there are no manual operations and all information is stored in the database. So implementing this will be really helpful to targeted people.

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