

SmartMart - An Automated Shopping Mart with Blink and Facial Recognition for Payment

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ABSTRACT: A new and innovative idea with social acceptance which will help in increasing the automation and bring ease in everyday life. According to the present scenario, Nowadays shopping in big malls is becoming a daily activity in metro cities. After adding to cart, at the checkout desk the cashier has to scan all products and then make a bill which is a time-taking process and makes big waiting lines.

Taking this in consideration, the proposed system to the aforementioned problem would be payment using facial recognition along with a completely new way of eye blink detection using real time template matching and similarity measure, which can efficiently reduce long queues at the malls or shopping marts also helping in less human error and hassle-free experience. This system will consist of a camera (hardware) and eye blink detection and face detection, recognition algorithms (software). Also, an interface which is a mobile application is used to compile these algorithms which works on android mobile phones and tablets. A user will enter his basic details while signing up in his app with a snapshot of his face, then add money to his e-wallet. Users will self scan the product barcode and on checking out of the purchase, the camera will detect eye blink and recognize the face and will lead to payment deduction on successful recognition.

The mobile application is built taking into consideration the user friendliness, fulfillment of promises, time saving, profit maximization, customer satisfaction.

KEYWORDS

Android Application, mobile, shopping marts, e-wallet, real time eye blink detection, Facial detection and recognition algorithm.

1. INTRODUCTION

Mobile phones are an important part of the human's life, there has been immense growth in mobile technology from past many years. Hence it has become possible for people to implement their ideas using this technology in real life. This technology has given many new concepts to the world such as online shopping, online payment, online cab bookings and so on. Hence we have brought up a

completely new system of buying products using your mobile and a new, fast mode of payment.

Accurate and automatic systems are the prerequisite of the world's standards. Proposing a system that will be used to ease the work of people in shopping marts and supporting small to mid scale business owners to escalate their business. This system will help the shopping marts hassle-free and fast working without the physical involvement of staff/workers. The basic idea behind Smart Mart is to turn the whole experience of shopping digital. We will be creating a "FacePay based Smart Shopping Cart" to help people ease their shopping tasks thus saving a lot of precious time. The user can shop required items, add it to their cart in the app and pay via his eye link detection and facial recognition easily without waiting in long queues. The motive of our project is to provide a technically advanced, user-friendly, cost effective, widely usable, and tough system helping people in shopping activities. On the payment desk, a camera will click the picture of the buyer and finds the wallet attached to the face ID, and payment will be deducted from his wallet or bank account. By this process, as the whole work will be done by the app and the server, the shopping experience will be comfortable, fast, and digitized. If wanted, the buyer can pay with cash or by any means on other counters but if chosen as a wallet this process will be very easy with a very good buying experience.

2. RELATED WORK

Following are some works done by different people related to the same topic or part of the topic with their own ideas on the aspect.

2.1 Smart shopping cart using RFID

Products are detected using radio frequency identification. Each cart is attached with this device along with a LCD display.

2.2 AmazonGo

Just walk out technology. Usage of advanced artificial intelligence, computer vision, sensors, cameras. Amazon wallet payment mode.

2.3 AliPay

‘Smile to pay’ payment mode. Only a payment mode. Uses facial recognition for payment. Used across many stores in China.

2.4 Robust real-time face detection

Face detection algorithm using cascade of classifiers. Simple Haar features are used to classify images.

2.5 Real-time Eye tracking and blink detection using usb camera

A unique formula for Correlation score is generated along with templates which are monitored continuously.

p1,p2,..p6 are eye coordinates obtained by dlib’s histogram of oriental gradients algorithm. This EAR is monitored in real time for every frame.

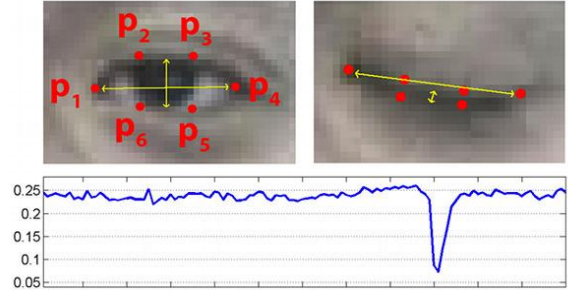


Fig.1 EAR demo and graph

The drop in the EAR graph indicates a blink detected. The frame at which blink is detected is captured as a test image for facial recognition. Facial recognition works on the comparison of binary encodings of the test image and binary encodings from the dataset.

3. COMPARATIVE ANALYSIS

Features	SmartMart	Others
Complete system for small to mid scale business	Yes	No
inbuilt barcode scanner	Yes	Not all
eye blink detection and facial detection	Yes	No
Transfer of money from e-wallet	Yes	Not all

4.1. Basic Idea

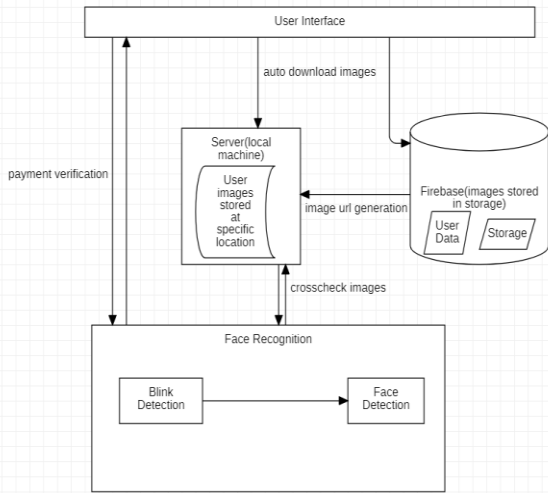
- Any person willing to buy a product is the user
- User has to sign up using email, phone, name, photo. Each user has a unique user ID. All data are stored in the firebase realtime database. User photos are stored in the firebase storage.
- On successful sign up. User photo is automatically downloaded to the server. It is then encoded and stored in a dataset file.
- Users can add money to e-wallet and scan the required product’s barcode and add it to the cart.
- At the checkout desk, a camera detects the user’s eye blink.
- The last frame is encoded and compared with the encodings of the dataset file.
- If the above steps are successful, respective user id is fetched used to perform further database operations using a python script.
- The users can update their name or phone number at any point of time.
- The users can transfer money from e-wallet to any other registered user.

4. FRAMEWORK OF THE SYSTEM In India, most of the companies are trying to bring in facial recognition in every software aspect. There is extensive research going on continuously to implement facial recognition algorithms in day to day applications. But it is prone to security issues. Hence for additional security we have brought in an unique eye aspect ratio(EAR) formula.

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

4.2. Architecture

Fig.2 SmartMart Architecture



5. DATA FLOW DIAGRAM AND USE-CASE FOR SMARTMART

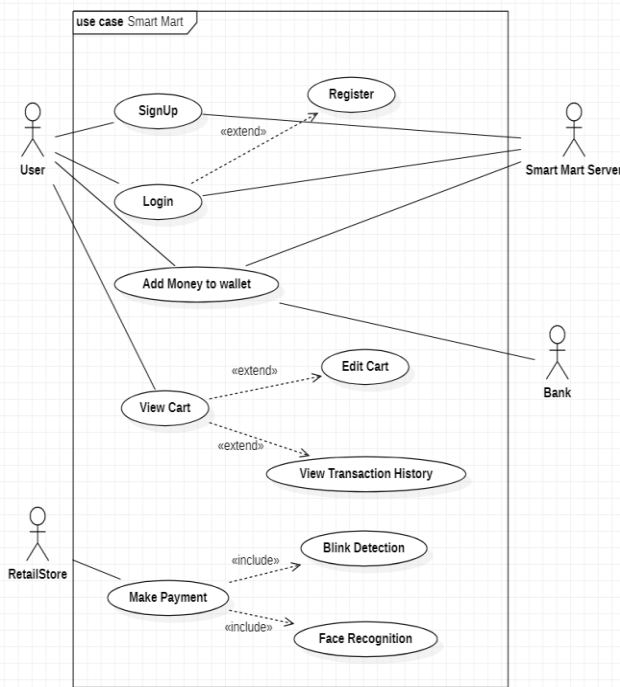


Fig.3 Use-case diagram

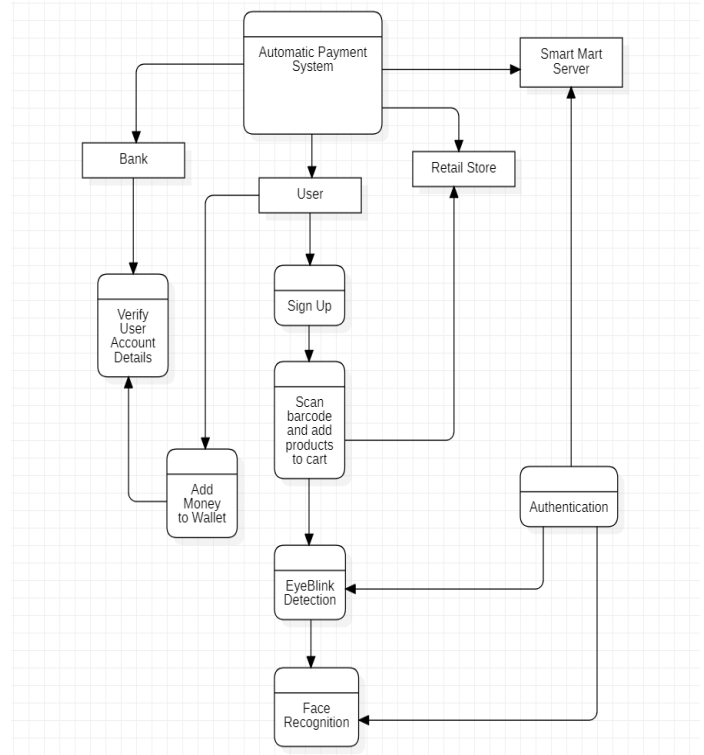
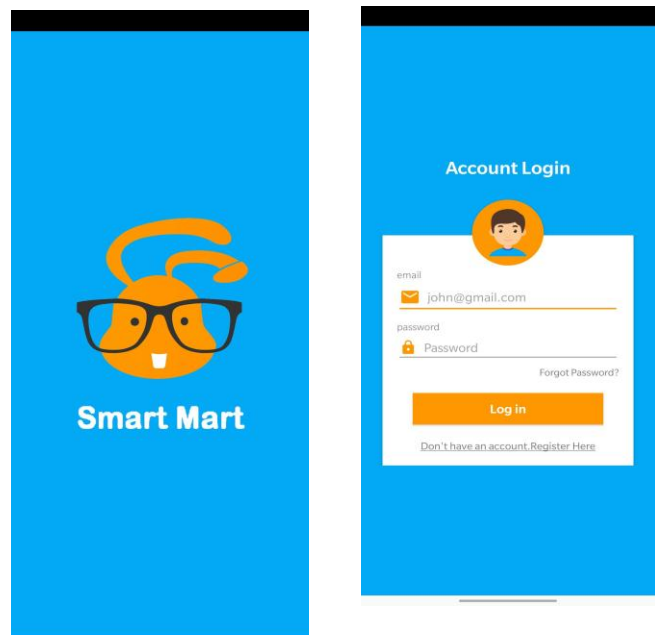


Fig.4 SmartMart DFD

6. SREENSHOTS FOR SMARTMART

Fig.5 Splash Screen and Login



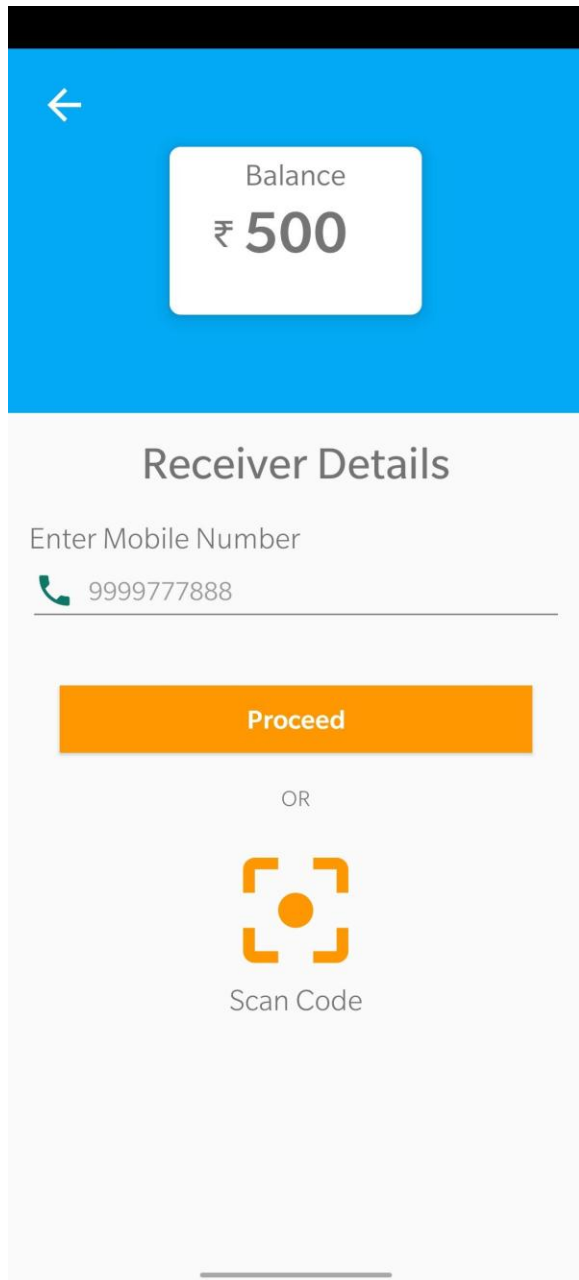


Fig.6 Sign up

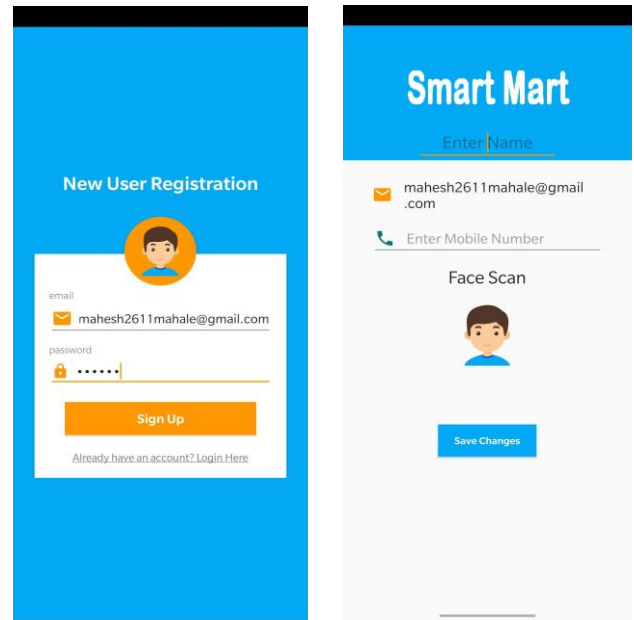


Fig.7 Home screen and User cart

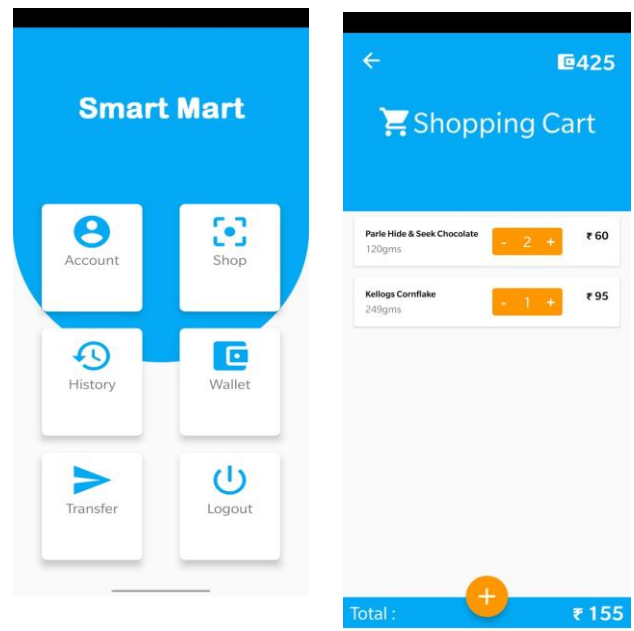


Fig.8 Account & history

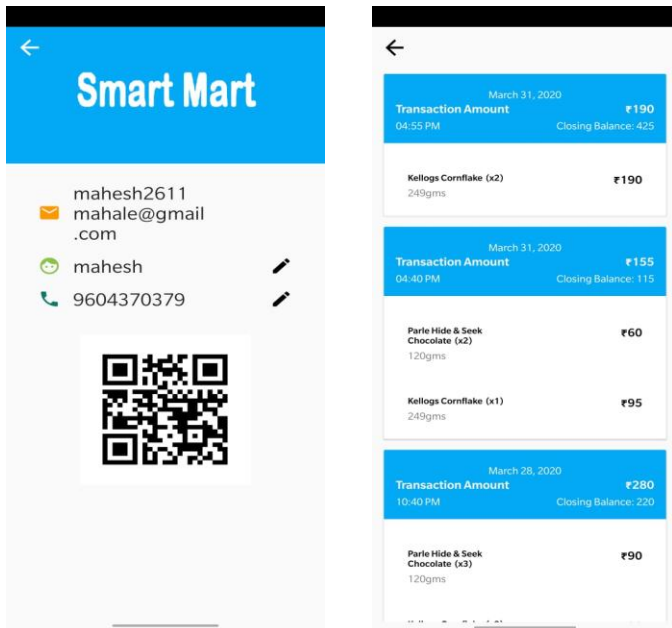
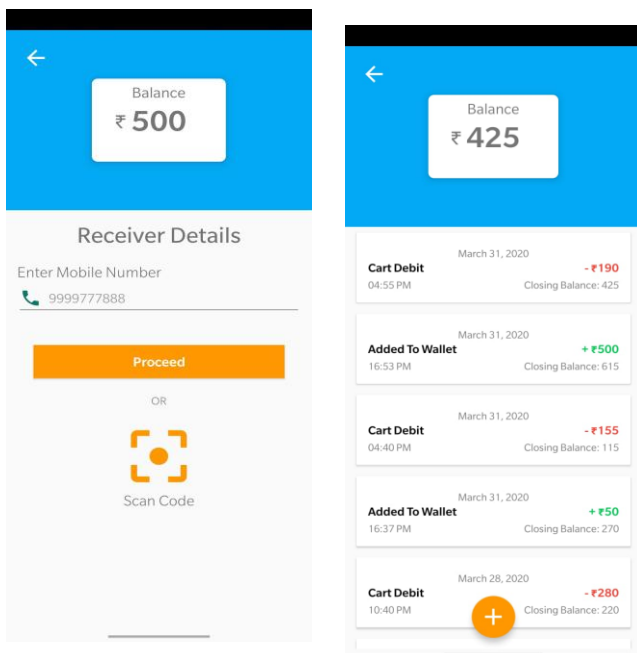


Fig.9 Transfer and Wallet



7. RESULTS

Fig.10 eye blink detection



Sample of eye blink detection. Left top displays the no of blinks and right top the current EAR. Green boundary is for the eyes.

Fig.11 Face recognition



(This image is only for representative purposes. The Actual System does not contain such a window and does not display facial recognition.)

8. CONCLUSION AND FUTURE SCOPE

With the increasing demand for facial recognition in daily use, this is the right time to build the system. In this paper, we have discussed two different algorithms which are eye blink detection and face recognition and how they can be used together to create a new mode of payment and a system which can be used to turn the shopping marts into smart mart.

The next step of this project would be to increase the security of this project and look into the measures by which theft and shoplifting can be taken care of. One of the measures would be to introduce a weighing scale. As the user moves forward for payment the app should calculate the weight of all the items that are there in the app. Then User will put all the items on a weighing scale. If the weight of the app matches the exact total weight of the items then only the payment will be successful.

There can be many more measures such as ios suitable app, in-app chatbot, admin side interface,etc which can be done to improve the quality and security of the system and make help more businesses.

9. REFERENCES

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