

Self-Checkout Shopping with Facial Recognition Based Payments

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Abstract— A new and creative idea for the society which will reduce the human efforts which they are taking in the big-bazaars malls etc. According to the current situation, India is facing very crucial health problems due to this covid-19 virus citizen of all over the world are following social distancing. Huge malls and big-bazaars are the most crowded place it becomes difficult to follow the social distancing. Costumers have to wait in big queues to make the payments of their purchased products. Taking this problem into the consideration the proposed system to the aforementioned 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 and eye blink detection and face detection. We are creating the application for android mobile phones and tablets. A user will simply enter the basic details while launching the software then he/she needs to add the money to his e-wallet. Users will self-scan the product barcode and on check-out time camera will detect eye blink and recognize the face and will lead to the payment deduction only after successful recognition.

Keywords: Eye Blinking Detection, Face-Recognition, Face Scan

I. INTRODUCTION

Accurate and automatic systems are the becoming trend in today's world. Proposing a system that will be used to ease the work of people in the shopping section 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 workers. The basic idea behind Self-checkout is to turn the whole experience of shopping digital. We will be creating a "Face Payment based Shopping Cart" to help people ease their shopping tasks thus helping to follow the social distancing. The user can shop required items, add them to their cart in the app and pay via his eye blink 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. By this process, as the whole work will be done by the app and the server, the shopping experience will be comfortable 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. As we know this Pandemic is going on all over the world so we would suggest to use this self-checkout app so we can avoid the physical connection with other people and by doing this we will be doing our job done and using this application with new technology will provide a new direction or we can

say it will start a new era of payment system it will change the entire billing system starting from the malls and bazars etc.

Person can also get to know his all account details in the profile section so he or she can change his account details however he/she wants to. In this system we tried to make in such a manner that everyone can use it very efficient way

II. PROBLEM DEFINITION

"Face Payment based SELF-CHECKOUT APP" 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 blink detection and facial recognition easily without waiting in long queues

III. PROPOSED SYSTEM

Following are some works done by different people related to the same topic with their own ideas views and aspects.

- Smart shopping cart using RFID
- Products are detected using radio frequency identification. Each cart is attached with this device along with an LCD display.
- 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.

IV. ALGORITHM

STEP 1 – LOADING VIDEO

- We use the OpenCV to capture the live video feed or to load an existing video file.

STEP 2- CONVERTING TO GRAYSCALE

- We convert every frame of the video/live feed to grayscale.

STEP 3- FACE DETECTION

- We detect faces in the frame of the video using dlib package.

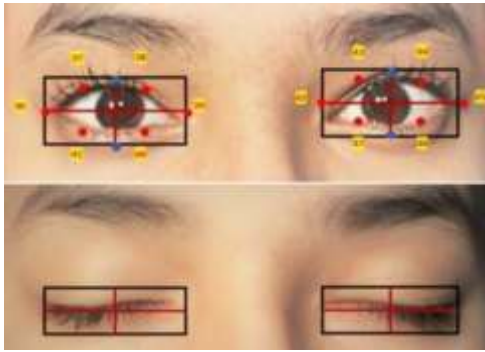
STEP 4 – GET LANDMARKS FOR THE EYES

- We use the dlib library to find the location of both eyes by mapping a pretrained model on the face detected in the last step.

STEP 5 – CALCULATING THE BLINKING RATIO USING EAR FORMULA

- We develop the concept of blink ratio and implement a function to calculate it.

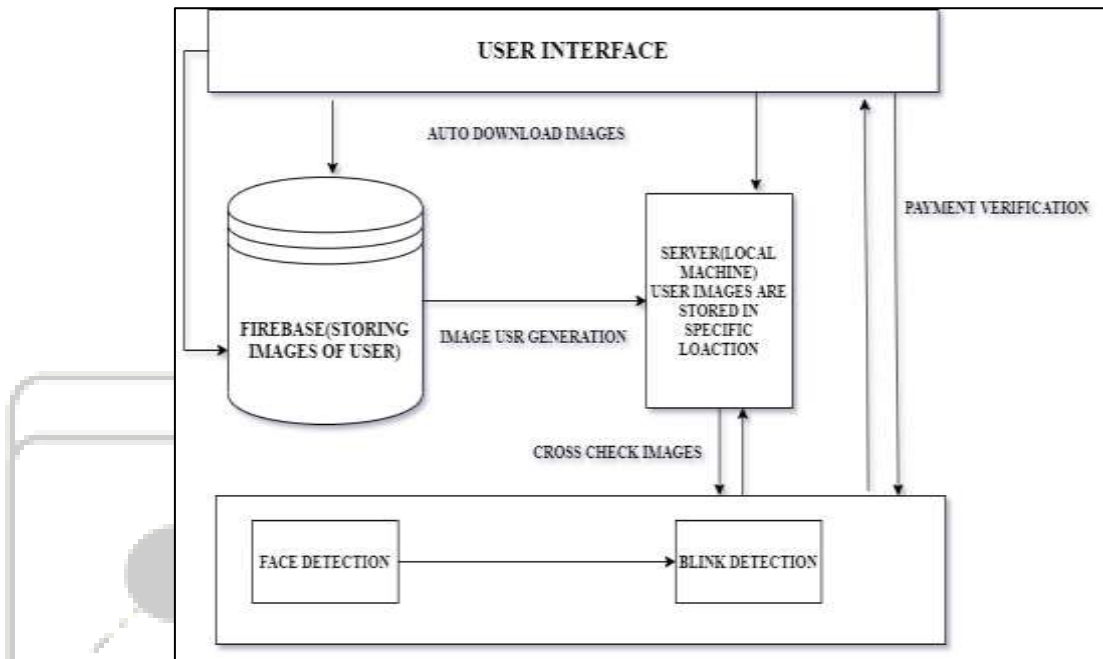
$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$



STEP 6 – DETECTING THE BLINKS AND COUNTING FOR FURTHER PROCESSING

- We decide a threshold for blinking if value of blink ratio is above the threshold we say that subject is blinking
- After knowing that object is blinking then we set a counter and calls the function to check the count if this counter is less than predecided value it will break and if not it will further proceed to the complete the task

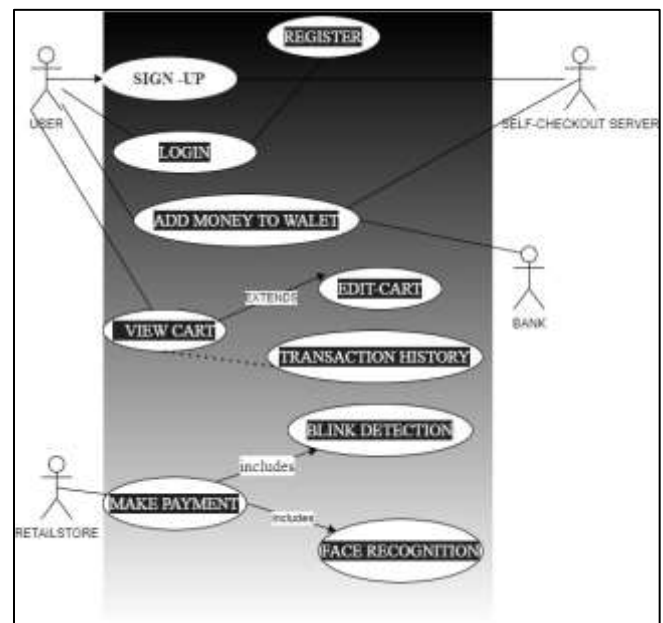
V. ARCHITECTURE



A. Basic Explanation of System Architecture

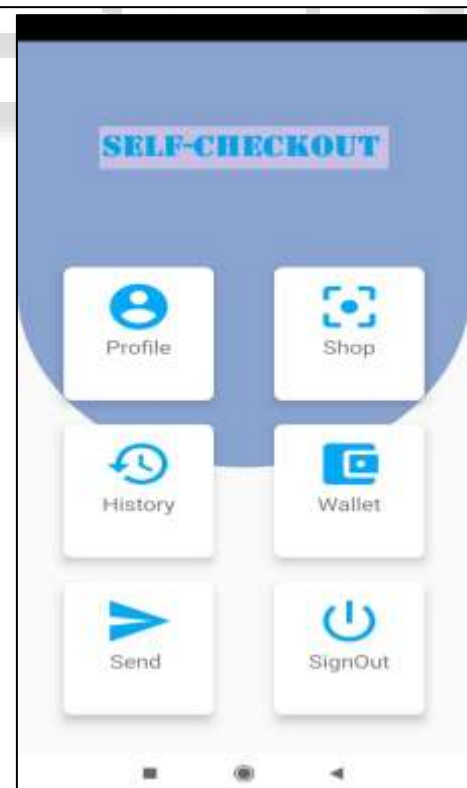
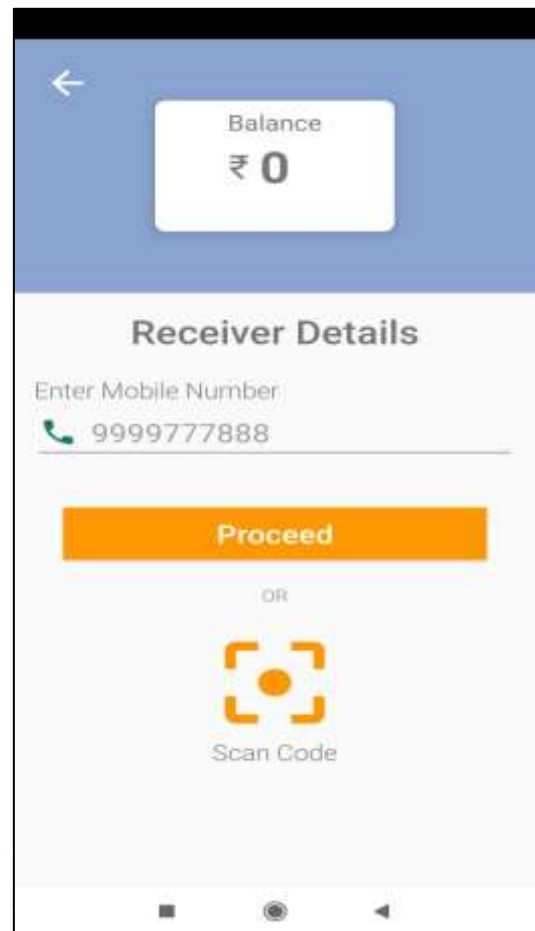
- Any person who wants to buy a product is the user or we can say customer.
- User has to sign up using email, phone, name, photo. Each user has a unique user ID. All data are stored in the firebase real-time database. User photos are stored in the firebase storage.
- On successful sign up. User photo 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 eyes blinks.
- 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 his e-wallet to any other user who has account of registered number.

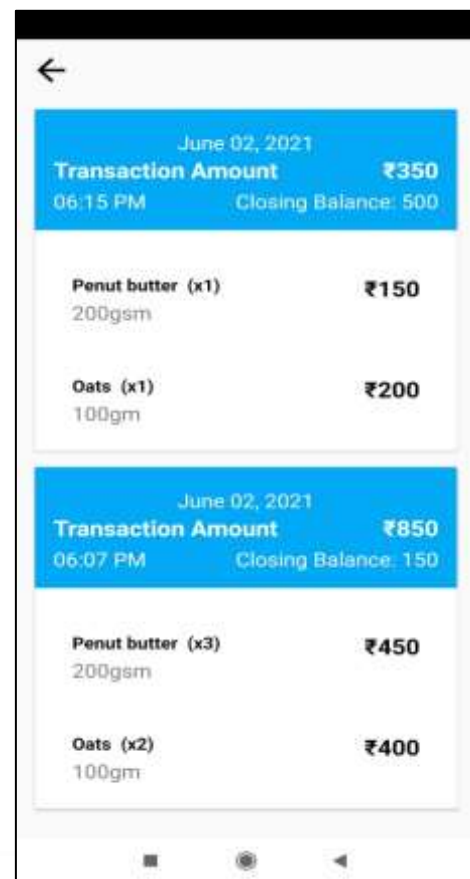
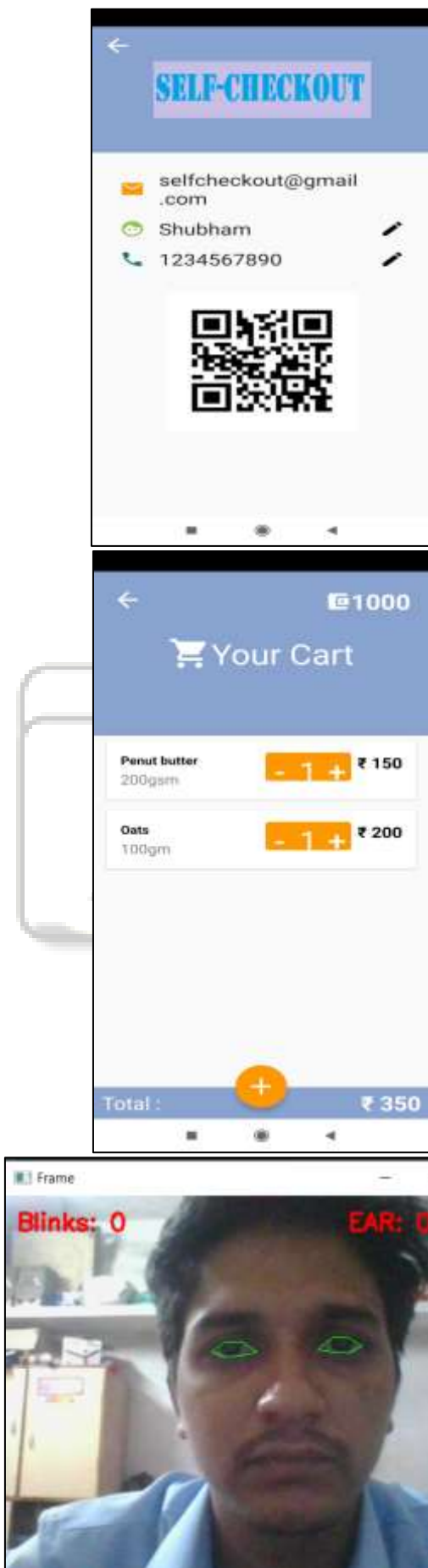
VI. USE CASE DIAGRAM FOR SELF-CHECKOUT



VII. RESULTS

Below are some screen-shots of self-checkout





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

VIII. CONCLUSION

With increasing in covid cases in India it becomes essential to develop the facial recognition system and bring that into daily practice to avoid physical connection in this research we have discussed two separate algorithms which are eye blink detection and facial recognition and How they can be used to create a new model or we can say how we can replace the entire billing system which is currently used in the malls and bazaars. The next factor or step of this system would be to increase the security of this project and to see the measure by which the theft and shoplifting can be taken care. One of the important measures would be to introduce a weighing scale. As soon as the user moves forward for the check-out of the payment the application should calculate the weight of all the purchase items that are in the cart.

Then the user will put all the items on the weighing scale. If all the weights present in the cart match the exact weight of the items, then only further payment will be successful.

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

IX. FUTURE SCOPE

- We can use the weighing machine to increase the security level for example when person scans the product barcode then the weight will be displaying and after completing whole shopping the weight of the all products will be calculated and will be cross verify on the billing counter we need to calculate the physical weight of all products.
- The result of weighing machine and the device result should be matched.
- One more future scope will be we can do image processing of all the products to increase the security level.

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