

EASYBILLS

Shopping on the GO!

Project Summary:

We are proposing to have a smarter malls checkout & payments with proper verification of items customer has in the cart, hence removing the need for guards to verify the bill during checkout.

We propose to have cameras in the mall that will detect and recognize the person giving each one of them a unique ID. Similarly, for the products present in stores, we manage the log of it. It helps us recognize which customer has picked up which product. A mapping between the customer's unique ID and the scanned items of store is managed as a log. The database would be updated for any event that includes picking up the item, placing it back or during billing. Now, at the billing time it would be matched in the database if weight of items for that person's ID (which are ideally the items one has picked up) is equal to the weight of items the customer is billing for. For any mismatch, person has to follow the existing payment process only. Such cases are though minimal and will be later in 'Challenges' section.

Rationale:

1. The person entering the mall has to go to the counter (similar to *self check-in*) where his face would be recognised to the system and particular ID would be given. This is mandatory process for anyone who wants to complete his billing (afterwards). For the persons coming with family, only one person is required to generate the ID.

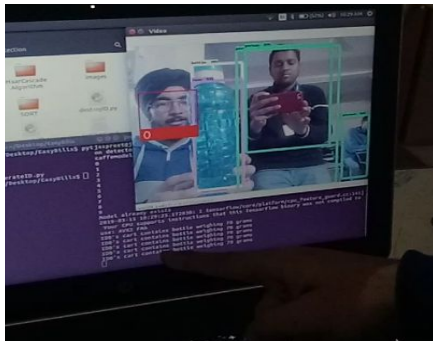


Machines for *self check-in*

2. The central logging system is present i.e. the cart is maintained for the person all over the mall which will make sure all the cameras in the mall are able to work in sync. Picking up the item at one place will add the item to given person's cart (ID) and vice-versa. Cart contains the values of Person's ID (PID), Name of the object(s) picked, their weights (predefined in system), their quantity and hence the costs.

PID	Name	Weight	Qty	Cost
1	HomeSoul Bottle (Blue)	70g	1	Rs. 100/-

3. Now, the person is being tracked all over the mall and the items he is picking up with the help of his ID and the objects are pre-listed and recognizable. As soon as the object comes in vicinity of the person, the item is added to particular cart.



Cameras tracking the person(ID-0) and object (bottle)

4. The billing counter is similar to the existing ones with the change that it requires no staff. The items person has picked up is put on the weighing tray where the items are weighed and compared with respect to the central logs. If the weights match i.e. all the objects were tracked accurately and payment portal page is made available to customer.

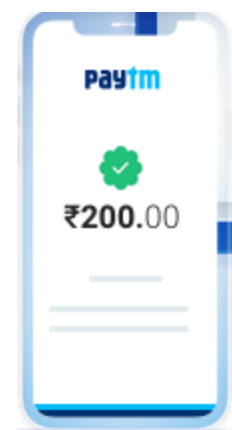


Billing counters

5. The person is redirected to the payment page where his cart details are present. The person may pay the net payable amount by scanning the unique QR code generated for the cart using Paytm or any other wallet. After successful payment the items are packed and sealed off and person may leave the mall. The ID of the person is destroyed and can be reallocated to some other customer.



Payment Portal



Wallet Payment

Impact:

In a supermarket, keeping track of the items or products that the customer has picked is difficult. In cases, the customer may try to steal any item or product from the store. He/she may check out from the supermarket before paying the bill. The problem of unrecognised theft even when security guards are on duty. This problem arises when there is not enough staff available. It is also time consuming for the guards to check everyone's bill & items according to bill and for customers to wait in the queue to have their bill checked at the time of check out. Even with the current security techniques, the problem of theft has not much resolved.

This system will also be time-efficient as the customers will no longer have to wait in the queue to pay the bills as well as get their bills checked with the number of items he/she is carrying. Once his/her ID is cleared, he/she will simply be allowed to leave. Hence, it has a real life importance in the malls wherein an efficient system would ensure that there are no mistakes by guards that may or may not be intentional.

Tech Stack:

For the *self check-in* counter, IDs are being generated for every given person and the face is extracted from it and stored in the database with the name as ID number. Open-cv and haar-cascades are used to extract out the face and stored in the folder.

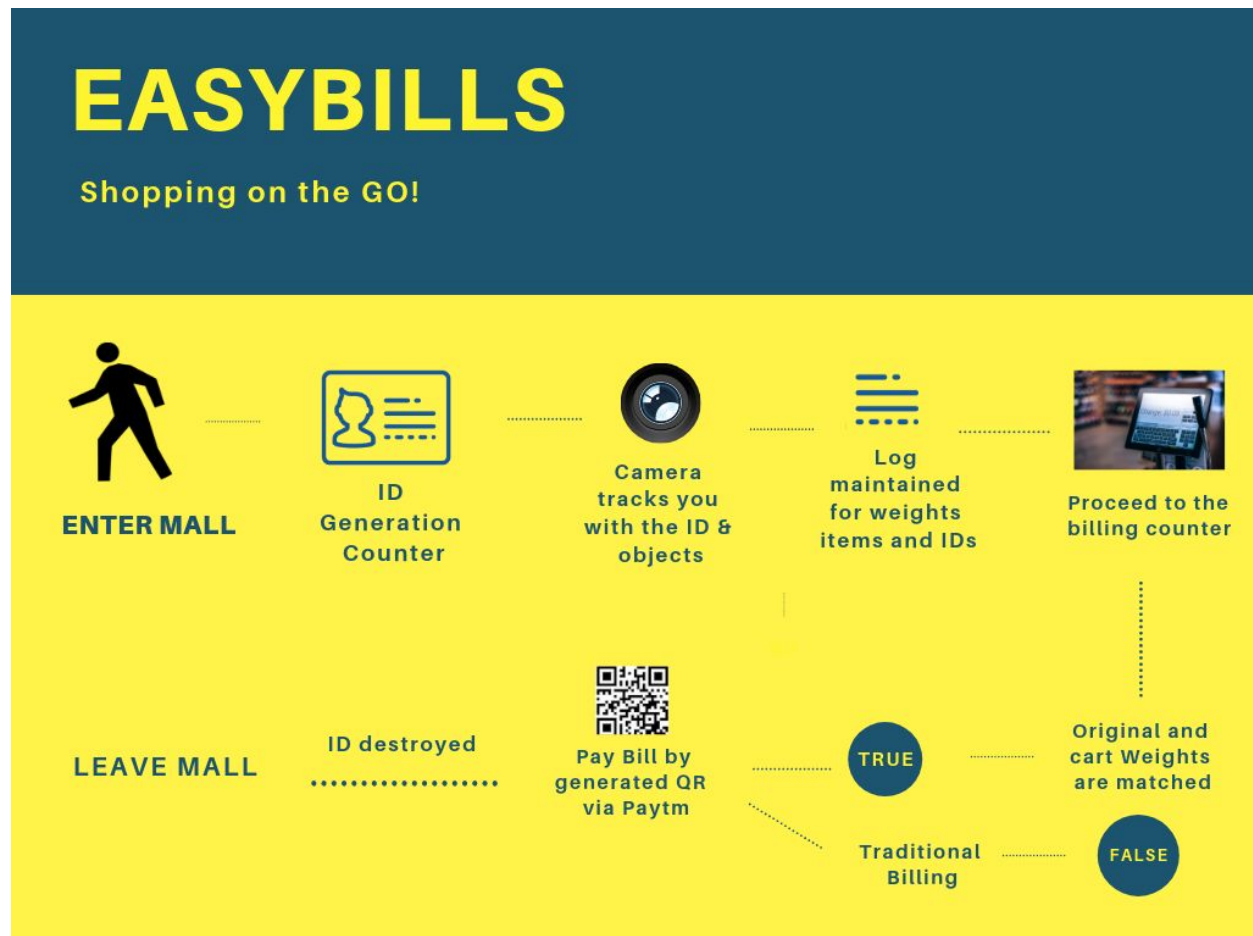
Face recognition python library is used now to compare between the faces in the video frames and the database and the bounding box with given ID is made on the face.

Object tracking is done using tensorflow pretrained models, like bottle, cell phones etc. The face recognition and object tracking both are executed parallelly using single executable python file. The items get added to the person's cart as soon as the bounding boxes of person and object collide / intersect. The weight and payment matrix are pre known and are calculated.

At the billing counter, the face of the person is again recognised and for the faceID cart details are opened (if actual and cart weights matches). The QR code is generated for the payment page and once the payment process is complete, the ID of person is destroyed.

For any mismatch of weights in actual and cart (~5% cases), traditional payment process needs to followed. These cases can be reduced as the model becomes more accurate in tracking items.

Flowchart:



Challenges:

1. Anything that impacts the delivery of the convenience, be it a technical glitch or on-shelf availability, will result in a backlash, particularly from time-poor customers.
2. Other than the shopper, article picked up by family member or any other person and unusually taken away. This challenge can be solved in future by using tracking id at the exit's with sensors. Also unusual activities (like stealing and putting items in pocket and hiding) can be tracked by the pre-trained machine learning models for the cases of chances of theft.

Video Demo:

<https://drive.google.com/file/d/1blmFTf8GGqVhMRm-7-aaBYdlXhAlYH6X/view?usp=drivesdk>

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