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Combining Face Recognition and SQL in Business Intelligence System

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Abstract Adapting to new environment technologies and understanding customer conditions to solve business problems is a representation of Business Intelligence duty. The enterprise BI system relies on their own SQL database for analyzing association rules of customer products purchased in order to maximize customer satisfaction. The results of association rules that recommend to the owner of minimarket for rearranging their shelves would make difficulties for owner and customer that already memorize the position of the products onwhich shelf. The changes in the product placement also add more time to customer to take their usual productneeded. This paper proposes the combination of computer vision of face recognition and SQL database to capture customer's faces and their product purchased to optimizing customer buying and satisfaction to overcome those difficulties.

Keywords: Business Intelligence, Face Recognition, SQL database

1. Introduction

An important factor of the modern organizations is the capability to overcome any uncertainties and rapid changes. Uncertainties and rapid changes mostly affected by attendance of new technologies and anything that accompanies it. On the other side, customers of this organization need to be served faster to fulfill their satisfaction. Adapting to those new environments technologies and understanding customer conditions as a business problem in any organization is a representation of Business Intelligence duty. Business Intelligence (BI) System need a preparation, collection, preservation, analytics and visualization of any internal informationinvolved to find any insight that come up to solve business problems. BI system also enables organizations togather any information from external sources and combine with internal information to create dashboards. BI systems also include an ad-hoc analysis, real-time BI, open source BI, mobile BI, and any other intelligence tools that will support top management decision-making [1]. Information is the core element that is used to communicate with other entities within the organization in the BI environment. As stated by Olszak and Zurada [2] BI system is a system that uses appropriate methods based on data collection from open and public sourcesand has the purpose to facilitate decision-making. A BI system provides answers for various business questions, like what is happening, why that is happening, what needs to be done, and predict what will happen next. According to Alexe et al [3], Business Intelligence in its history is applied in the military to protect national and internal

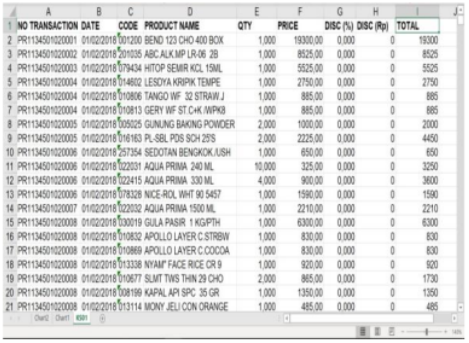
security but today's modern BI users are business managers. According to Obeidat et al. [4], BI transforms the raw and massive data collected from various sources into useful information. According to Chenet al. [5], BI enables organizations to make more intelligent to adapt a changeable environment and to fight in the business world.

In the business intelligence world, there is a famous methodology that helps retailers and restaurant managers better understand and serve their consumer by predicting their purchasing behaviours which is known as "Market Basket Analysis". Market basket analysis (MBA) is a set of statistical affinity calculations to highlight customer purchasing patterns [6]. MBA present the combinations of products purchased most frequently occurtogether in the transaction orders [7]. These relationships can be used to ultimately serve customers and increase profitability through cross-selling, recommendations, promotions discount, or even the placement of products on a menu or in a shelves' store [8]. This paper shows the difficulties of implementation the result of association rules of Market Basket Analysis and proposed the techniques to build a face recognition system and database to ultimately server customer and increase profitability selling.

2. Methods

2.1 Market Basket Analysis

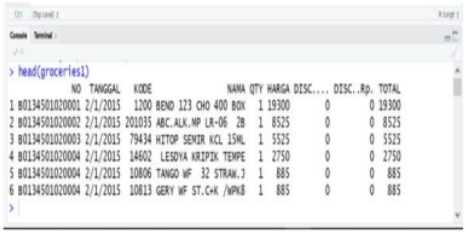
The approach of Market Basket Analysis is based on the general assumption that customers who buy a certain item are more likely to buy another specific item and it studies customers' buying patterns and preferences to predict what they will prefer to purchase along with the existing items in their cart. A quick- serve restaurant has marked if someone buys a cookie then they do not want any drink, but when a someone buy a sandwich and cookies, they are more likely also buy a drink. Another example, if customers purchase egg along with flour and sugar then this pattern can predict strong possibility of customer to buy egg if it is offered along with flour and sugar. This information supports that association becomes more valuable if those products bought together. Therefore, market basket analysis (MBA) is included in a business intelligence technique due to its capability to make general association of product purchase pattern for predicting future decisions of the customers. Figure 1 shows example of transaction in one minimarket.



	NO TRANSACTION	DATE	CODE	PRODUCT NAME	QTY	PRICE	DISC (%)	DISC (Rp)	TOTAL
2	PR1134501020001	01/02/2016	101200	BEND 123 CHO 400 BOX	1,000	19300,00	0,000	0	19300
3	PR1134501020002	01/02/2016	201035	ABC ALK.MP LR-06 2B	1,000	8525,00	0,000	0	8525
4	PR1134501020003	01/02/2016	179434	HITOP SEMIR KCL 15ML	1,000	5525,00	0,000	0	5525
5	PR1134501020004	01/02/2016	114602	LESDYA KRIPIK TEMPE	1,000	2750,00	0,000	0	2750
6	PR1134501020004	01/02/2016	110806	TANGO WF 32 STRAW J	1,000	885,00	0,000	0	885
7	PR1134501020004	01/02/2016	110813	GERY WF ST.CHK WPK8	1,000	885,00	0,000	0	885
8	PR1134501020005	01/02/2016	205025	GUNUNG BAKING POWDER	2,000	1000,00	0,000	0	2000
9	PR1134501020005	01/02/2016	116163	PL-SBL PDS SCH 25'S	2,000	2225,00	0,000	0	4450
10	PR1134501020006	01/02/2016	257354	SEDOTAN BENGKOK /USH	1,000	650,00	0,000	0	650
11	PR1134501020006	01/02/2016	122031	AQUA PRIMA 240 ML	10,000	325,00	0,000	0	3250
12	PR1134501020006	01/02/2016	122415	AQUA PRIMA 330 ML	4,000	900,00	0,000	0	3600
13	PR1134501020006	01/02/2016	178328	NICE-ROL WHT 90 5457	1,000	1590,00	0,000	0	1590
14	PR1134501020007	01/02/2016	122032	AQUA PRIMA 1500 ML	1,000	2210,00	0,000	0	2210
15	PR1134501020008	01/02/2016	130019	GULA PASIR 1 KG/PTH	1,000	6300,00	0,000	0	6300
16	PR1134501020008	01/02/2016	110832	APOLLO LAYER C.STRBW	1,000	830,00	0,000	0	830
17	PR1134501020008	01/02/2016	110869	APOLLO LAYER C.COCOA	1,000	830,00	0,000	0	830
18	PR1134501020008	01/02/2016	113338	NYAM' FACE RICE CR 9	1,000	920,00	0,000	0	920
19	PR1134501020008	01/02/2016	110677	SLMT TWS THIN 29 CHO	2,000	865,00	0,000	0	1730
20	PR1134501020008	01/02/2016	108199	KAPAL API SPC 35 GR	1,000	1350,00	0,000	0	1350
21	PR1134501020008	01/02/2016	113114	MONY JELI CON ORANGE	1,000	485,00	0,000	0	485

Figure 1. Data Transaction in Minimarket

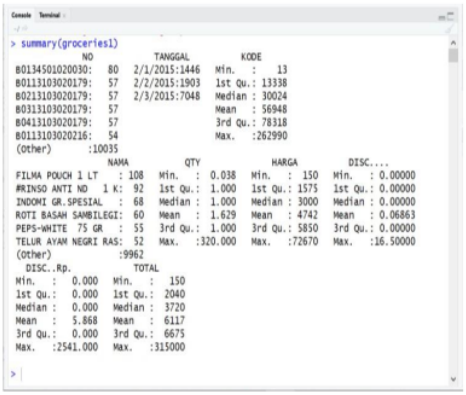
We would like to apply market basket techniques to assign pattern of customer behaviour, and we got the first six data (figure 2) to show that the data is already uploaded into R software



```
> head(groceries1)
          NO  TANGGAL   KODE              NAMA QTY HARGA DISC.... DISC..Rp. TOTAL
1 B0134501020001 2/1/2015   1200 BEND 123 CHO 400 BOX   1 19300        0         0 19300
2 B0134501020002 2/1/2015 201035 ABC.ALK.MP LR-06  2B   1  8525        0         0  8525
3 B0134501020003 2/1/2015  79434 HITOP SEMIR KCL 15ML   1  5525        0         0  5525
4 B0134501020004 2/1/2015  14602  LESDYA KRIPIK TEMPE   1  2750        0         0  2750
5 B0134501020004 2/1/2015  10806 TANGO WF  32 STRAW.)   1   885        0         0   885
6 B0134501020004 2/1/2015  10813 GERY WF ST.CHK /WPK8   1   885        0         0   885
>
```

Figure 2. Transaction data already extracted to R Software

And the dimension of the transaction data is 10397x9 column and the summary of the data in figure 3.



```
> summary(groceries1)
          NO                TANGGAL           KODE
 B0134501020030:   80   2/1/2015:1446   Min.   :    13
 B0113103020179:   57   2/2/2015:1903   1st Qu.: 13338
 B0213103020179:   57   2/3/2015:7048   Median : 30024
 B0313103020179:   57                   Mean   : 56948
 B0413103020179:   57                   3rd Qu.: 78318
 B0113103020216:   54                   Max.   :262990
 (Other)       :10035
                NAMA            QTY              HARGA          DISC....
 FILMA POUCH 1 LT    : 108   Min.   :  0.038   Min.   :  150   Min.   : 0.00000
 #RINSO ANTI ND  1 K:  92   1st Qu.:  1.000   1st Qu.: 1575   1st Qu.: 0.00000
 INDOMI GR.SPESIAL   :  68   Median :  1.000   Median : 3000   Median : 0.00000
 ROTI BASAH SAMBILEGI:  60   Mean   :  1.629   Mean   : 4742   Mean   : 0.06863
 PEPS-WHITE  75 GR   :  55   3rd Qu.:  1.000   3rd Qu.: 5850   3rd Qu.: 0.00000
 TELUR AYAM NEGRI RAS:  52   Max.   :320.000   Max.   :72670   Max.   :16.50000
 (Other)             :9962
   DISC..Rp.           TOTAL
 Min.   :    0.000   Min.   :   150
 1st Qu.:    0.000   1st Qu.:  2040
 Median :    0.000   Median :  3720
 Mean   :    5.868   Mean   :  6117
 3rd Qu.:    0.000   3rd Qu.:  6675
 Max.   :2541.000   Max.   :315000

>
```

Figure 3. Summary of Transaction Data

Then we would like to get the information of total transaction,

```
  > trans
transactions in sparse format with
 1332 transactions (rows) and
 2286 items (columns)
```

There 1332 transactions and 2286 items purchased by customers, then showing the graphics (figure 4) that shows the frequencies of the most products purchased

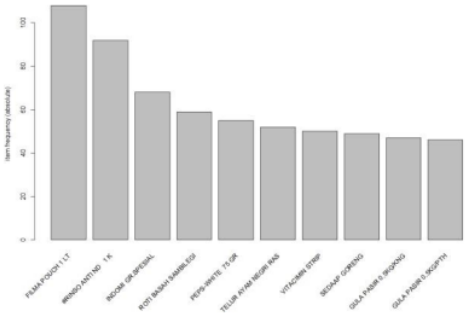
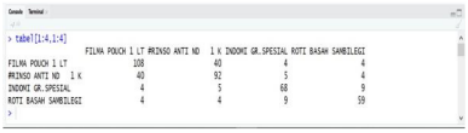


Figure 4. Graphs of products purchased frequencies

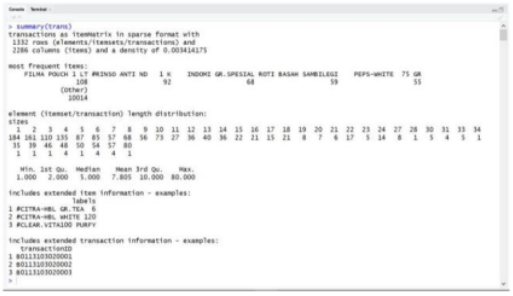
And the cross-product table (figure 5) show the most products purchased together



```
> table[1:4,1:4]
                    FILMA POUCH 1 LT #RINSO ANTI ND  1 K INDOMI GR.SPESIAL ROTI BASAH SAMBILEGI
FILMA POUCH 1 LT                 108               40                   4                    4
#RINSO ANTI ND  1 K               40               92                   5                    4
INDOMI GR.SPESIAL                  4                5                  68                    9
ROTI BASAH SAMBILEGI               4                4                   9                   59
>
```

Figure 5. Cross-product purchased

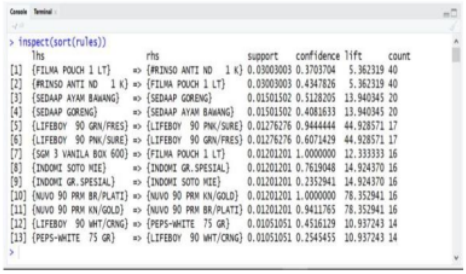
The detail information of transaction very useful for adding a value to take a decision (figure 6)



```
> summary(trans)
transactions as itemMatrix in sparse format with
 1332 rows (elements/itemsets/transactions) and
 2286 columns (items) and a density of 0.003414175

most frequent items:
      FILMA POUCH 1 LT #RINSO ANTI ND   1 K    INDOMI GR.SPESIAL ROTI BASAH SAMBILEGI    PEPS-WHITE  75 GR
                   108                92                   68                    59                    55
                (other)
                 10014

element (itemset/transaction) length distribution:
sizes
  1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  27  28  30  31  33  34
184 161 110 135  87  85  57  68  56  73  27  36  40  36  22  21  15  21   8   7   6  17   5  14   8   1   5   4   5   1
 35  39  46  48  50  54  57  80
  1   1   1   4   1   4   4   1

   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.000   2.000   5.000   7.805  10.000  80.000

includes extended item information - examples:
                labels
1 #CITRA-HBL GR.TEA  6
2 #CITRA-HBL WHITE 120
3 #CLEAR.VITALOO PURFY

includes extended transaction information - examples:
   transactionID
1 B0113103020001
2 B0113103020002
3 B0113103020003
>
```

Figure 6. Detail of transaction

Then with the command `apriori(trans,parameter=list(supp=0.01,conf=0.2))`. Using support = 0.01 and confidence 0.2 we got the result rules



```
> inspect(sort(rules))
    lhs                                rhs                                support    confidence lift     count
[1] {FILMA POUCH 1 LT}              => {#RINSO ANTI ND  1 K}              0.03003003 0.3703704  5.362319 40
[2] {#RINSO ANTI ND  1 K}           => {FILMA POUCH 1 LT}                 0.03003003 0.4347826  5.362319 40
[3] {SEDAAP AYAM BAWANG}            => {SEDAAP GORENG}                    0.01501502 0.5128205 13.940345 20
[4] {SEDAAP GORENG}                 => {SEDAAP AYAM BAWANG}               0.01501502 0.4081633 13.940345 20
[5] {LIFEBOY  90 GRN/FRES}          => {LIFEBOY  90 PNK/SURE}             0.01276276 0.9444444 44.928571 17
[6] {LIFEBOY  90 PNK/SURE}          => {LIFEBOY  90 GRN/FRES}             0.01276276 0.6071429 44.928571 17
[7] {SGM 3 VANILA BOX 600}          => {FILMA POUCH 1 LT}                 0.01201201 1.0000000 12.333333 16
[8] {INDOMI SOTO MIE}               => {INDOMI GR.SPESIAL}                0.01201201 0.7619048 14.924370 16
[9] {INDOMI GR.SPESIAL}             => {INDOMI SOTO MIE}                  0.01201201 0.2352941 14.924370 16
[10] {NUVO 90 PRM BR/PLATI}         => {NUVO 90 PRM KN/GOLD}              0.01201201 1.0000000 78.352941 16
[11] {NUVO 90 PRM KN/GOLD}          => {NUVO 90 PRM BR/PLATI}             0.01201201 0.9411765 78.352941 16
[12] {LIFEBOY  90 WHT/CRNG}         => {PEPS-WHITE  75 GR}                0.01051051 0.4516129 10.937243 14
[13] {PEPS-WHITE  75 GR}            => {LIFEBOY  90 WHT/CRNG}             0.01051051 0.2545455 10.937243 14
>
```

Figure 7. Result of Association Rules of Market Basket Analysis

The rules shown (figure 7) in that list with its support, confidence, lift ratio and count. The higher the valueof each measurements indicate the products have strong association to bought together.

Lhs	rhs	support	confidence	lift	count
[1] {FILMA POUCH 1 LT}	=> {RINSO ANTI ND 1 K}	0.03003003	0.3703704	5.362319	40
[2] {RINSO ANTI ND 1 K}	=> {FILMA POUCH 1 LT}	0.03003003	0.4347826	5.362319	40
[3] {SEDAAP AYAM BAWANG}	=> {SEDAAP GORENG}	0.01501502	0.5128205	13.940345	20
[4] {SEDAAP GORENG}	=> {SEDAAP AYAM BAWANG}	0.01501502	0.4081633	13.940345	20
[5] {LIFEBOY 90 GRN/FRES}	=> {LIFEBOY 90 PNK/SURE}	0.01276276	0.9444444	44.928571	17
[6] {LIFEBOY 90 PNK/SURE}	=> {LIFEBOY 90 GRN/FRES}	0.01276276	0.6071429	44.928571	17
[7] {SGM 3 VANILA BOX 600}	=> {FILMA POUCH 1 LT}	0.01201201	1.0000000	12.333333	16
[8] {INDOMI SOTO MIE}	=> {INDOMI GR.SPESIAL}	0.01201201	0.7619048	14.924370	16
[9] {INDOMI GR.SPESIAL}	=> {INDOMI SOTO MIE}	0.01201201	0.2352941	14.924370	16
[10] {NUVO 90 PRM BR/PLATI}	=> {NUVO 90 PRM KN/GOLD}	0.01201201	1.0000000	78.352941	16
[11] {NUVO 90 PRM KN/GOLD}	=> {NUVO 90 PRM BR/PLATI}	0.01201201	0.9411765	78.352941	16
[12] {LIFEBOY 90 WHT/CRNG}	=> {PEPS-WHITE 75 GR}	0.01051051	0.4516129	10.937243	14
[13] {PEPS-WHITE 75 GR}	=> {LIFEBOY 90 WHT/CRNG}	0.01051051	0.2545455	10.937243	14

Some of rules is a common pattern of customer buying, thus we make two group of those rules, first group is

lhs	rhs	support	confidence	lift	count
[3] {SEDAAP AYAM BAWANG}	=> {SEDAAP GORENG}	0.01501502	0.5128205	13.940345	20
[4] {SEDAAP GORENG}	=> {SEDAAP AYAM BAWANG}	0.01501502	0.4081633	13.940345	20
[5] {LIFEBOY 90 GRN/FRES}	=> {LIFEBOY 90 PNK/SURE}	0.01276276	0.9444444	44.928571	17
[6] {LIFEBOY 90 PNK/SURE}	=> {LIFEBOY 90 GRN/FRES}	0.01276276	0.6071429	44.928571	17
[8] {INDOMI SOTO MIE}	=> {INDOMI GR.SPESIAL}	0.01201201	0.7619048	14.924370	16
[9] {INDOMI GR.SPESIAL}	=> {INDOMI SOTO MIE}	0.01201201	0.2352941	14.924370	16
[10] {NUVO 90 PRM BR/PLATI}	=> {NUVO 90 PRM KN/GOLD}	0.01201201	1.0000000	78.352941	16
[11] {NUVO 90 PRM KN/GOLD}	=> {NUVO 90 PRM BR/PLATI}	0.01201201	0.9411765	78.352941	16
[12] {LIFEBOY 90 WHT/CRNG}	=> {PEPS-WHITE 75 GR}	0.01051051	0.4516129	10.937243	14
[13] {PEPS-WHITE 75 GR}	=> {LIFEBOY 90 WHT/CRNG}	0.01051051	0.2545455	10.937243	14

And the second group is

	lhs	rhs	support	confidence	lift	count
[1]	{FILMA POUCH 1 LT}	=> {RINSO ANTI ND 1 K}	0.03003003	0.3703704	5.362319	40
[2]	{RINSO ANTI ND 1 K}	=> {FILMA POUCH 1 LT}	0.03003003	0.4347826	5.362319	40
[7]	{SGM 3	=> {FILMA POUCH	0.01201	1.000	12.3	16

	VANILA BOX 600}	1LT}	201	0000	3333 3	

The first group look like a common group which consisting of items of product in a same category, personal hygiene kits for everyday routine and some different type of instant noodles as a substitute for staple foods, and we find interesting items rules in the second group which consisting of, FILMA POUCH 1 LT (product brand of cooking oil) and RINSO ANTI ND 1 K (product brand of laundry soap) also SGM 3 VANILA BOX600 (product brand of instant milk for children) and FILMA POUCH 1 LT. These rules can be used to recommend a purchase based on the presence of a common pairing, such as in the first group. When a customer orders personal hygiene kits or instant noodles they might be more likely to buy another type in the same product brand. Staff trained to memorize these behaviours can offer their customers the additional different items within same product brand possibly with a discount to make the option more attractive.

The problems appears in the second group that FILMA POUCH and RINSO ANTI ND or SGM 3 VANILA BOX and FILMA POUCH have different function from cooking oil, laundry soap and instant milk for children,those three product could be identified as keystone products, the speciality items that the presence with discount price would be attracted many customers to buy. Those keystones could be very special for some profiles of customers like housewives but could not be generalize to all customers. To justify high visibility of common pairing placement in the shelves of store is impossible, because those threes product have very different categories. The owners of store do not want to rearrange the placement of product items due to the result of MBA. They worry that their customers will have difficulty finding shelves to find the items they usually buy. The more attracting technologies they need are, due to customer rejection if offered a member of stores, how they can memorize one-by-one customers in what the last product they purchased in this store, so staff can remind them of what products they might not have bought.

3. Result and Discussion

3.1 Face Detection and Recognition

Since there was difficulty to implement the result of association rules from Market Basket Techniques, customer analysis using their face recognition is important as a part of Business Intelligence looking to get a better understanding and ultimately serve of customer. Customer face recognition could be used to boost customer engagement and optimizing serve to customer based on customers' purchasing behaviour. Good services felt by customer will be engaged customer and would be a returning customer. Real-time insights into customer's interest and history of product purchased will be able to save customers time to make choices. Meanwhile in most real-world situations there is only once sample image taken per person, like in ID card verification, driving license, etc. Recognizing customer face with only one sample taken per person is a very challenging problem due to the lack of information in the query image to predict the face variations. This problem is the most failure encountered in the face recognition systems because most current algorithms cannot recognize the face due to the lack of information of extremely limited representation of training sample. The number of image training samples for a particular face quite heavily affect the

performance of the learning mechanism therefore the current face recognition techniques usually use several image samples of the same person [9]. The first step is to capture the face of the customer while in the front of cashier, and then detect the face in each image using Haar Cascade Classifier, once we get the region of the face in the image, we will generate several image from one customer face for learning mechanism of algorithm and use it for training the recognizer. The recognition of face is used Local Binary Patterns Histograms (LBPH) algorithm, both of Haar Cascade Classifier and LBPH algorithm is available on OpenCV as a module in Python. While the facial recognition step is carried out, along with that the process of entering the customer profile and the items purchased are typed in the database.

Haar Cascade Classifier is implemented through two things haar-like features and cascade classifiers.Because of the similarity of concept with haar-wavelet these features are then named as haar-like features. Haar-like feature considers adjacent rectangular regions at a specific location in an input image, looking for the pixel intensities and sums up in each of the regions and then calculates the difference between these sums.This step give result as a detection window of a face. Detail of this step could read in Viola and Jones [10]. We apply the second step if it passes the first step and so on. The recognition phase is done using Local Binary Pattern Classifier. Local Binary Pattern work in order to achieve a local structure of an image using comparation of each pixel as a centre with its neighbourhoods' pixels (figure 8). The main idea of Local BinaryPatterns is to condense the local structure in an image by comparing each pixel with its neighbourhood pixels. Neighbourhoods' pixels will be assigned to 1 if a pixel value is greater than the pixel value of the centre and otherwise it will be assigned 0 if the pixel value is less than the pixel value of the centre. By shifting the centre each time, we will get the result a binary matrix of an image containing relative values [9].

Customer facial recognition system is considered as an automatic tool to control, monitor and keep track of customers' attendance at stores and products purchased by them. The prototype developed in this research was customized for customers' attendance taking at store with the view to assisting the staff memorizing manual method of customer attendance and result rules of market basket analysis. The algorithmdeveloped was implemented using Python and OpenCV module bindings and Structured Query Language lite (SQLite) were used to develop the relational databases [11]–[13]. The prototype system identifies a person froma digital image or video source and mark the person present then provided the face matches and verifies the face listed in the customer database. Here it is the step of customer face recognition, minimarket camera try to capture the attendance of customer. Then give user ID to each of customer.

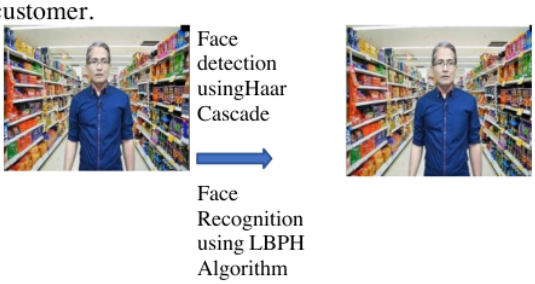


Figure 8. Face detection and face recognition step

Then program will generate each of face detected in 25 times (depend on the setting)

and save it to folder fortraining phase (figure 9).

Figure 9. Replication of one face captured

And do the training phase and adding the products that customer bought in the SQL.

```
Import cv2, time
video = cv2.VideoCapture(0)
faceDetect =
cv2.CascadeClassifier('haarcascade_frontal
face_default.xml')
id = input('masukan id user ')
#(eNglish=enter id user)
a=0
while True:
check, frame = video.read()
gray = cv2.cvtColor(frame,
cv2.COLOR_BGR2GRAY)
faces=faceDetect.detectMultiScale(gray,1.3
,5);
for(x,y,w,h) in faces:
a=a+1
cv2.imwrite("DataSet/User."+str(id)+"."+str
(a)+".jpg",gray[y:y+h,x:x+w])
cv2.rectangle(frame,(x,y),(x+w,y+h),(0,255
,0),2)
   cv2.imshow("wajah",frame)
#(English=face)
   key = cv2.waitKey(1)
   if (a>24):
      break
   print(a)
video.release()
cv2.destroyAllWindows()
```

Figure 10. Code for capture face of customer

Figure 10 is the code for capturing customer face once time and generate those capture to 25 times for the nextcode used in training the face. The database design (figure 11) of field or column is arranged to suit the total average number of customers bought, in this research we set 3 columns (Produk11, Produk21, Produk31) thatrepresent the total number of customers usually bought . Other columns are "NoCusto", for customer number in minimarket which is different with ID used to identify the face captured, "Date" are the date the last time customer attend, "Status" is the job assumed by staff and "Exptd" is the column for staff expected that this customer has potential prospect to buy a lot in minimarket.

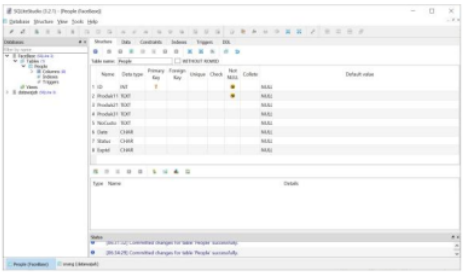


Figure 11. The Database Design

And the product purchased could be typed into database,

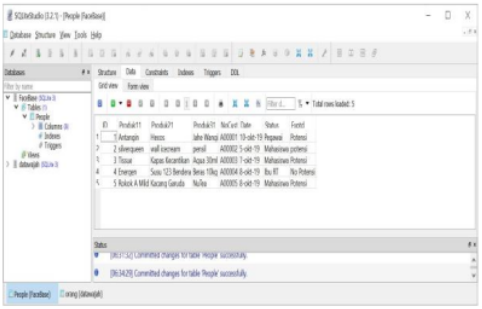


Figure 12. Entry the products purchased

This information in the database can be used to remind the staff for customer who coming back to buy something again in the minimarket. For the second attendance of customer, the system will work,

Figure 13. The Next Attendance of Customer Recognition with the Last Product Purchased

The system can match the person from this customer face recognition and the last products purchased (figure 13) could be used by cashier or staff to be remembering customer that they might be forgot to take. This proposed system really could help managers in optimize the serve to customer not only using rules of Market Basket Analysis, but also person to person customer by recognizing their face and what the last they bought.

```
import cv2,os, time
import numpy as np
from PIL import Image
import pickle
import sqlite3
camera=0
faceDetect=cv2.CascadeClassifier('haarcascad
e_frontalface_default.xml');
video=cv2.VideoCapture(camera,cv2.CAP_DSHOW
)
a=0
recognizer=cv2.face.LBPHFaceRecognizer_crea
te();
recognizer.read("c://capture/training/train
ing.yml")
id=0
fontface=cv2.FONT_HERSHEY_SIMPLEX
fontscale=1
fontcolor=(0,0,255)
path='DataSet'
def getProfile(id):
  conn=sqlite3.connect("datawajah.db")
  cmd="SELECT * FROM orang WHERE id="+str(id)
  cursor=conn.execute(cmd)
  profile=None
  for row in cursor:
    profile=row
  conn.close()
  return profile
```

```
while(True)
  check, frame=video.read();
  gray=cv2.cvtColor(frame,cv2.COLOR_BGR2GRAY
)
  faces=faceDetect.detectMultiScale(gray,1.3
,5);
  for(x,y,w,h) in faces:
    a=a+1
    cv2.rectangle(frame,(x,y),(x+w,y+h),(0,2
55,0),2)
    id,conf=recognizer.predict(gray[y:y+h,x:
x+h])
    profile=getProfile(id)
    if (profile!=None):
      cv2.putText(frame,str(profile[1]),(x,y+
h+30),fontface,fontscale,fontcolor)
      cv2.putText(frame,str(profile[2]),(x,y+
h+60),fontFace,fontscale,fontcolor)
      cv2.putText(frame,str(profile[3]),(x,y+
h+90),fontFace,fontscale,fontcolor);
    cv2.imshow("wajah",frame);
    if(cv2.waitKey(1)==ord('q'))"
      break
  print(a)
cam.release()
cv2.destroyAllWindows()
```

Figure 14. Code for Customer Profiles and The Last Products Purchased

The code for combining face recognition and the last product purchased (figure 14) is proved can be used to enhance customer satisfaction by reminding their products purchased in the last transaction.

4. Conclusion

In the term Business Intelligence, Market Basket Analysis could assist retailers understanding and give ultimately serve their customer by predicting their purchasing behaviour, but some result of association rules from Market Basket Techniques could not be applied directly in the minimarket. Retailers have difficulty to rearrange their products shelves and afraid for confusing customer to finding their items needed. The system to recognize the customer who attend the minimarket and what the products they have bought from the last attendance could help retailers to solve their difficulties. The proposed system for face recognition and combining with SQL

database as a part of develop intelligence for business could be enhance more with any parameters included in the database.

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