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Virtual Wallet Application With Two-Step Verification For Traveling Anywhere In The World

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Abstract

With the development of Intelligent Transportation Systems (ITS), the transportation sector is experiencing a major transformation. Other realized systems are just one example of innovative solutions, and it is expected that such technologies will become more widespread and an integral part of our lives in the future. This study aims to increase both the safety of users and the efficiency of transportation by taking these technologies one step further. The software we developed combines security technologies such as facial recognition and QR code to provide a safe and practical transportation solution that can be applied on a global scale. In the future, it is aimed for this system to be used in more countries around the world and to play an important role in the digitalization process of public transportation. The necessary experimental studies on face recognition were given in a table. Our application was developed using languages such as Html, Css, Bootstrap, Jquery, JavaScript, Ajax in the frontend and Python, Php, MySQL in the backend.

Keywords: "Virtual Wallet, face recognition, two-step verification."

1. Introduction

With the impact of Industry 4.0, advances in technology have radically changed our lives. Especially in developed countries, these advances are also leading to revolutionary innovations in the transportation sector. Technology-based solutions are being developed in transportation services to minimize potential problems in traffic patterns and prevent errors. This is where ITS come into play. ITSs envisage the use of information-based systems in transportation that include multi-faceted analysis and control mechanisms for many purposes in order to increase traffic safety, facilitate payment transactions, shorten travel times, use road capacities more effectively and reduce environmentally harmful emissions [1]. Many different studies and projects are being carried out on this subject around the world and in our country. One of the sustainable transportation solutions is to shift travel to public transportation types [2]. In the general literature, the 1970s are accepted as the basic period for intelligent transportation systems, and in the relevant years, studies and trials were carried out in which intelligent transportation systems were operated, especially in South Korea, Japan, America and Europe [3]. Solutions that are actively designed in the architectural structure of smart transportation system data require innovative technology accumulation and trained human resources. The use of big data in public transportation companies has become widespread as of 2013. The data that creates the business-based smart transportation system ecosystem has reached trillion bytes to Petabytes with the development of smart transportation technologies [4]. ITS contributes significantly to the reduction of traffic problems in cities by improving the quality of public transportation services. With the continuous population growth in cities, the problem of inadequacy of resources to meet demand arises. Recent technological developments, especially the advancement of wireless communication and artificial intelligence technology, support the rapid development of intelligent transportation systems. Efforts to find solutions to transportation problems are supported by various studies. For example, Çapalı [5] examined the advanced technology ITS usage areas around the world and discussed the traffic software and highway applications in Turkey. This study revealed that traffic technologies in Turkey are insufficient and the use of ITS is necessary. Köz [6] examined the transportation policies in our country and discussed the issues of urban transportation and ITS. Today, rapidly developing information technologies have brought about the concept of ITS. Yıldırım [7] emphasized the importance of ITS technologies in disaster emergency management. This architecture can be built as a result of comprehensive studies involving all system stakeholders. In addition to these studies, the article by Bodur [8]

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states that comfort-based transportation investments should be increased and that it is important to determine national strategies. Also noteworthy is the study by Kenanoğlu and Aydın [9], in which they discuss the measures that need to be taken to spread ITS to a wider area. In the light of these studies, it is understood that steps such as the dissemination of smart card systems and the development of mobile solutions supported by information systems are important. These studies generally cover the areas of ITS parking systems, traffic control, traffic planning and flow optimization, and driving safety. There are different studies for pricing systems outside these areas. However, these studies could not provide complete comfort and safety for passengers. Among the projects carried out for pricing systems, applications such as Smart Card and Payment Systems stand out. ITS applications are generally based on technologies such as Radio Frequency Identification (RFID), Near Field Communication (NFC), Quick Response (QR) Code, Contactless Credit Card and Validator. It is known that these technologies contribute to making transportation more efficient, reliable and environmentally friendly [10]. The ITS user services and service classification table developed by ISO for developing countries serves as a guide when creating the ITS architecture of countries [9]. In our country, ITS applications are considered a natural choice, especially when considering the intensive use of buses, minibuses, metro and rail systems in urban transportation [11]. Smart Card and Payment Systems are systems that allow passengers to use public transportation without paying cash during travel. User information and movements can be stored in these systems and institutions can use this information to make feedback or provide personal information. Smart Cards can be integrated with various services; for example, student cards can be used in different services such as transportation and food. These cards have chips that can store and process data, and payment transactions are carried out through card readers [12]. However, smart card systems may not always work safely and smoothly. Passengers may create security gaps by using other people's cards and may encounter problems during payment. In addition, the loss of time experienced during the money loading phase is among the disadvantages. The security problems that occur may pose serious dangers to the society. Current public transportation systems may also expose drivers to rights violations. Along with negative results such as loss of time and rights violations, this situation may cause various problems for the society. Due to this, it is aimed to eliminate these problems by carrying out different projects for the charging systems under the articles of ITS [13]. To prevent these problems, Moscow authorities announced that they have launched a new payment method based on facial recognition technology called "Face Pay" in the city's metro stations. Authorities state that Moscow is the first city to use facial recognition technology on this scale. The new payment system operates in more than 240 stations in the Moscow metro system, which is used by approximately 9 million people daily. It is thought that Face Pay will provide great convenience, especially when passing through turnstiles. It was stated that in order to use Face Pay, passengers must register their photos, bank cards and metro cards via the Mosmetro mobile application. The photo registered to the application must be taken in good light, showing the full face. At least 40% of the face must be visible for the technology to recognize users [14]. Different studies were conducted in different web-based areas [15, 16]. OpenCV library was used in the face mask recognition system [17].

In this study, a two-step verification system was developed. In this system, a web interface was developed where registered people can check their accounts. In this way, it was possible to travel freely all over the world thanks to the face recognition and QR code system. The main purpose of the study is to ensure the safety and trouble-free travel experience of users and drivers in transportation processes that take place in any time zone for any place to travel. Today, there is no system that finds/suggests a complete solution to this problem. To achieve this goal, we aim to provide a complete, easy, efficient, hassle-free and safe experience regardless of the means of transportation used. Our special software works in integration with cameras, enabling users to travel by making it easier to pay during the journey without having to deal with complicated procedures. This software is designed to ensure that users and drivers are safe at every stage. Our goal is to manage this process in the easiest and most effective way while ensuring safe travel conditions and paying the fare without any cash or cards.

2. Material and Methods

In this study, we addressed this system in a more comprehensive way, closing its security gaps and ultimately enabling it to operate anywhere in the world. In this study, with the two-step verification system, the personalized QR code and the person's face are scanned simultaneously and the verification process is performed. After the verification process, the money is deducted simultaneously and the passenger can check it from the mobile application. In this way, the privacy of the person is not violated by using their image. In addition, the person's passwords, unique number, image and other information are stored in our system with certain encryption methods and even different companies cannot access this information. While the Moscow system requires 40% of the face to be visible, our software can perform face scanning and control in various situations, and our system performs a perfect face scan. Thus, this process can be performed with any accessory on the person's face. In addition, in the next stage, we have made it possible to perform this system from anywhere in the world, from every city, from every public transportation vehicle. For this, some international agreements need to be made, an example of this is getting a visa. Thus, people will be able to travel flawlessly and completely safely, no matter where they go in the world. While doing this, they will not have to use any public transport vehicle they want and will not have to make any money conversion. Money can be deducted based on possible conditions (disabled, student, elderly) with the information entered during membership.

Taking into account the personal information and visual data entered when registering to the application, a facial scan will be performed with cameras in the vehicle during travel. With this transaction, travel money can be paid without cards or cash. In

this process, as proof that the person is actually present, if the QR code sent to the e-mail address during membership matches, the price will be deducted from the account. This measure will eliminate the possibility of unfairly deducting money from anyone's account and will also increase the security of the society. Users will be able to check their balance instantly from the application and add money to their accounts from anywhere, at any time. All information entered into the application will be protected by software engineers with certain encryption methods, making it almost impossible to access. If accessed in any way, the data will become meaningless thanks to the encryption and will not be observable. In this way, there will be no security gap and an easier and more convenient journey will be provided. In this way, when going somewhere, situations such as searching for a card, finding it, losing time, taking and giving money, etc. will be eliminated, as well as transactions such as taking and giving money, and exchanging money between the driver and the passenger while using public transportation vehicles. Some of the negativities we see in the news arising from these transactions will be prevented. The ultimate goal of the study is to enable anyone to travel in any city without having to use any card and to travel in any way they want as long as they have money in their balance with a transparent control system that can be verified by both parties (passenger and driver). In this study, Python language and OpenCV library will be used and a face recognition system that provides full security and gives successful results under all conditions has been developed. OpenCV's optimized C++ library can perform face detection and recognition operations as real-time fast detection. Face recognition technology is a technology that can identify or verify a person from a digital image or video frame. It usually works by comparing the facial features selected from the given image with faces in a database. Our system can detect any feature on the face without exception [18]. Our web application was developed using languages such as Html, Css Bootstrap, Jquery, JavaScript, Ajax in the frontend and Python, Php, MySQL in the backend. Users will be able to enter their personal information into the system during the membership creation process. The information entered will be recorded using encryption algorithms in accordance with the privacy policy, and any problems caused by system violations will be prevented. The information entered during membership includes name, surname, e-mail address, unique ID number, date of birth, phone number, city of residence, disability status, martyr/veteran affiliation status, profession, bank information and gender, and any uploaded files are also stored confidentially with the MD5 encryption method.

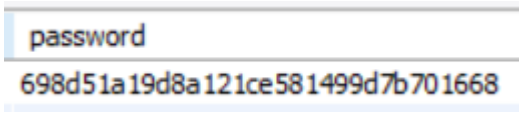

Fig. 1. Storing passwords in the database

Passwords will be stored as shown in Fig. 1, thus making it impossible to access the data.

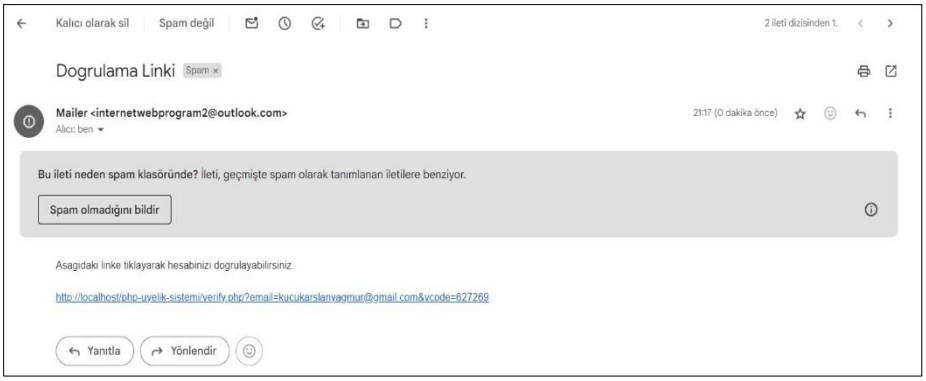

Fig. 2. Verification mail sent to the user's e-mail address

Afterwards, the photo capture page was opened for face recognition operations and photos showing the user's face from every angle were automatically taken, encrypted in the system and saved in the database.

In Fig. 2, when the register button is clicked, a personalized QR code and an extension address to activate the system are sent to the user's e-mail address.

Fig. 3. QR code sent to the user

Fig. 3 shows the QR code image specifically generated for the user.

id	email	vcode
5	kucukarslanyagmur@gmail.com	348683
6	nefisekeskin@gmail.com	329448
9	elif.yedekhesap@gmail.com	692818
NULL	NULL	NULL

Fig. 4. Database where users who have not verified their emails are registered

Fig. 4 shows that accounts that have not been activated are recorded in another table. If activated by the user, the information is updated from the database.

	birth_date	telno	sehir	engel_durumu	engel_dosya_yolu	sehitlik_durumu	sehit_dosya_yolu	meslek	bankaadi	hesapno	iban	verified
18	2003-09-17	5445620190	ankara	Yok		Yok		Mühendis	ziraat	75482631	45642452	1
10	2001-02-15	455345344	Eskişehir	Yok		Yok		Doktor	ziraat	444455555	5544444444	1
11	2014-09-10	455345311	ankara	Yok		Yok		Mühendis	ziraat	717171771717	171717171717	1
4	4124-02-14	4272272	ankara	Yok		Yok		Mühendis	ziraat	5588888888	58585	1
22	2003-09-21	05464868199	ankara	Yok		Yok		Öğrenci	Ziraat Bankası	87965413164	13216546	0
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Fig. 5. Users who do not verify their emails in the database

In Fig. 5, accounts that have not been activated appear as 0 in the ‘verified’ block.

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

	birth_date	telno	sehir	engel_durumu	engel_dosya_yolu	sehitlik_durumu	sehit_dosya_yolu	meslek	bankaadi	hesapno	iban	verified
218	2003-09-17	5445620190	ankara	Yok		Yok		Mühendis	ziraat	75482631	45642452	1
910	2001-02-15	455345344	Eskişehir	Yok		Yok		Doktor	ziraat	444455555	5544444444	1
111	2014-09-10	455345311	ankara	Yok		Yok		Mühendis	ziraat	717171771717	171717171717	1
14	4124-02-14	4272272	ankara	Yok		Yok		Mühendis	ziraat	5588888888	58585	1
222	2003-09-21	05464868199	ankara	Yok		Yok		Öğrenci	Ziraat Bankası	87965413164	13216546	1
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Fig. 6. Users who verify mail in the database

Fig. 6 shows that if the user verifies the incoming mail, the value in the 'verified' column is updated to 1.

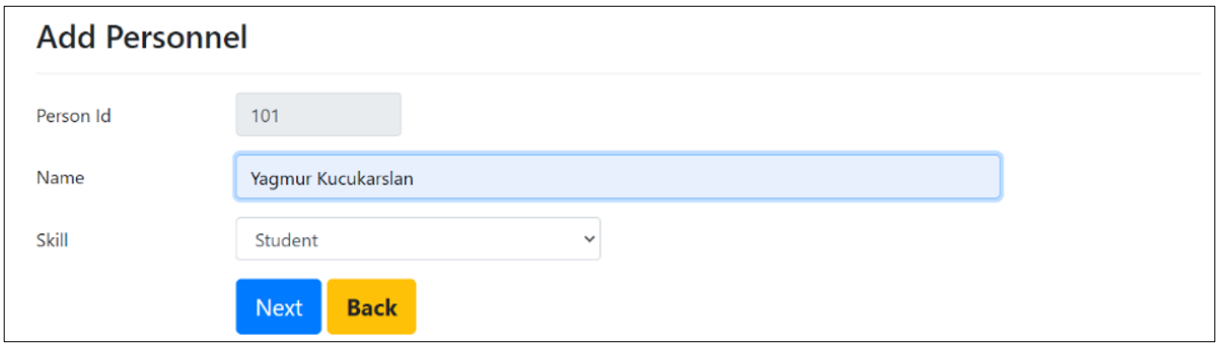

Fig. 7. The page created to record face data

The system opened to record facial data after the registration process is shown in Fig. 7.

In Fig. 8, while the user scans his/her face, the system instantly saves 100 photographs of the person into the dataset. This data set to be created can be in any physical environment. Having the same person's face photo from all different environments is better for the system to recognize.

The 100 photographs recorded in Fig. 9 are saved in a folder and a data set is created.

Various tests were carried out under different recognition value conditions and the results obtained are shown in Table 1.

When the system is activated by clicking on the extension address, the user can log in to the system. There are some terms and conditions in the background of the software for security purposes. These terms and conditions are meticulously applied to ensure the security of user information.

Fig. 8. Recording the user's facial data

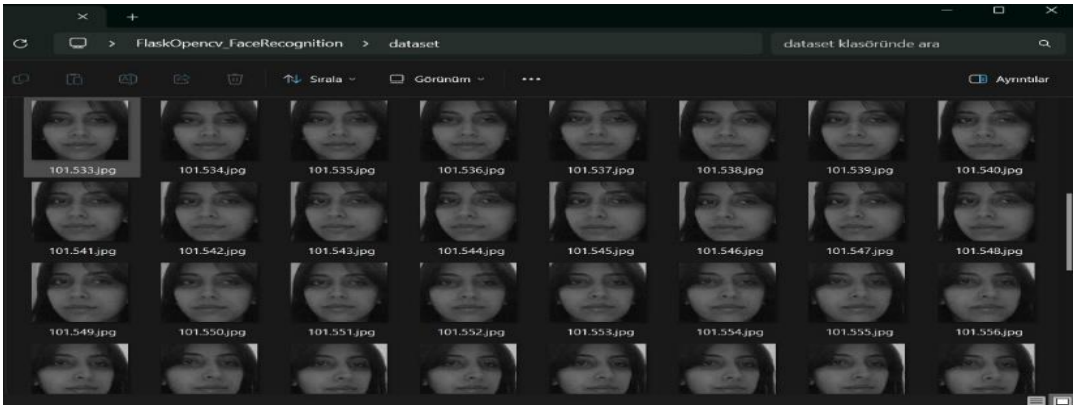

Fig. 9. Dataset consisting of users' face data

Table 1. Level of face detection in different situations

Ambient Light Condition	Angle of view of the face	Distance	Finding level
Too much	+/- 15-25 Degree	120 cm +/-15 cm	High
Too much	+/- 15-25 Degree	170 cm +/-15 cm	Medium
Medium	+/- 15-25 Degree	120 cm +/-15 cm	High
Medium	+/- 15-25 Degree	170 cm +/-15 cm	High
Medium	+/- 15-25 Degree	170 cm +	Few
Low	+/- 15-25 Degree	120 cm +/-15 cm	Medium
Low	+/- 15-25 Degree	170 cm +/-15 cm	Medium
Low	+/- 15-25 Degree	170 cm +	Few

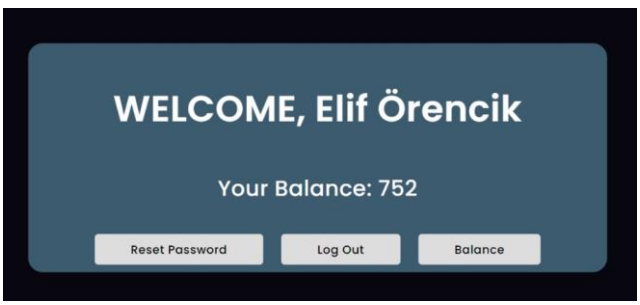

Fig. 10. Balance display page

In Fig. 10, after users successfully log in to the system, they are directed to the balance display page. This page includes password reset, balance update and exit transactions. Instant balance display system and balance loading transactions can be followed simultaneously through the application.

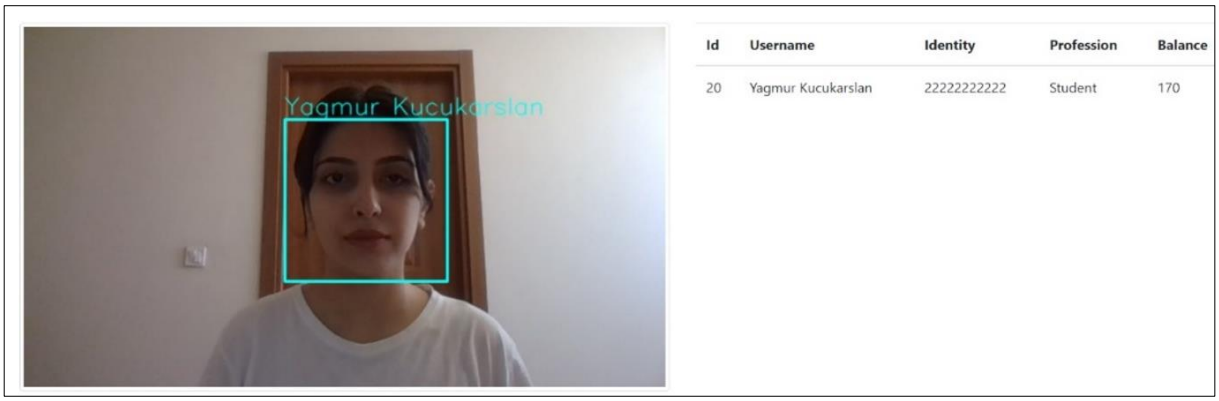

Fig. 11. The page where face recognition takes place

In Fig.11, when the camera is turned on, the face recognition process is performed simultaneously. In case of a suitable match between the person's face and the data set, the person's name, surname, unique identification number, occupation and balance information are displayed on the screen.

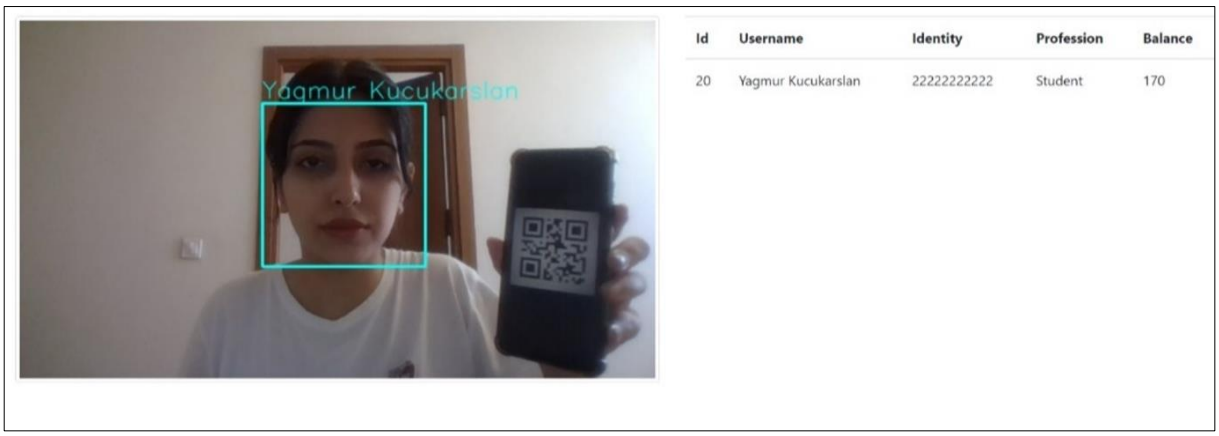

Fig. 12. Reading QR code to camera

During the journey, the person must show their personal QR code on the screen when they scan their face with the camera (Fig. 12.). This double verification system provides assurance that the person is really there at that moment.

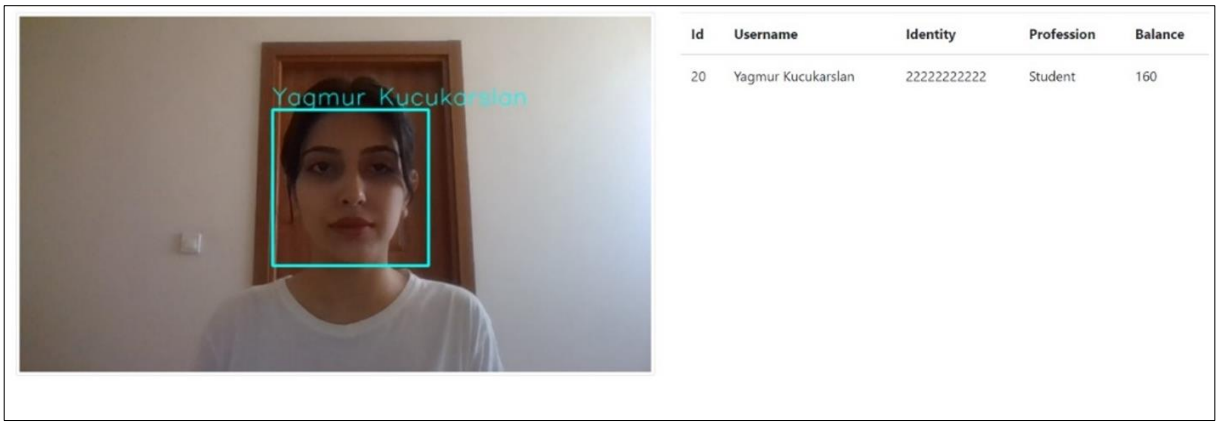

Fig. 13. Realization of the money deduction process

In Fig. 13, after both face recognition and QR code scanning processes, the system automatically deducts the fee. The user can view these processes instantly through the application. In this way, both a fully secure application is used and easier and more convenient transportation is provided. In addition, it will be possible to easily provide transportation abroad with this system.

In case of re-registration with a previously entered e-mail address, the system will give a warning and prevent the registration process. This application is made to prevent the risk of sharing or neglecting the QR codes used for the two-step verification system. Similarly, the system will give a warning in cases where the same unique ID number cannot be used for a person. When a user forgets their password and wants to change it, they can change their password if they are logged in and on the user page. In this case, changes can be made to the database in line with the necessary conditions and security measures. To add money to the account, 3D secure transaction steps are opened and money loading transactions are carried out. An interface system will be developed where users and travel agencies can see all the details regarding the balance section and usage. Thus, not only the user status will be followed, but also the drivers will be able to see the report of how many people and what type of passengers (students etc.) got on at the end of the day. Fig. 14 shows the general flow diagram of the application.

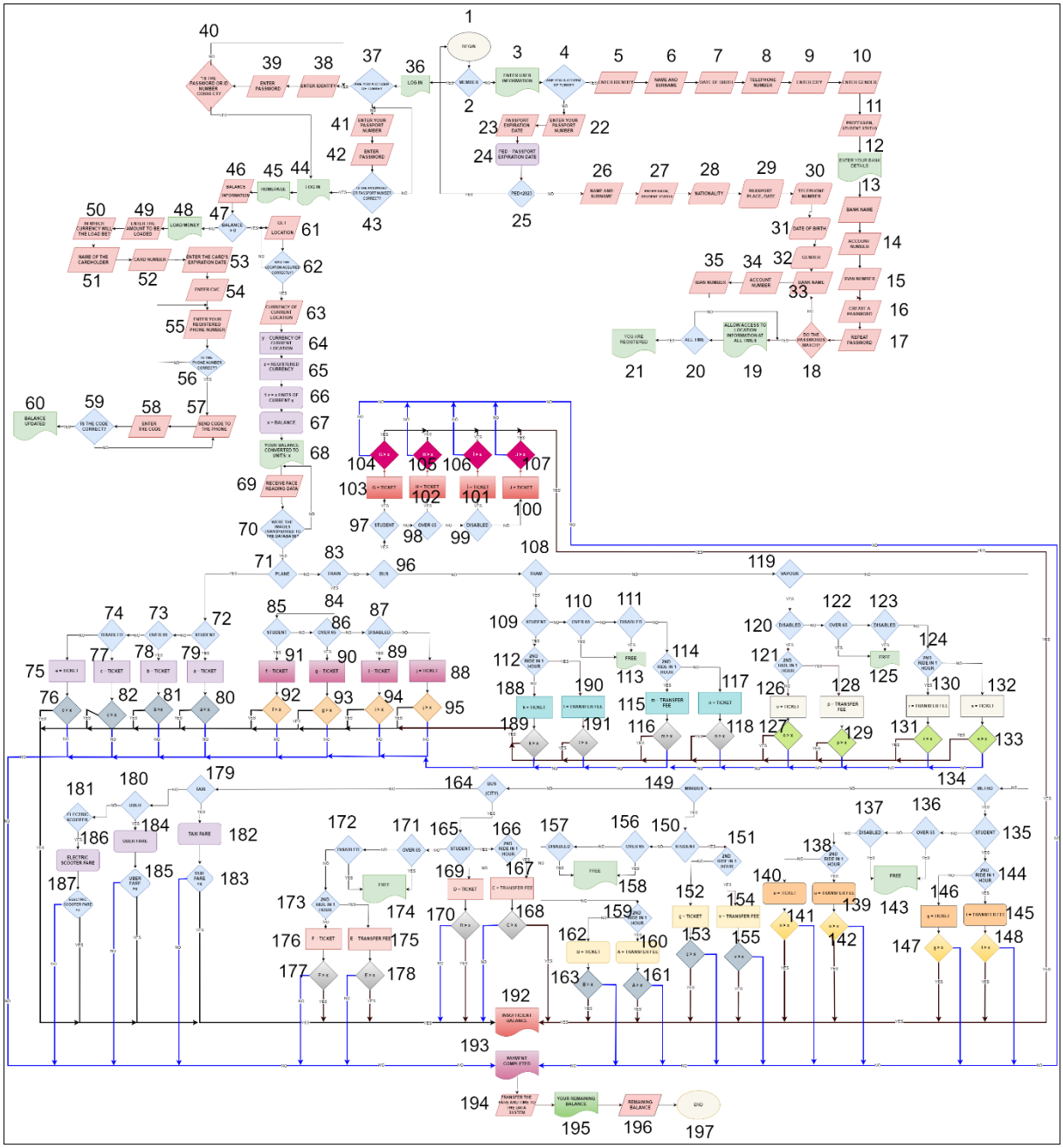

Fig. 14. General flow diagram of our application

Explanations of the numbers in the flow diagram are shown in Table 2.

Table 2. Explanations of numbers

[1]-BEGIN	[99]-DISABLED
[2]-MEMBER	[100]-J = TICKET
[3]-ENTER USER INFORMATION	[101]-İ = TICKET
[4]-ARE YOU A CITIZEN OF TURKEY	[102]-H = TICKET
[5]-ENTER IDENTITY	[103]-G = TICKET
[6]-NAME AND SURNAME	[104]-G > x
[7]-DATE OF BIRTH	[105]-H > x
[8]-TELEPHONE NUMBER	[106]-İ > x
[9]-ENTER CITY	[107]-J > x
[10]-ENTER GENDER	[108]-TRAM
[11]-PROFESSION, STUDENT STATUS	[109]-STUDENT
[12]-ENTER YOUR BANK DETAILS	[110]-OVER 65
[13]-BANK NAME	[111]-DISABLED
[14]-ACCOUNT NUMBER	[112]-2ND RIDE IN 1 HOUR
[15]-IBAN NUMBER	[113]-FREE
[16]-CREATE A PASSWORD	[114]-2ND RIDE IN 1 HOUR
[17]-REPEAT PASSWORD	[115]-m = TRANSFER FEE
[18]-DO THE PASSWORDS MATCH?	[116]-m > x
[19]-ALLOW ACCESS TO LOCATION INFORMATION AT ALL TIMES	[117]-n = TICKET
[20]-ALL TİME	[118]-n > x
[21]-YOU ARE REGISTERED	[119]-VAPOUR
[22]-ENTER YOUR PASSPORT NUMBER	[120]-DISABLED
[23]-PASSPORT EXPIRATION DATE	[121]-2ND RIDE IN 1 HOUR
[24]-PED=PASSPORT EXPIRATION DATE	[122]-OVER 65
[25]-PED<2024	[123]-DISABLED
[26]-NAME AND SURNAME	[124]-2ND RIDE IN 1 HOUR
[27]-PROFESSIONAL STUDENT STATUS	[125]-FREE
[28]-NATIONALITY	[126]-o = TICKET
[29]-PASSPORT PLACE, DATE	[127]-o > x
[30]-TELEPHONE NUMBER	[128]-p = TRANSFER FEE
[31]-DATE OF BIRTH	[129]-p > x
[32]-GENDER	[130]-r = TRANSFER FEE
[33]-BANK NAME	[131]-r > x
[34]-ACCOUNT NUMBER	[132]-s = TICKET
[35]-IBAN NUMBER	[133]-s > x
[36]-LOG IN	[134]-METRO
[37]-ARE YOU A CITIZEN OF TURKEY	[135]-STUDENT
[38]-ENTER IDENTITY	[136]-OVER 65
[39]-ENTER PASSWORD	[137]-DISABLED
[40]-IS THE PASSWORD OR ID NUMBER CORRECT?	[138]-2ND RIDE IN 1 HOUR
[41]-ENTER YOUR PASSPORT NUMBER	[139]-u = TRANSFER FEE
[42]-ENTER PASSWORD	[140]-ü = TICKET
[43]-IS THE PASSWORD OR ID NUMBER CORRECT?	[141]-ü > x
[44]-LOG IN	[142]-u > x
[45]-HOMEPAGE	[143]-FREE
[46]-BALANCE INFORMATION	[144]-2ND RIDE IN 1 HOUR
[47]-BALANCE>0	[145]-t = TRANSFER FEE
[48]-LOAD MONEY	[146]-ş = TICKET
[49]-ENTER THE AMOUNT TO BE LOADED	[147]-ş > x
[50]-IN WHICH CURRENCY WILL THE LOAD BE?	[148]-t > x
[51]-NAME OF THE CARDHOLDER	[149]-MINIBUS
[52]-CARD NUMBER	[150]-STUDENT
[53]-ENTER THE CARD'S EXPIRATION DATE	[151]-2ND RIDE IN 1 HOUR
[54]-ENTER CVC	[152]-ç = TICKET
[55]-ENTER YOUR REGISTERED PHONE NUMBER	[153]-ç > x
[56]-IS THE PHONE NUMBER CORRECT?	[154]-v = TRANSFER FEE
[57]-SEND CODE TO THE PHONE	[155]-v > x
[58]-ENTER THE CODE	[156]-OVER 65
[59]-IS THE CODE CORRECT?	[157]-DISABLED
[60]-BALANCE UPDATE	[158]-FREE
[61]-GET LOCATION	[159]-2ND RIDE IN 1 HOUR
[62]-WAS THE LOCATION ACQUIRED CORRECTLY?	[160]-A = TRANSFER FEE
[63]-CURRENCY OF CUREENT LOCATION	[161]-A > x
[64]-y=CURRENCY OF CURRENT LOCATION	[162]-B = TICKET
[65]-z=REGISTERED CURRENCY	[163]-B > x
[66]-1 z = x UNITS OF CURRENT y	[164]-BUS (CITY)
[67]-x = BALANCE	[165]-STUDENT
[68]-YOUR BALANCE CONVERTED TO UNITS: x	[166]-2ND RIDE IN 1 HOUR
[69]-RECEIVE FACE READING DATA	[167]-C = TRANSFER FREE
[70]-WERE THE IMAGES TRANSFERRED TO THE DATABASE?	[168]-C>x
[71]-PLANE	[169]-D = TICKET
[72]-STUDENT	[170]-D > x
[73]-OVER 65	[171]-OVER 65
[74]-DISABLED	[172]-DISABLED
	[173]-2ND RIDE IN 1 HOUR

[75]-e=TICKET **[76]-e>x** **[77]-c=TICKET** **[78]-b=TICKET** **[79]-a=TICKET** **[80]-a>x** **[81]-b >x** **[82]-c > x** **[83]-TRAIN** **[84]-TRAIN** **[85]-STUDENT** **[86]-OVER 65** **[87]-DISABLED** **[88]-j = TICKET** **[89]-i = TICKET** **[90]-g = TICKET** **[91]-f = TICKET** **[92]-f > x** **[93]-g > x** **[94]-i > x** **[95]-j > x** **[96]-BUS** **[97]-STUDENT** **[98]-OVER 65**	**[174]-FREE** **[175]-E = TRANSFER FEE** **[176]-F = TICKET** **[177]-F > x** **[178]-E > x** **[179]-TAXI** **[180]-UBER** **[181]-ELECTRIC SCOOTER** **[182]-TAXI FARE** **[183]-TAXI FARE > x** **[184]-UBER FARE** **[185]-UBER FARE > x** **[186]-ELECTRIC SCOOTER FARE** **[187]-ELECTRIC SCOOTER FARE>x** **[188]-k = TICKET** **[189]-k > x** **[190]-l = TRANSFER FEE** **[191]-l > x** **[192]-INSUFFICIENT BALANCE** **[193]-PAYMENT COMPLETED** **[194]-TRANSFER THE FARE AND TIME TO THE DATA SYSTEM** **[195]-YOUR REMAINING BALANCE** **[196]-REMAINING BALANCE** **[197]-END**

The QR code creation block code in our application is as shown in Table 3.

Table 3. Qr code creation code block

Code-Block: read_qr_code() Function:

```
1.  def read_qr_code(frame):
2.  decoded_objects ← decode(frame)
3.  if decoded_objects: then
4.  return decoded_objects[0].data.decode('utf-8')
5.  else:  return ""
6.  qr_read ← False
7.  def check_qr_data(qr_data , s):
8.  global qr_read
9.  mycursor.execute("SELECT .." , (s,))
10. qrcontent ←mycursor.fetchone()
11. mycursor.execute("SELECT .." , (s,))
12. face_name ← mycursor.fetchone()
13. mycursor.execute("SELECT .." , (s,))
14. register_name ← mycursor.fetchone()
15. mycursor.execute("SELECT .." , (qr_data,))
16. balance_result ← mycursor.fetchone()
17. if qrcontent: then
18. if face_name == register_name: then
19. mycursor.execute("SELECT .." , (qr_data,))
20. obstacle ← mycursor.fetchone()
21. if obstacle and obstacle[0] == "None": then
22. mycursor.execute("SELECT .." , (qr_data,))
```

There are some important functions in the algorithm we developed. To explain them briefly;

read_qr_code() Function:

This function detects and decodes QR codes in an image frame. The decode() function analyzes the QR code in the frame. If the QR code is detected, the content of the code is decoded and returned in utf-8 format. If the QR code is not found, an empty string is returned.

check_qr_data() Function:

This function checks the user's information in the database by comparing the QR code data (for example qr_data) and the name obtained as a result of face recognition (for example s). It is queried whether the QR code data and the name obtained as a result of face recognition match. The function also checks additional information such as the user's disability status, martyrdom status, occupation status and balance. If the user is a student and has a balance, 10 units are deducted from the balance, otherwise 20 units are deducted. If the balance is insufficient, the user is given an "Insufficient Balance" message. If the person is a martyr or disabled, no money is deducted.

face_recognition() Function:

This function performs face recognition. It contains a helper function called draw_boundary() that detects the face, draws a rectangle around it, and verifies the presumed identity of the face.

1. The image is converted to gray tones and face detection is performed with the classifier.detectMultiScale() function.

2. A rectangle is drawn around the face for each detected face. Then, the identity of the face is predicted with clf.predict().

3. The person's name is queried from the database with the predicted identity.

4. If the confidence score of the prediction is above 70%, the person's name is written on the image and the QR code shown on the screen is read with the read_qr_code() function.

5. The data obtained with the QR code and face recognition result is checked and verified in the check_qr_data() function. If correct, the user is given the "WELCOME" message; if not, the "QR code did not match" message is displayed.

6. If the confidence score is below 70%, the face is marked as "UNKNOWN".

This function aims to perform identity verification by integrating face recognition and QR code reading processes.

3. Conclusions And Future Works

As a result, in this study, a virtual wallet that can be controlled by users and travel agencies has been developed with a web-based face recognition system that is developed with the combination of web technologies and python programming-based systems and works simultaneously. Fee reduction transactions have been carried out according to the pricing tariff determined by the provinces. Thanks to the system where both the user and the travel agency can control the account control by entering their own system, all similar negativities such as getting a card, filling it, and losing time will be prevented. Perhaps in the future, by adding different verification methods, this study will be successfully implemented in real life.

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