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Web Application for Tourists Monitoring System in Iraqi Marshlands

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ABSTRACT: Tracking systems have become a common technology in various fields and a tool to assist with the recreation resource management. Such technologies allow real-time tracking and monitoring of tourists and modeling their movement on Google Map. Furthermore, they provide security and safety for tourists and countries by accurately transmitting series of their movements information to a data center. This paper introduces a web application that can monitor the tourists in Iraqi marshlands based on Global Position System (GPS) to acquire the location and Radio Frequency Identification (RFID) tags for identification. The movement of tourism in the marshes is monitored by tracking the tourists' boats, which are the only means of transport. In this paper, an integrated cost effective web based GPS-RFID Tourist monitoring system was implemented and designed. The system enables tourism enterprises owners to monitor the locations recorded of the tourists' boats on Google Map through purpose designed web site. The current location of the boat is acquired by GPS and the tourists' identification data collects through RFID tags (cards) attached to tourists which all are integrated in the target boat. Moreover, the location coordinates and RFID data are sent through GPRS service provided by the GSM network. The GPS and RFID data are sent using Get method of HTTP protocol, the data at server side are saved in a database tables and can be restored as request for location browsing on Google map. A web application is developed using PHP, JavaScript, CSS, HTML, and MySQL with Google Map to retrieve and display on track details.

KEYWORDS: GPS, RFID, Tourist Tracking, PHP, Database, SQL Server.

I. INTRODUCTION

For the tourism services industry it is important to develop a system that determines the accurate location of the tourists and identifies the tourists by attached tags for safety and security purposes. Diverse technologies can be utilized to fulfill this purpose. The RFID (Radio Frequency Identification) technology is recognized for real-time identification and tracking. Because of its precise and express identification, RFID is used extensively to asset tracking [1]. The GPS (Global Positioning System) is the most common technology that used to obtain the position information in outdoor environments. Constantly GPS is assisting for tracking of vehicles over a broad geographical area. With simultaneously information received from four satellites and typical conditions and least of Ionosphere, users can calculate an object's position included latitude, longitude, and altitude. This powerful combination of data and advanced technologies allows tracking objects accurately [2]. Moreover, wireless communication systems have been used to transmit and receive information between the stations. The most prevalent used communication system is GSM. This is due to inexpensive cost and accessibility around the covered area and its reliability [3].

In terms of data centers, several software and algorithms have been used to reach the object tracking systems. Moreover, the data center includes some intellectual property have to be preserved in a secure environment to emphasize confidentiality and availability [4]. The database is used to store the data and assist managers to produce different reports related to events. It is essentially to note that all the applications are built as a webpage based to be universal and can be accessed from different places [5].

In the proposed system a web application is designed for tourism enterprises which provide registration services for tourists and their related information from trips, boats and tourism guides and other services all under the supervision of users of a system with different authorization levels. Moreover, this system can monitor and track the movement of tourists' boats on Google map by reviewing the GPS data stored in the database and give different alerts such as the disappearance of one of the RFID cards carried by the tourists, the boat stopped due to failure and exceeding the allowed border. A Graphical User Interface (GUI) has been introduced to be easy used by users. This GUI is built using HTML elements with PHP to connect the database built in SQL server. The results appear the efficiency of the proposed system in terms of database management and PHP functionality in generated reports.



II. RELATED WORKS

Researches in the field of localization and tracking of individuals and objects such as vehicles are a very effective area. Generally these researches not only interested in the field of tracking and monitoring but also concern with safety, security, control and management issues. Many monitoring systems have been designed; each varies with some of its properties, merits and abuses. Some of those systems will be reviewed:

In [6] cargo based GPS presented for petroleum transportation tankers. The system collect different type of information related to cargo and sent them to a data base by GSM technology. Moreover, the system supported with a security technique for overall operation.

In [7] authors presented a methodology to analyze the spatial behavior of tourists based on tracking data. This method was applied during a field study in the city of Goerlitz at the east border of Germany. Global Positioning System (GPS) was used to know the places (which sights, shops, restaurants, events, etc.) and times (at which daytime, in which season, etc.) tourists visit.

In [8] vehicle terminal system is proposed to realize continuous monitoring and tracking the location of cargos or goods loaded on board for digital logistics. The embedded design of the terminal system is combines both the RFID with GPS technologies. The ultra-low power 16-bit RISC microcontroller is used as the central control unit considering both small size and high efficiency. The vehicle terminal system can give the automatic identification of cargos loaded, the real-time vehicle location, the data and voice communication, and continuous monitoring. The results specify that the combination of RFID and GPS can provide the reliability of the system, which further improve the accuracy and efficiency of digital logistics management.

In [9] authors used GSM & GPS based system for Vehicle Tracking and Employee Security System. It consists of car unit, emergency button and company unit. Car unit is placed inside the car. When the car picks up the employee; he/she needs to swap the RF card. The micro controller matches the RF card no. with its database records and sends map. The system's efficiency is dependable on the sufficiency of the used communication network.

In [10] a hybrid RFID-GPS tool used, allowing for the real-time location of humans. This tool tracks the location of humans using GPS within 100 meters range and RFID within 2 meters range. The tool that ensures security and monitors the location along with watch over a suspicious person or prisoners with human tracking of cared ones in case of emergency.

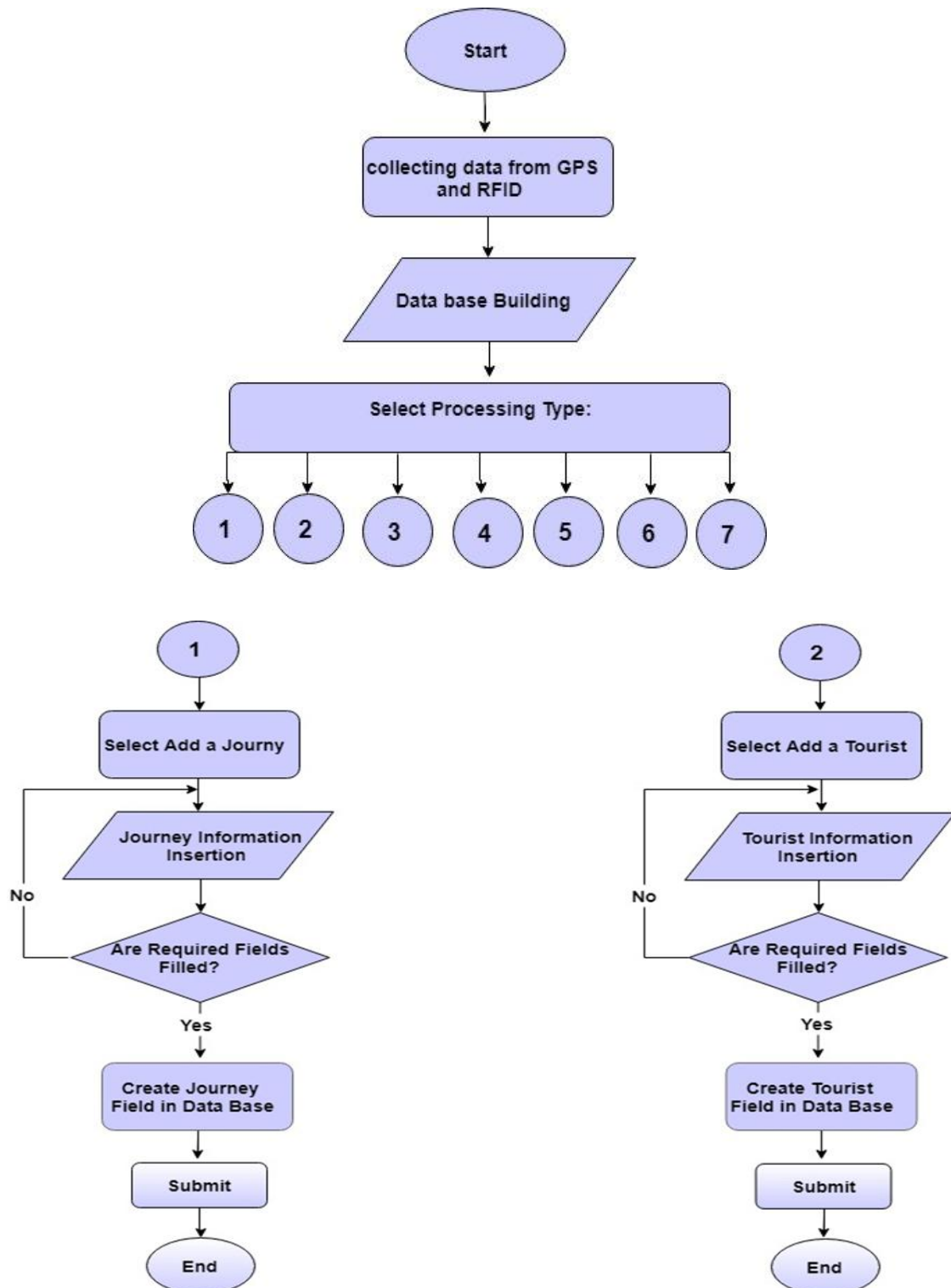
III. WEB DESIGN

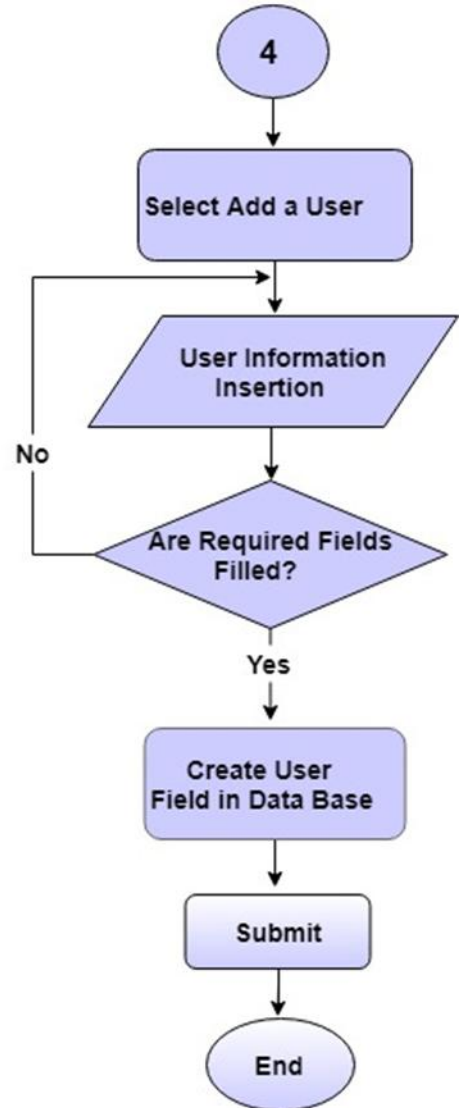
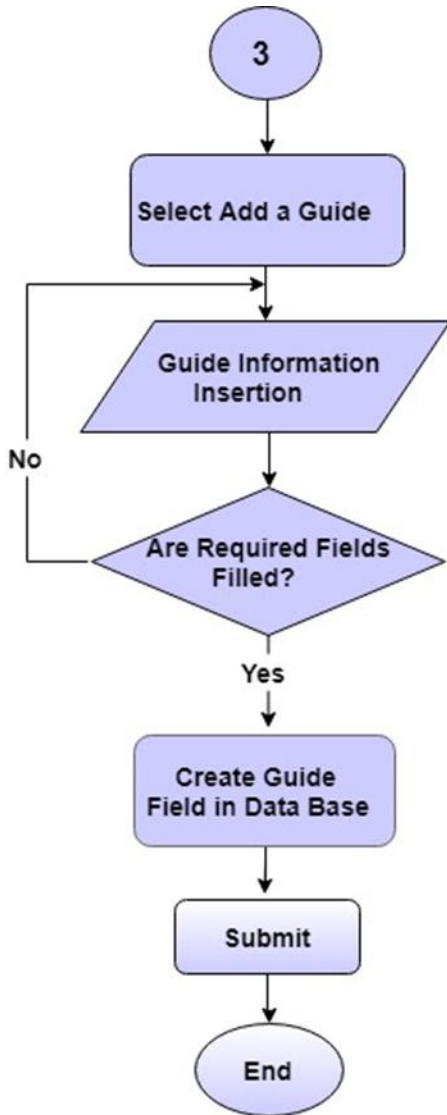
Various web application development languages are used to satisfy several purposes for the designed applications which resulted in a complete integrated system allow the users to benefit of such system. The overall objective of the proposed web application can be summarized in the following:

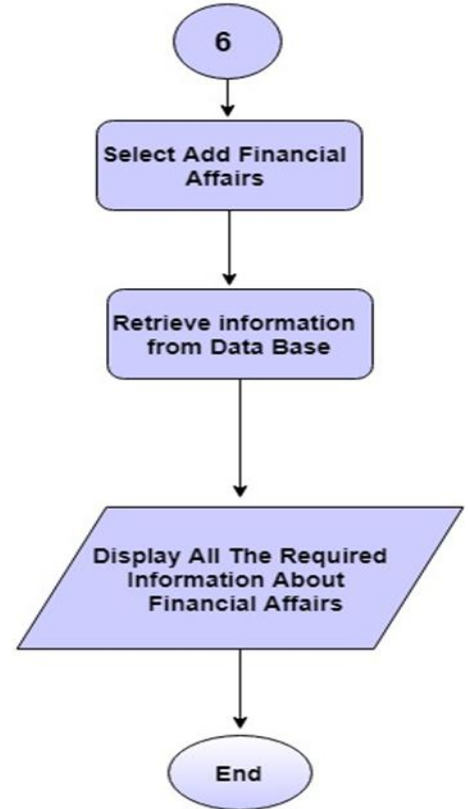
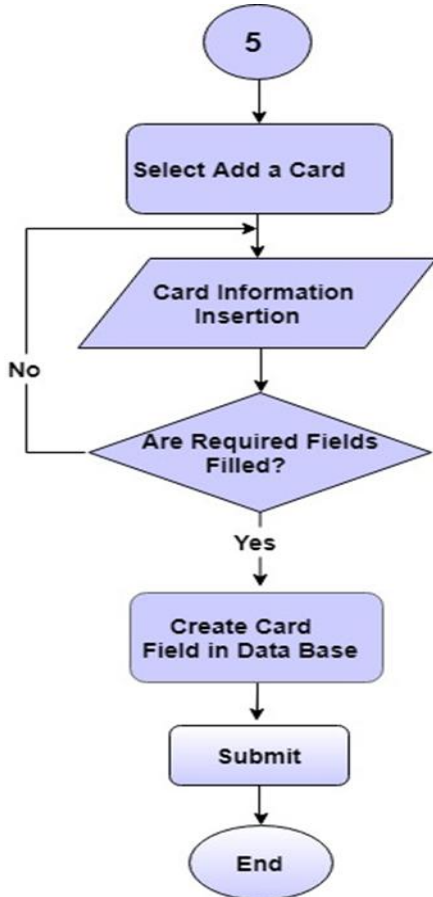
1. Define and manage all tourists' information by system administrator.
2. Add journeys information related to tourists by system administrator.
3. Show the financial affairs related to trips.
4. Design a system with different levels of authentications.
5. Receive and identify tracking data from each equipment unit (GPS-RFID).
6. Save tracking information received from (GPS-RFID) devices in the database.
7. Display the track positions on Google map by several browsing types.
8. Show notifications on the Dashboard interface in the following cases:
 - i) The entry of tourists' boats to the border of the neighboring countries.
 - ii) The boat stopping of movement for a certain period of time for various reasons.
 - iii) The loss of one or more tourists from the boat.
8. Generate reports of boats movements showing their information and tracking details.

Web pages was designing using HTML elements such as JavaScript, CSS and PHP which performs functions and adds effects on the behavior of HTML pages. JavaScript and CSS implement the background functions such as login check, information validation, and browsing function. Moreover, JavaScript embeds Google Map API on the web site utilizing key that provided by Google Company where boats locations coordination are displayed. Administration of accounts performed using PHP commands which is embedded directly into HTML source document rather calls external file to manipulate data. The administration jobs include adding, deleting, browsing and formatting into tables. Using PHP at the server side is to save the received GPS and RFID data in forms which is simpler to inspect and check intended parts of received data. Moreover, detailed notifications and reports of tourists' boats track are generated by

PHP commands where the pertinent information is saved into table contain boat basic data and particular track information including position coordination and RFID identification data. The proposed system design can be summarized in a flowchart as shown in Figure (1).







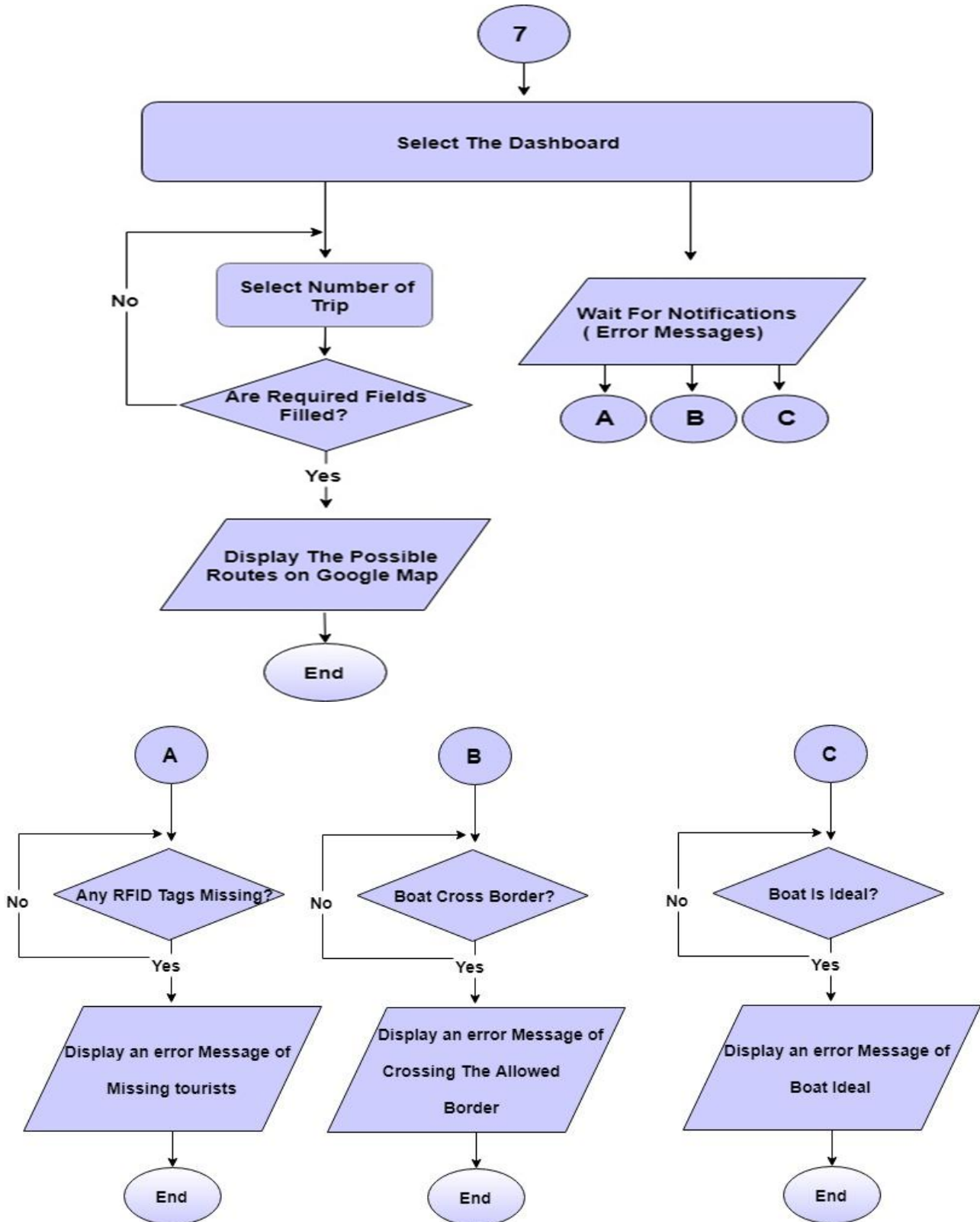


Fig.1. Web Design Flowchart



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IV. DATA BASE DESIGN

The responsibility of the database is to save all system data including user login credentials, tourists' information, guides information, and tracking data. Moreover, the database collects and displays data in a consistent format to ensure the integrity of data. This system must retrieve information efficiently which has led to design a complex data structures to represent information using entity relationship diagram (ERD).

System database consists of eight tables which can be summarized in the following:

1. Cards table which holds all RFID cards serial numbers provided by website system.
2. Cards_Log table which holds RFID cards serial numbers provided by the system fixed in the tourists' boat.
3. Notifications table which contain extra information of the status of the trip in terms of reporting the system with different types of error message as explained earlier.
4. Trip_tracking table holds the tracking data that is received from GPS component fixed in tourists' boat.
5. Guide table to save various information about the tourists' guide such as the name, phone numbers and so on.
6. Tourists table which includes the personal information of the tourist such as his name and nationality in addition to the RFID card data that gave to the tourist.
7. Trip table which holds the basic information of the trip including start point location and end point location in addition to the price of the trip ticket.
8. Users table holds all the important users information including credentials and the level of permeations for each user.

The database's ERD shown in Figure (2) depicts eight tables (cards_log, notifications, trip_tracking, guide, trip, tourist, cards and users) that are required for this design, the cards_log and trip_tracking tables are used to store information from tourists' boat while the notifications table is the result of linking various tables to tell any errors occur during the trip. The rest tables are required for registration purposes such as tourist, cards, trip and guide tables. The user table is responsible for determining the level of authentication for system users. data by their names.

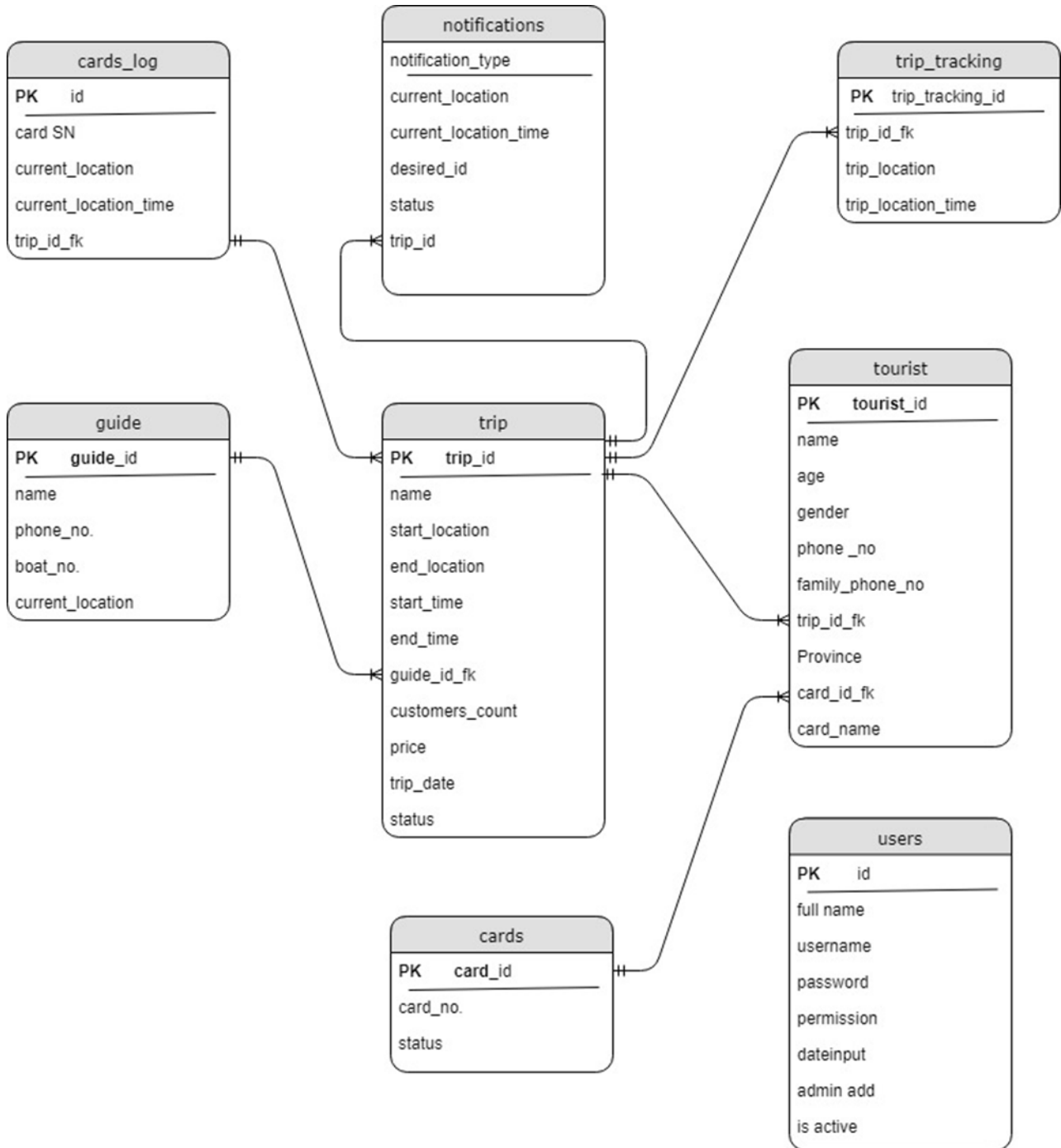


Fig.2. Basic ERD

V. GUI DESIGN

The system interfaces are designed by HTML element which provides interfaces that are easier to use and without prior knowledge. The home page of the proposed system includes seven main buttons for (super admin) authorization level and four buttons for (admin) authorization level which are explained as following:

1. login page which allow multiple users to login the system with different authorization levels as shown in Figure (3).

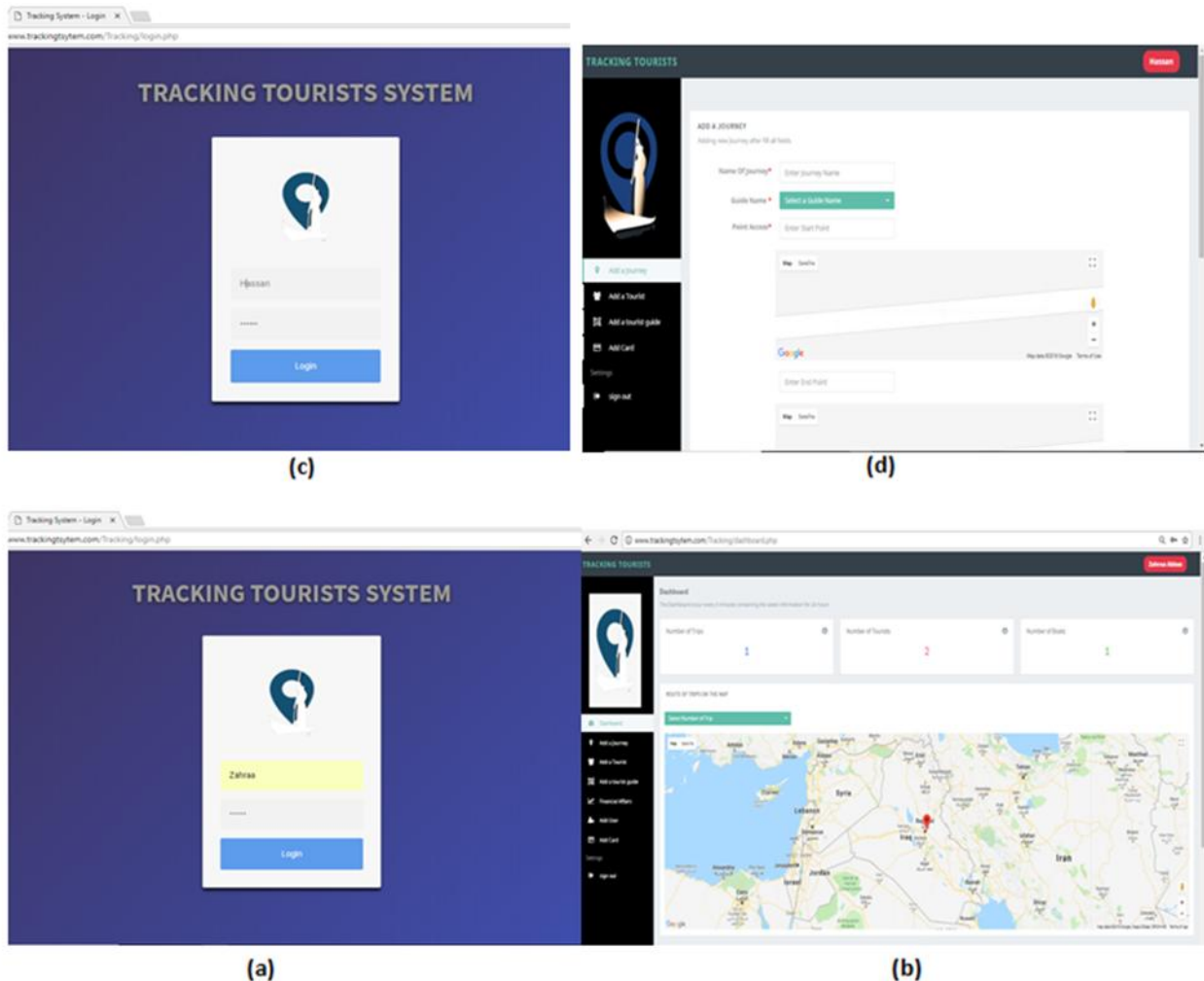


Fig.3. (a) login Super Admin (b) Homepage for Main Admin (c) login Admin (d) Homepage for Admin

2. Dashboard Figure (4) shows the dashboard interface that displays tourists' boat positions on Google Map in addition it shows the total number of trips, tourists and boats. Moreover, it shows warnings messages (Notifications) in cases of the loss of tourists, crossing the boat the allowed border and stopping the boat at the same place for a long time interval that will be discussed in the result section.

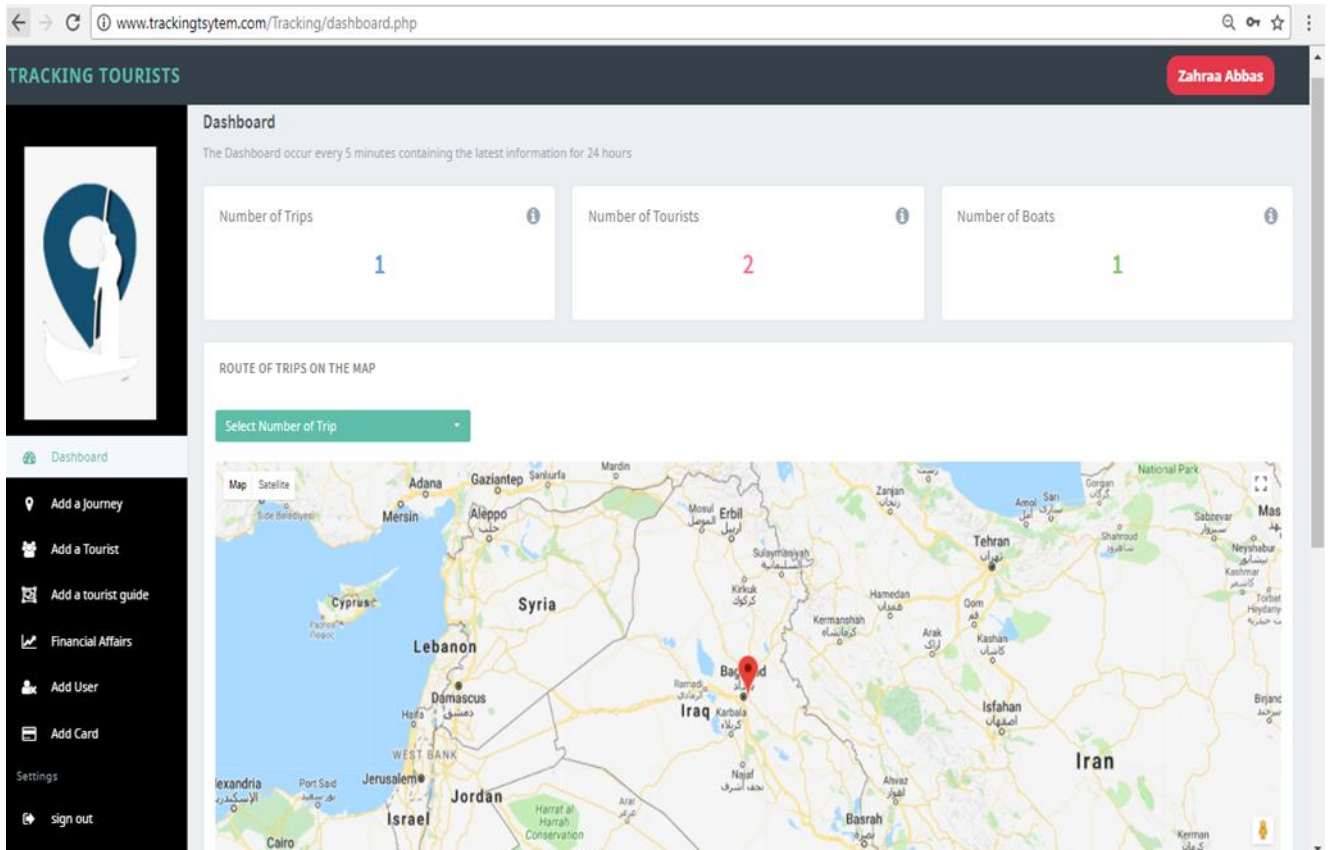


Fig.4. "Dashboard page"

3. Add a Journey interface is allowed to insert the details of the trip such as name of journey, name of guide, start time of trip, arrive time of trip, number of tourists in the specified trip and the price of the ticket. Moreover, this page provides two important points which are start point and end point of the trip by which the system can determines if the boat of tourists cross the limited boarder as shown in Figure (5).

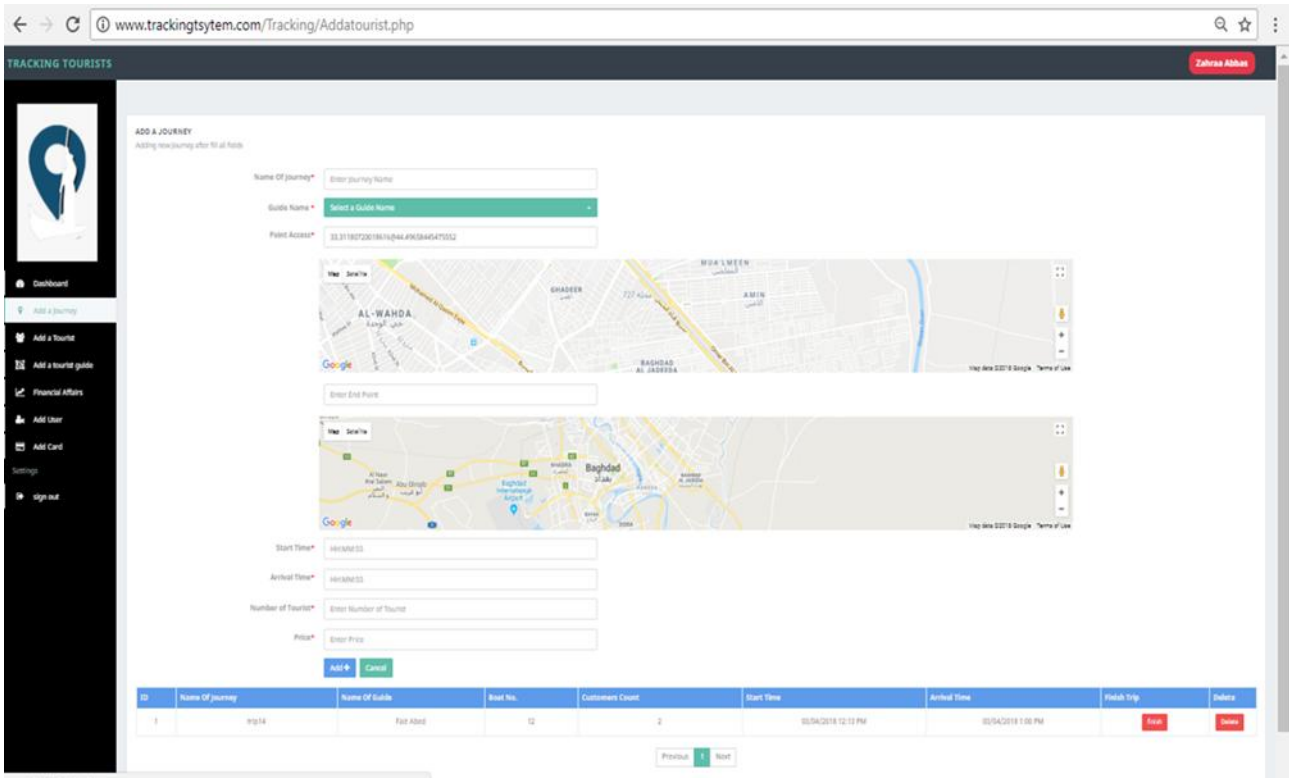


Fig.5. "Add a Journey interface"

4. Add a Tourist interface is allowed to insert necessary information about the tourist such as the name of tourist, gender, age, name of the previously added journey, province, phone number, phone family number and the number of RFID card (tag) as shown in Figure (6).

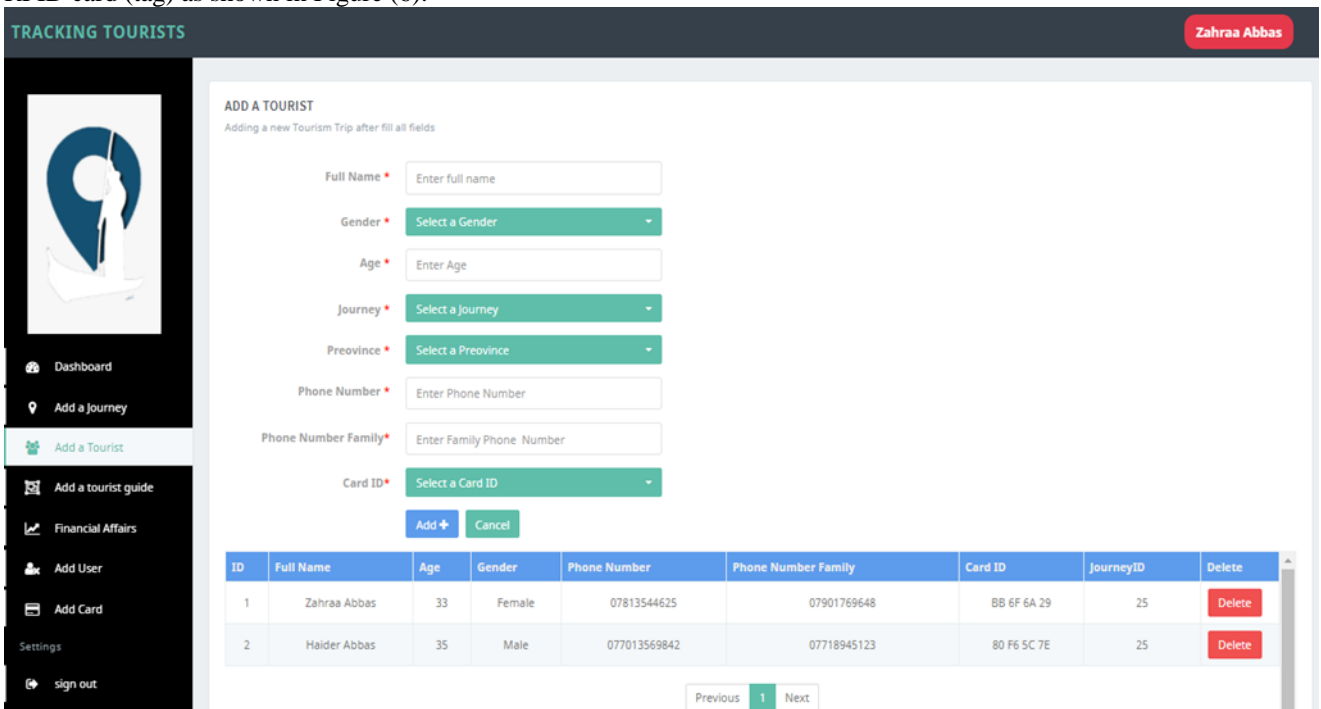


Fig.6. "Add a Tourist interface"

5. Add a Tourist Guide interface which is for insert information about the tourist guide such as full name, phone number and number of boat as shown in Figure (7).

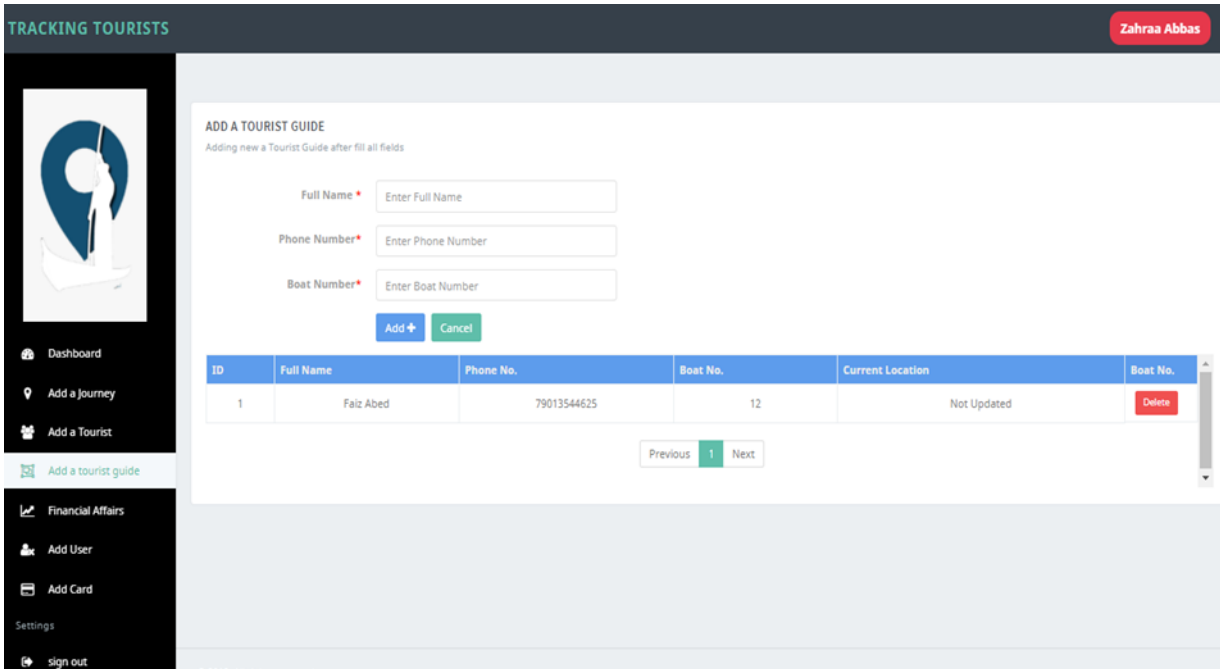


Fig.7. "Add a Tourist Guide interface"

6. Financial Affairs shown in Figure (8) displays the totally budget of the traveled trips and the number of tourists.

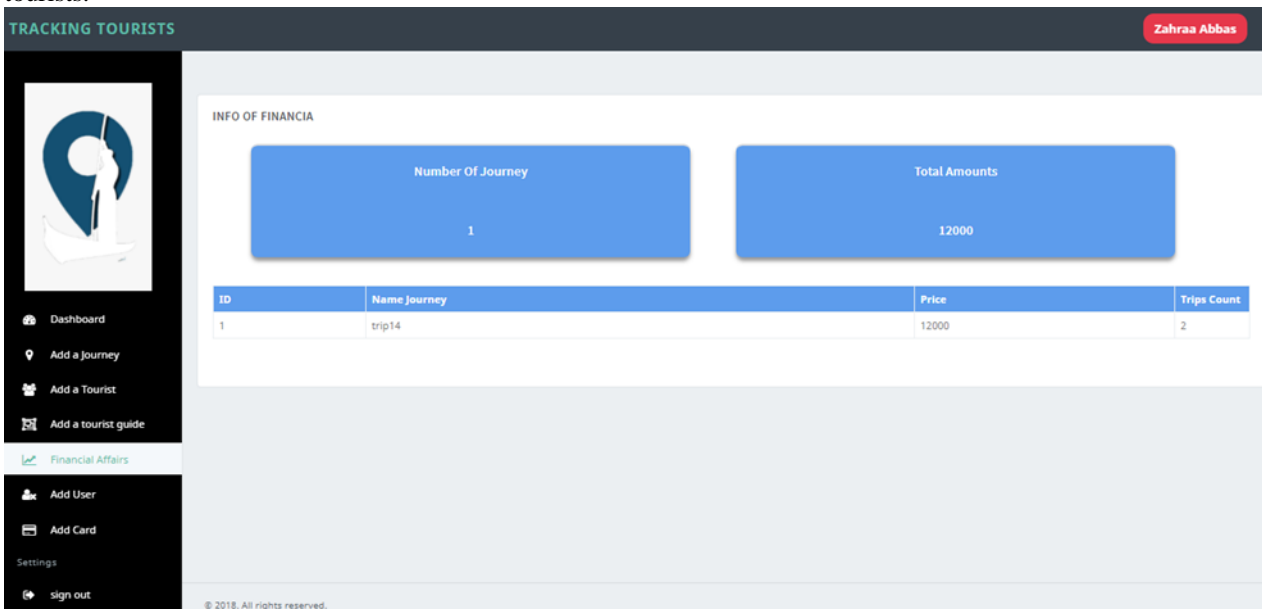


Fig.8. "Financial Affairs interface"

7. Add Card interface which is allowed the system to insert the serial number of RFID cards (tags) that given to tourists through their journey for identification purposes as shown in Figure (9).

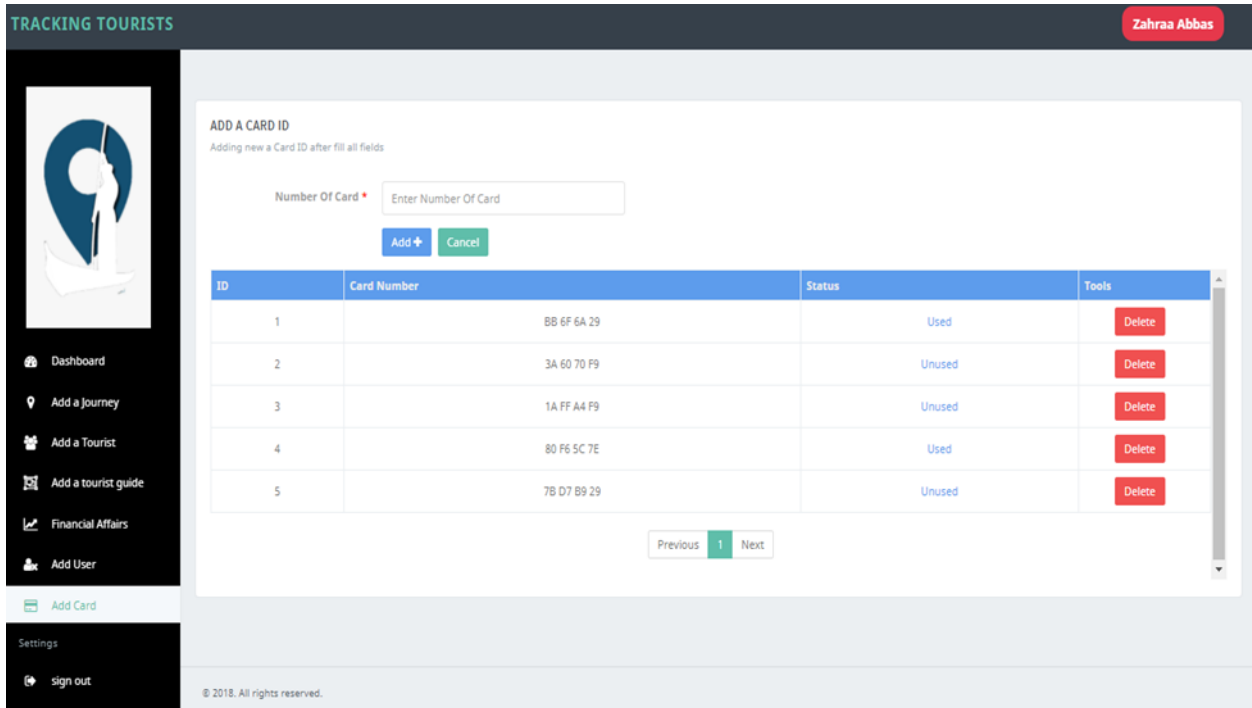


Fig.9. "Add Card interface"

8. Add User interface used to insert more than one user to the system with an authorized level as explained earlier. Figure (10) shows two users with different authorization.

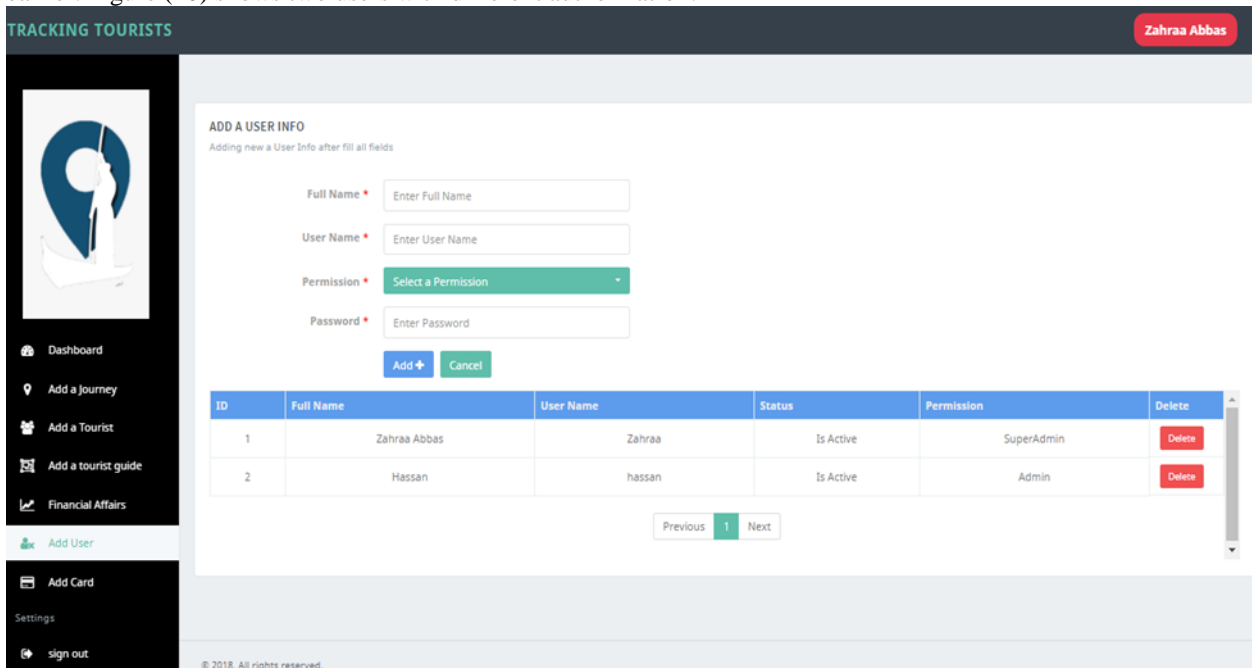


Fig.10. "Add User interface"

VI. RESULTS

A tracking page was designed (Dashboard page) for the purpose of track and monitors the tourists' boat; this page consisting of three updatable card boxes for the purpose of obtaining the latest update of the number of trips, tourists and boats. Moreover, an embedded Google Map was implemented to the purpose of showing the rout of tourists' boat that can be selected by drop-down list for trip selection. Through this page, user can monitor on map by selecting number of trip. Moreover, this page can viewed three types of error messages as explained earlier. We can summarize the obtained results as follow:

1. Monitor the movement of the boat on the Google map by selecting the trip number as shown in Figure (11).
2. When the boat of tourists stopping for long interval of time for any reason; an error message is displayed in the web system as shown in Figure (12).

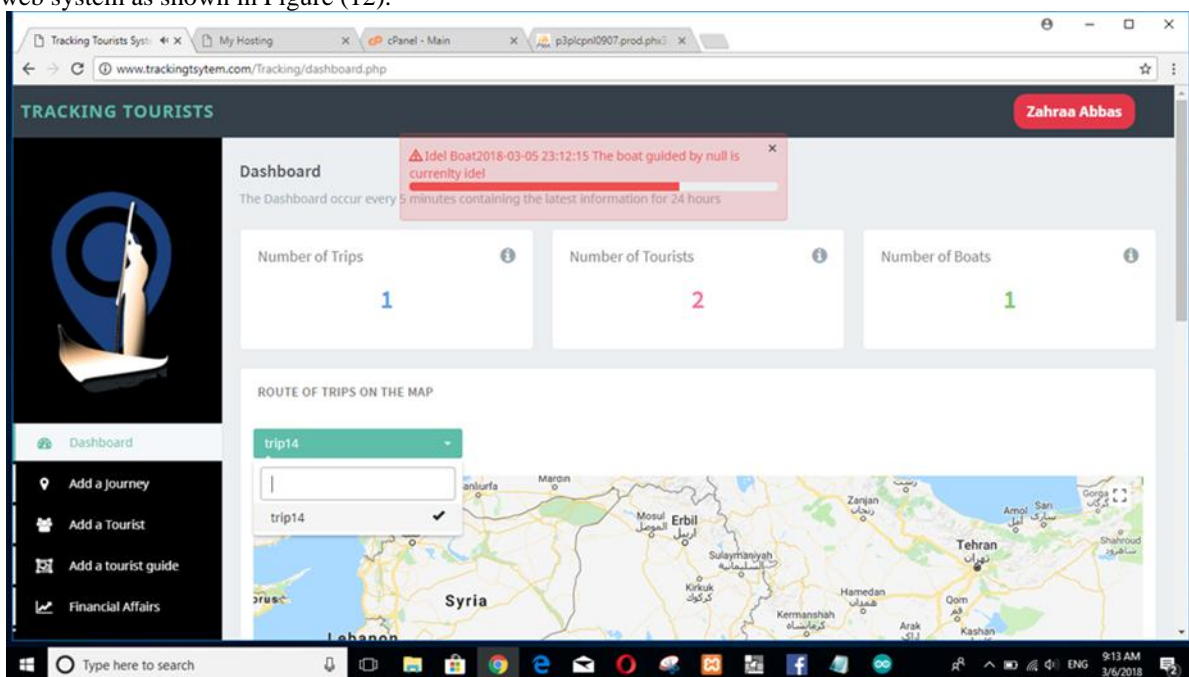


Fig.11. "Idle Boat Error Message"

3. When any tourist missing; another error message is displayed as shown in Figure (13).

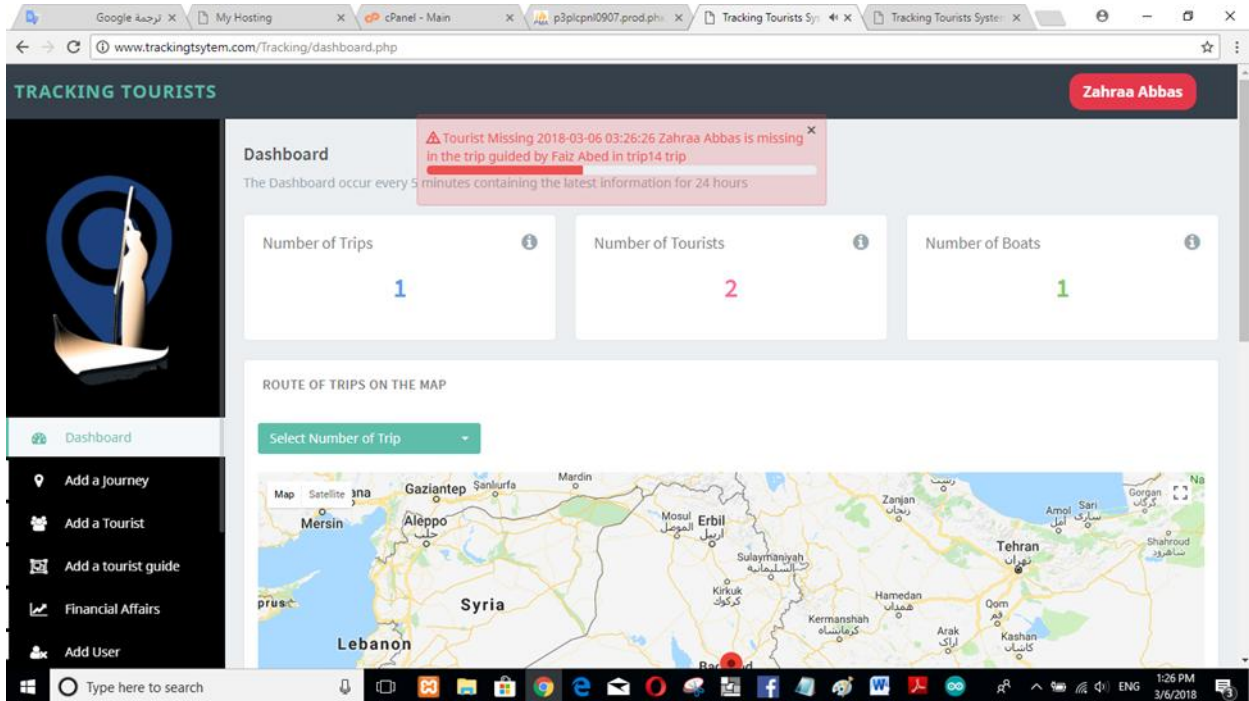


Fig.13. "Tourist Missing Error Message"

4. Finally when the boat cross the border a third error message is displayed in the web as shown in Figure (14).

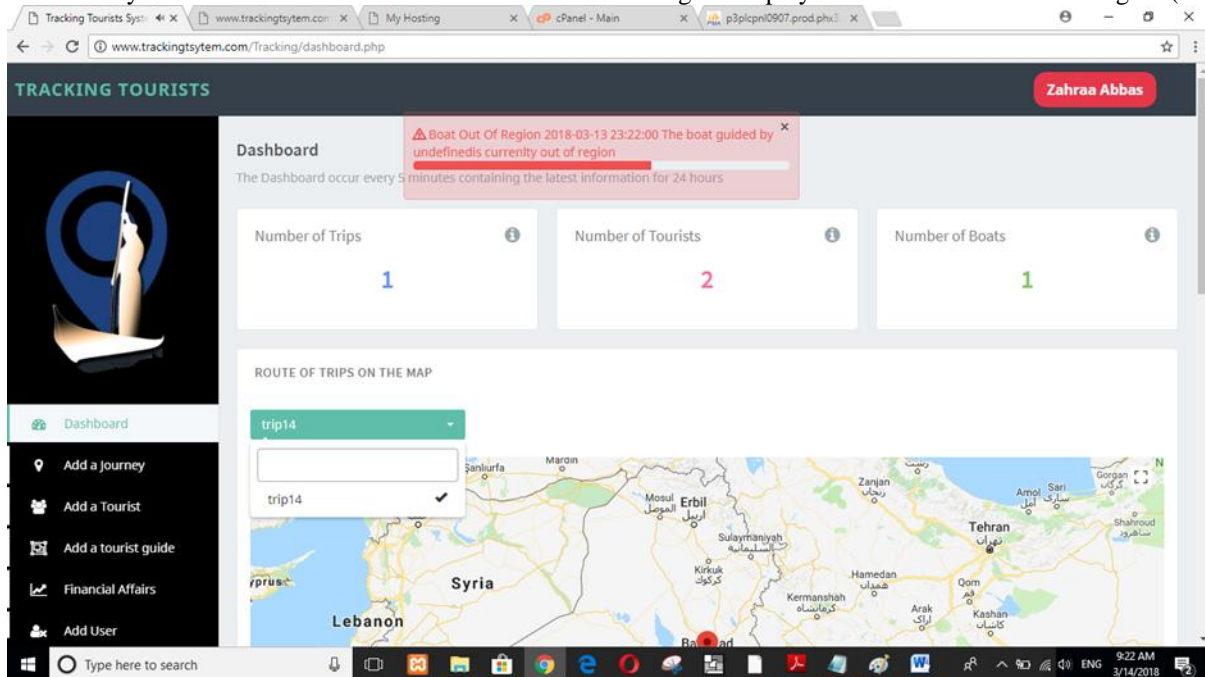


Fig.13. "Out of Region Error Message"

Outcome results appear as notifications in the dashboard system interface for easy monitor by the user of system as shown in Figure (15).

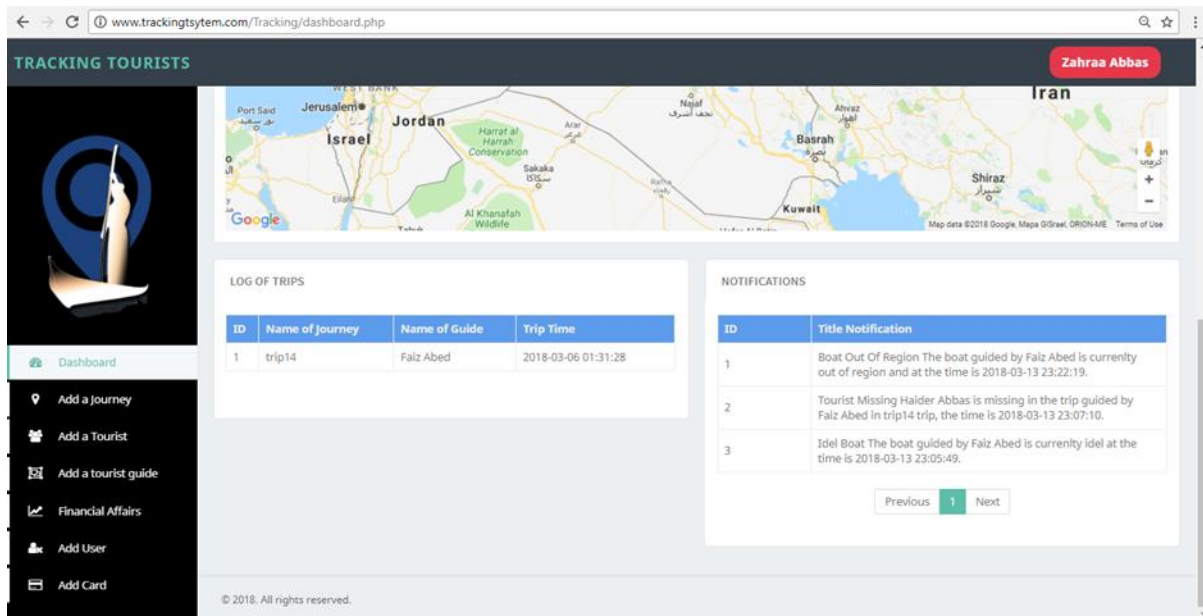


Fig.15. "Notifications Table"

VII. CONCLUSION

The integration of GPS with RFID provides real-time tracking by GSM that provides GPRS service which is extremely less cost than SMS service. Moreover, Google Map which is free service and the utilized of HTTP protocol as a method for data sending minimizes the cost for enterprises. The proposed system was designed to allow multiple users with different type of authorization to control the web application which displays locations of tourists' boat on Google map and checking with the boats is ideal, cross the border and if any tourist is missing by notification method. The web is designed to be interactively, easy to use, securely and reliable.

The data base is designed in normalized pattern to avoid the redundancy in the data which exhaust the server and there for the reduction in the lines of codes used in the system.

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