BILKENT UNIVERSITY

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CS353 TERM PROJECT

FINAL REPORT

GROUP 31

Zoo Database Management System

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1.0 Description of Application System

Within this project for the CS353 Database Systems course, we have designed and built an application system for a Zoo Database Management System. The aim of this system is for the visitors and employees to have easy access to information about the zoo. So, there are two types of users: visitors and employees. The employees are further subcategorized into three as coordinators, veterinarians and keepers. Each of these types of users (and employees) has access to different information and functionalities.

The visitors are able to browse the available events of the zoo and also see the comments made by visitors under these events. There are three types of events: conservation organizations, group tours and educational programs. Depending on the event type, the register to the event or make a donation. The visitors are able to make comments for events they have attended or create complaint forms depending on the event type. The visitors are also able to buy souvenirs sold in the physical souvenir shop in the zoo from this application system if the item is in stock.

The employees all have different functionalities, too. The coordinators are able to create events and respond to the complaint forms constructed by the visitors. They can also invite veterinarians as speakers to events of the type educational program. The veterinarians can update the status of the invitations from coordinators as accepted or rejected. The veterinarians are also able to update the status of treatment requests for an animal sent by the keepers. The keepers can send a treatment request for an animal if the animal is sick, and also schedule training for an animal. The keepers are able to regularize the food for a cage as well, by updating the amount of food assigned.

2.0 Final E/R

The final ER diagram is given below in Figure 1. The main change we made to the previous version was to remove the restaurant component because of time and complexity constraints. We have also changed or updated other sections based on feedback and insight during the implementation stage.

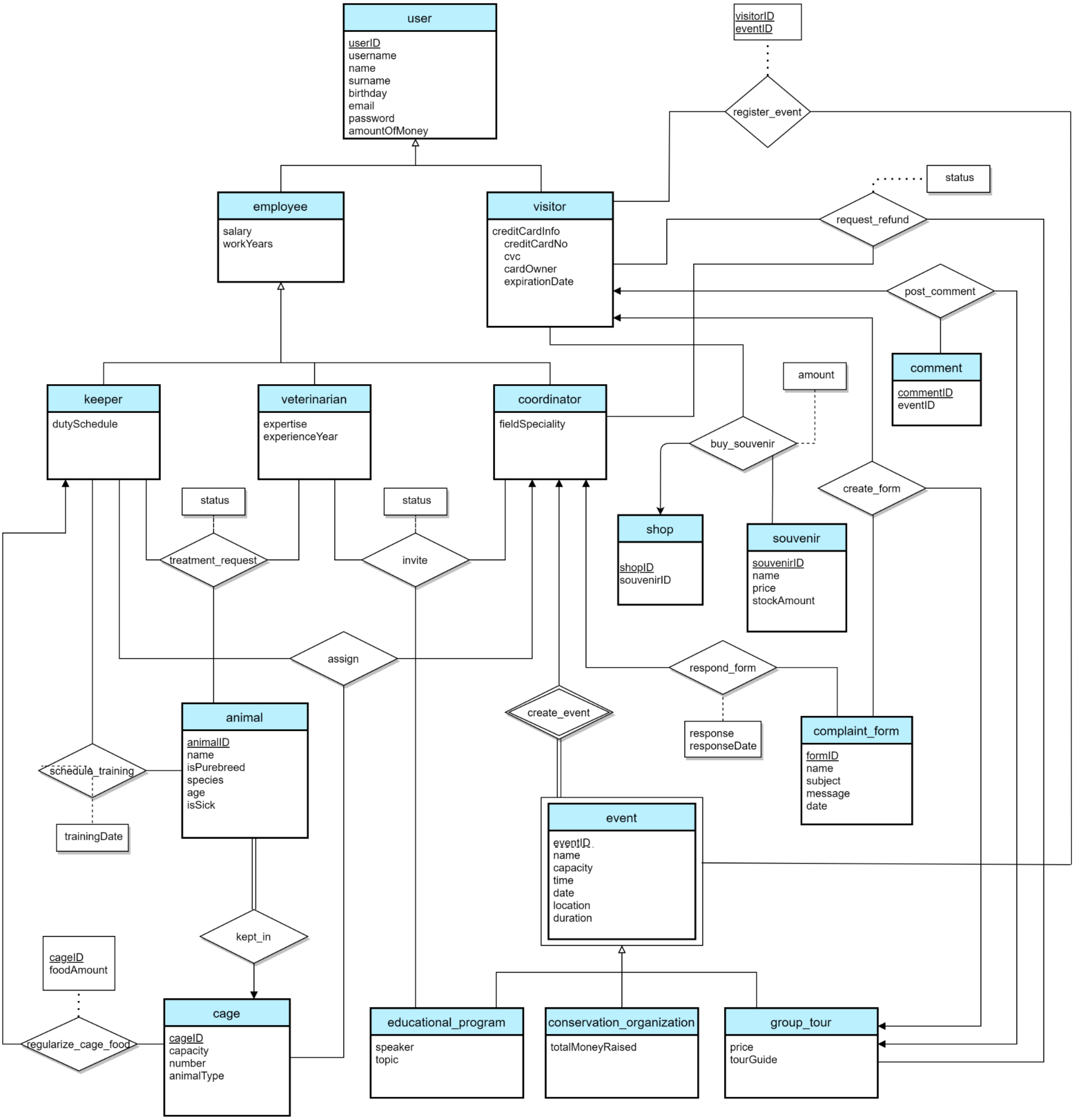


Figure 1: The Final ER Diagram

3.0 Final List of Tables

The finalized schemas and their primary key(s) and, where applicable, foreign key(s) are given below in accordance with the ER diagram.

3.1 User

user(userID, username, name, surname, birthday, email, password, amountOfMoney)
primary key(s) → userID

3.2 Visitor

visitor(visitorID, creditCardNo, cvc, cardOwner, expirationDate)
primary key(s) → visitorID
foreign key(s) → visitorID references user (userID)

3.3 Employee

employee(employeeID, salary, workYears)
primary key(s) → employeeID
foreign key(s) → employeeID references user (userID)

3.4 Keeper

keeper(keeperID, dutySchedule)
primary key(s) → keeperID
foreign key(s) → keeperID references employee (employeeID)

3.5 Veterinarian

veterinarian(vetID, expertise, experienceYear)
primary key(s) → vetID
foreign key(s) → vetID references employee (employeeID)

3.6 Coordinator

coordinator(coordID, fieldSpeciality)

primary key(s) → coordID

foreign key(s) → coordID references employee (employeeID)

3.7 Souvenir

souvenir(souvenirID, name, price, stockAmount)

primary key(s) → souvenirID

3.8 Buy Souvenir

buy_souvenir(visitorID, coordID, souvenirID, amount)

primary key(s) → visitorID, coordID, souvenirID

foreign key(s) → visitorID references visitor
→ coordID references coordinator
→ souvenirID references souvenir

3.9 Event

event(coordID, eventID, name, capacity, time, date, location, duration)

primary key(s) → eventID

foreign key(s) → coordID references coordinator

3.10 Educational Program

educational_program(eduID, speaker, topic)

primary key(s) → eduID

foreign key(s) → eduID references event (eventID)

3.11 Invite

invite(vetID, coordID, eduID, status)

primary key(s) → vetID, coordID, eduID

foreign key(s) → vetID references veterinarian

→ coordID references coordinator
→ eduID references educational_event

3.12 Conservation Organization

conservation_organization(consID, totalMoneyRaised)
primary key(s) → consID
foreign key(s) → consID references event (eventID)

3.13 Group Tour

group_tour(groupID, price, tourGuide)
primary key(s) → groupID
foreign key(s) → groupID references event (eventID)

3.14 Register Event

register_event(visitorID, eventID)
primary key(s) → visitorID, eventID
foreign key(s) → visitorID references visitor
→ eventID references event

3.15 Complaint Form

complaint_form(formID, name, subject, message, date)
primary key(s) → formID

3.16 Create Form

create_form(formID, visitorID, groupID)
primary key(s) → formID, visitorID, groupID
foreign key(s) → formID references complaint_form
→ visitorID references visitor
→ groupID references group_tour

3.17 Respond Form

respond_form(formID, visitorID, groupID, response, responseDate)

primary key(s) → formID, visitorID, groupID
foreign key(s) → formID references complaint_form
→ visitorID references visitor
→ groupID references group_tour

3.18 Comment

comment(commentID, comment)

primary key(s) → commentID

3.19 Post Comment

comment(commentID, eventID)

primary key(s) → commentID
foreign key(s) → eventID references event

3.20 Animal

animal(animalID, name, isPureBreed, species, familyMembers, age, isSick)

primary key(s) → animalID

3.21 Treatment Request

treatment_request(keeperID, vetID, animalID, status)

primary key(s) → keeperID, vetID, animalID
foreign key(s) → keeperID references keeper
→ vetID references veterinarian
→ animalID references animal

3.22 Schedule Training

schedule_training(keeperID, animalID, trainingDate)

primary key(s) → keeperID, animalID

foreign key(s) → keeperID references keeper

→ animalID references animal

3.23 Kept in

kept_in(animalID, cageID)

primary key(s) → animalID, cageID

foreign key(s) → animalID references animal

→ cageID references cage

3.24 Cage

cage(cageID, capacity, number, animalType)

primary key(s) → cageID

3.25 Regularize Cage Food

regularize_cage_food(cageID, foodAmount)

primary key(s) → cageID

foreign key(s) → cageID references cage

3.26 Assign

assign(keeperID, coordID, cageID)

primary key(s) → keeperID, coordID, cageID

foreign key(s) → keeperID references keeper

→ coordID references coordinator

→ cageID references cage

4.0 Implementation Details and Contributions

We decided to change some components (i.e. backend) of our implementation plan reported in the design report during the final phase. After we went through a couple of ideas for the backend, such as Spring and flask, we decided on the following. We used MySQL Workbench, XAMPP and Intellij IDEA for implementation.

- React.js for the frontend.
- MySQL to implement the database.
- Node.js for the backend.
- Material-UI and React-Bootstrap frameworks.

We have created the tables directly in the MySQL Workbench application and connected to the database through the local host via the mysql module using node.js. One of our most noticeable problems is that the checkboxes in the login and invite veterinarian pages do not appear to be checked off, even though they work. We could not solve this problem. Another problem we have faced was when a user leaves the texts empty in the signup page, there is no error message given. We tried using the features of the React.js to solve this problem and we also tried adding constraints in the database, but we could not solve this problem.

The contribution of each group member to the project is given below. It is important to mention that the contributions are not limited to the list below as we collaboratively implemented the project.

Mehmet Yaylacı - Application system description, UI design, use cases and functionality, relation schema remodification, user manual. ‘Login’, ‘Signup’ and visitors’ pages in UI design for frontend.

Yiğit Erkal - Conceptual design, advanced components, use cases and functionality, relation schema remodification, user manual. Helped with the backend.

Selin Kırmacı - Conceptual design, UI design, user manual. Frontend for the remaining pages, backend and connecting the two.

Selcen Kaya - Application system description, relational schema, implementation details, advanced database components. Database design and helped with backend.

5.0 Advanced Database Components

The advanced database components are given below in categories based on requested explanation levels

5.1 Reports

List All Cages Assigned to a Keeper by Coordinator with ID = 7

```
SELECT *
FROM cage
WHERE cageID IN ( SELECT cageID
                  FROM assign
                  WHERE coordID = 7 );
```

List All Group Tours That Visitor Mehmet Attended

```
SELECT *
FROM group_tour
WHERE groupID IN ( SELECT eventID
                   FROM register_event
                   WHERE visitorID IN
                        ( SELECT visitorID
                          FROM visitor, user
                          WHERE visitorID = userID AND name = “Mehmet”));
```

Events For Tomorrow Which Are Made By Coordinator Ahmet

```
SELECT E.eventID
FROM event E
WHERE E.capacity > 30 and
        date = @current_date + 1 and
        E.coordID = ( SELECT coordID
                      FROM coordinator, employee
                      WHERE coordID = employeeID and employeeID IN
                           ( SELECT userID
                             FROM user, employee 62
```

```
                                         WHERE userID = employeeID AND name = “Ahmet”
                                        ) );
```

5.2 Views

Active Treatment Request

This view helps the veterinarians see the treatment requests made for them by the keepers that they have not responded to yet. It is used in the listTreatementRequests in the veterinarian home page which is for the veterinarians. The SQL query is given below.

```
CREATE view activeTreatmentRequests as
SELECT *
FROM treatment_request
WHERE status = 'pending';
```

5.3 Triggers

- When the event is cancelled, it is removed from all pages that contain that event.
- When the user profile is deleted, all of its complaint forms about events are also deleted.

5.4 Constraints and Secondary Indices

Many constraints are used in the database, mainly the NOT NULL and UNIQUE are used. These constraints prevent database errors based on null values or duplicate values that could arise for certain attributes, such as IDs. Secondary indexes are used in the user table, where the primary key is userID, which is not null, unique and auto incremented. Other attributes email and username are both unique and are used as secondary indices.

6.0 User's Manual

ZooDBMS is a website that helps the visitors of our zoo to have a pleasant experience. It also helps our employees to do their work easier and more efficiently while providing a better communication system among the employees. Since our platform has many functionalities, we have decided to create this manual to help the users of the platform to have a better understanding.

6.1 General

Every user is able to see the page described below.

6.1.1 Login & Sign Up

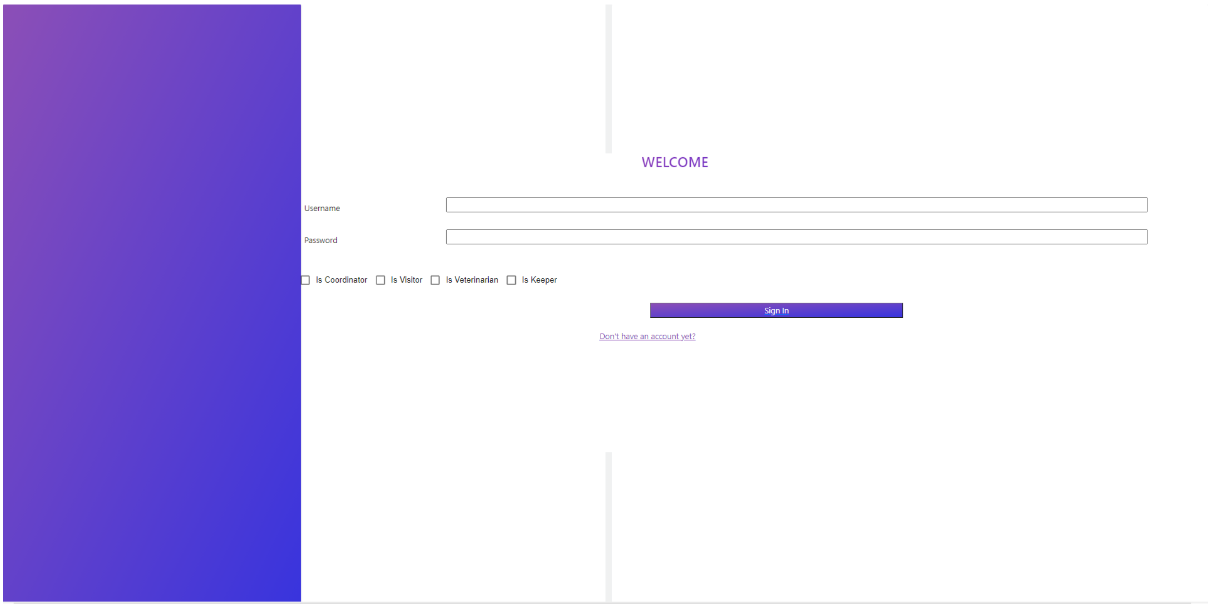


Figure 2: Login page

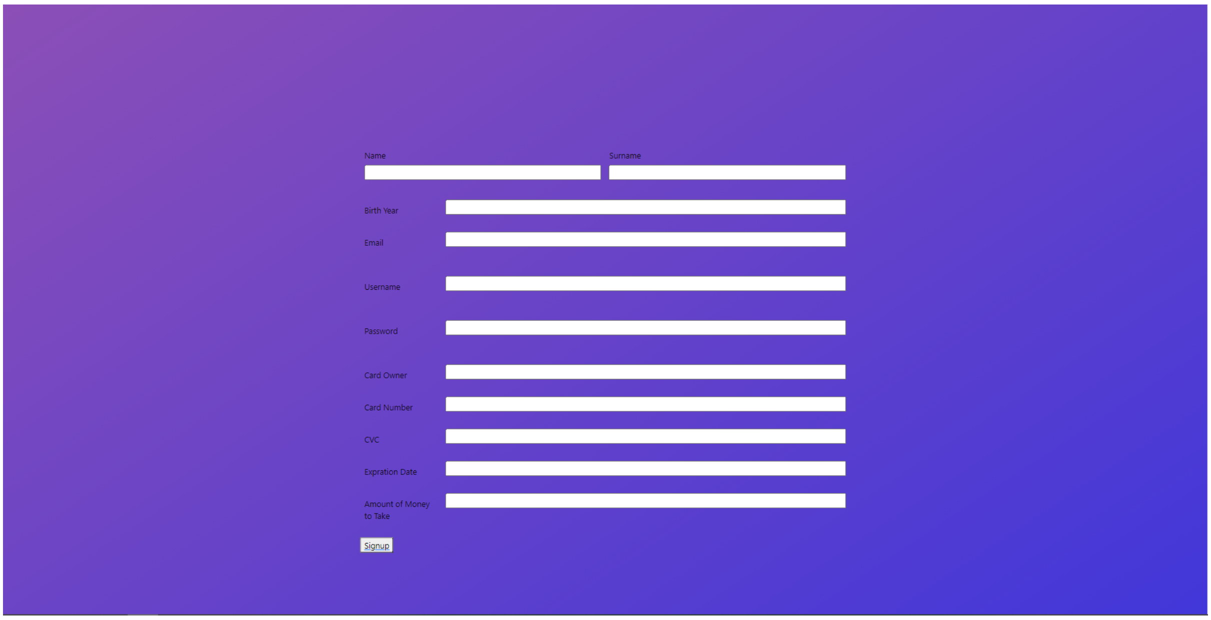


Figure 3: Signup page

Login page is the first page for all the users of the platform. If the visitor does not have an account, they can go to the sign up page and enter their basic information which are name, surname, username, birthday, email, password, amount of money. This page also takes the credit card information from the user. The credit card information is not stored in the database, however some money is taken from the account according to the amount of money the user wants to add to the ZooDBMS system. This functionality is only for creating a visitor account. If a user already has an account they can enter their username and password to login to their account. If the user is an employee they have to check the box to declare that they are an employee. After login in every user will be directed to their homepage according to their authority in the platform.

6.2 Visitor Pages

The visitors are able to see these pages.

6.2.1 Visitor Homepage

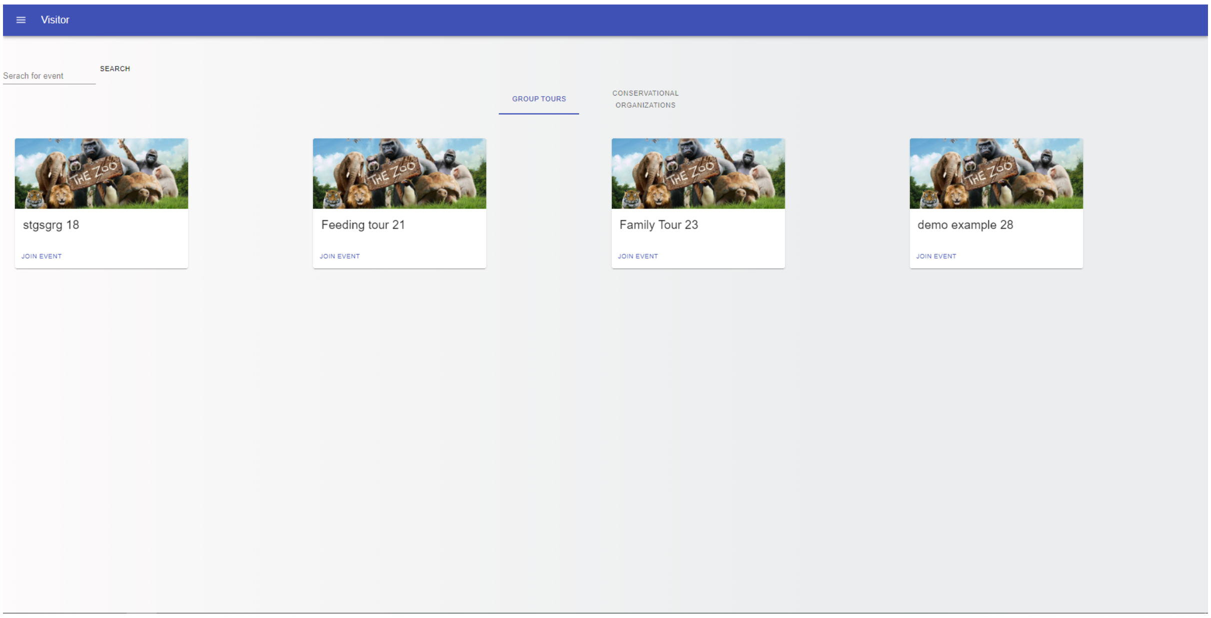
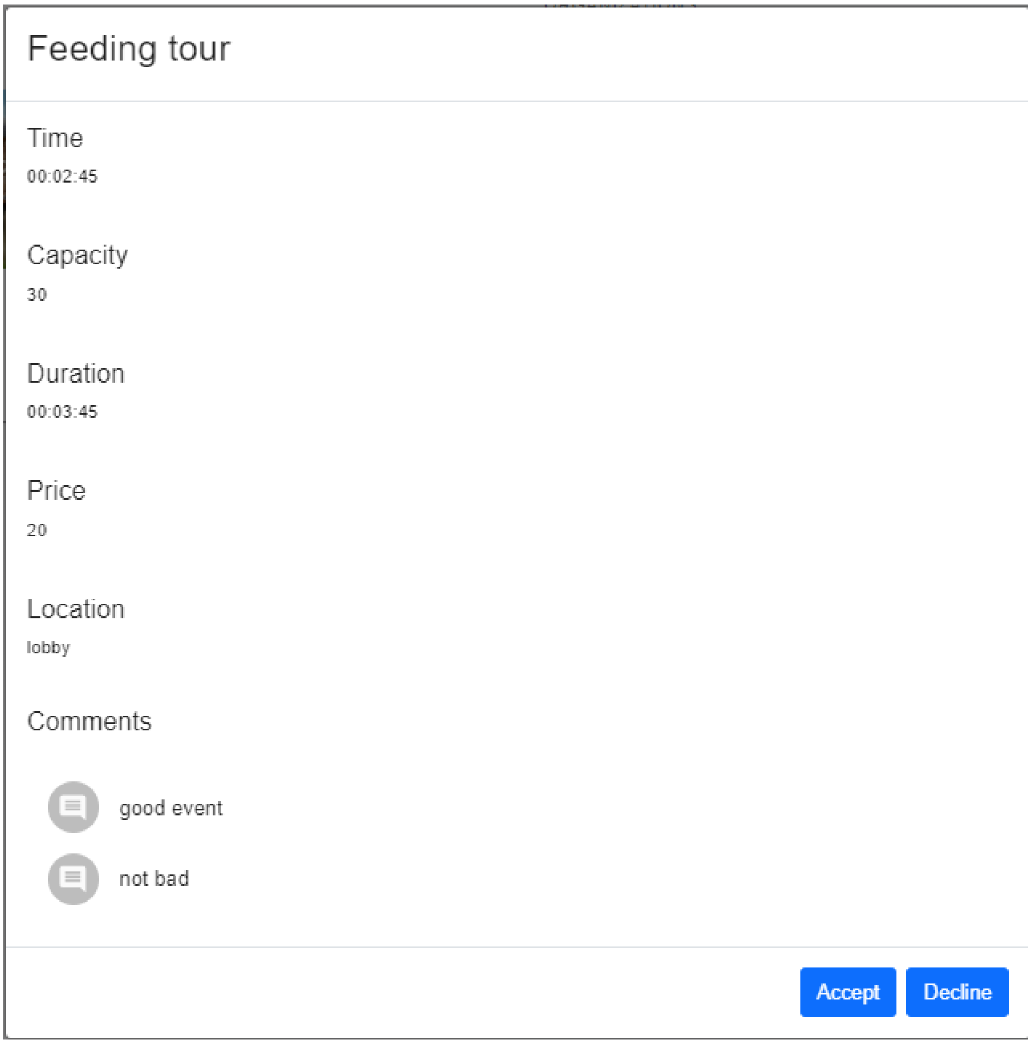


Figure 4: Visitor homepage

Visitors are directed to this page after logging in. This page displays all the events. There is a slider that helps to categorize the event types. In the first part of the slider there are group tours where visitors can register by clicking the register button and opening the event detail modal and in the second part there are conservation organizations where visitors can go to the donation page and make donations. There are three buttons on top of the page which take the user three different pages which are profile, restaurants and gift shop.

6.2.2 Event Detail



Feeding tour

Time

00:02:45

Capacity

30

Duration

00:03:45

Price

20

Location

lobby

Comments

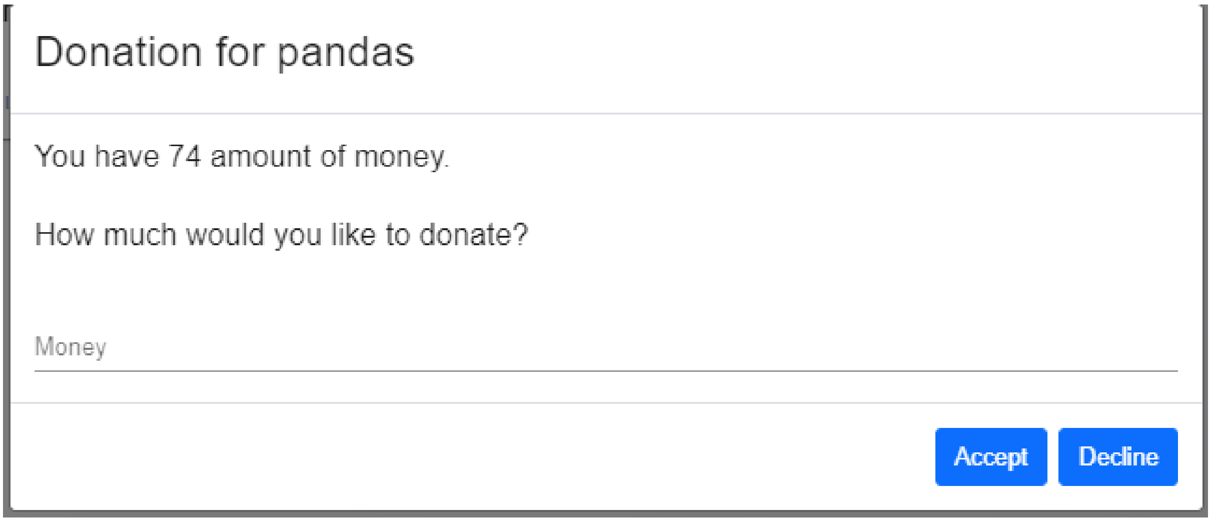
good event

not bad

Figure 5: Event detail page

Here, all details about the event will be displayed such as name, number of participants, price, tour guide, capacity, time, date, duration and location. From here if the visitor wants to register to the event, s/he will click to continue to go to do the payment if they have enough money on the system. If not they will go to the upload money page to load more money to the system.

6.2.3 Donation Page



Donation for pandas

You have 74 amount of money.

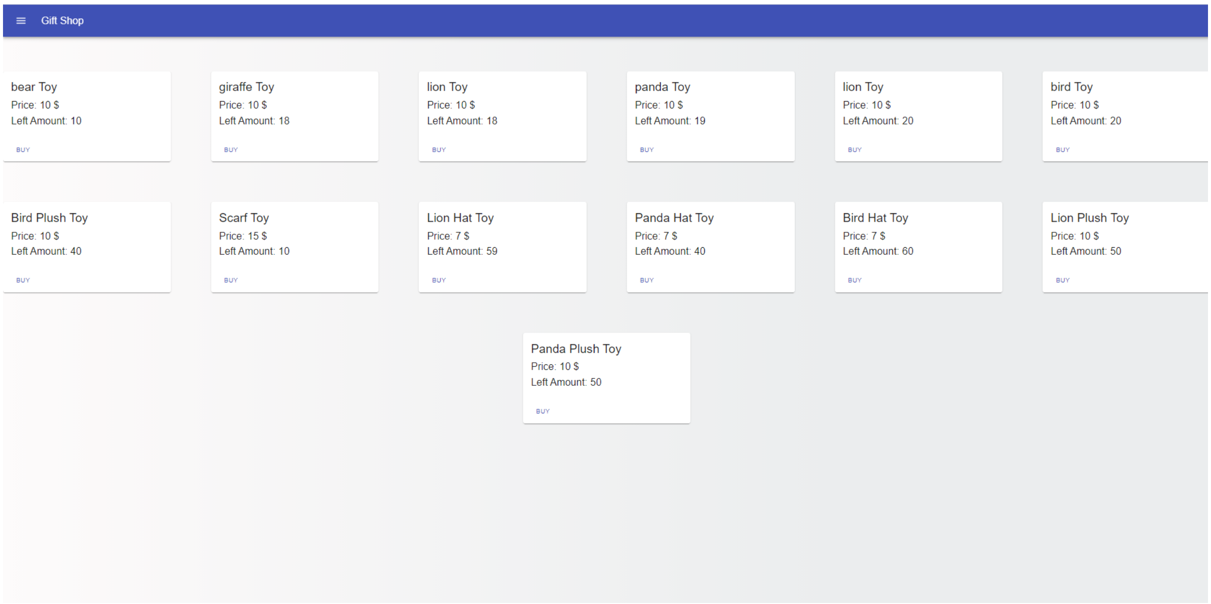
How much would you like to donate?

Money

Figure 6: Donation page

Here, only one entry which is the amount of money that the visitor would like to donate is necessary. S/he will click to continue to make donations if they have enough money on the system. If not they will go to the upload money page to load more money to the system.

6.2.4 Gift Shop Page



bear Toy
Price: 10 $
Left Amount: 10

giraffe Toy
Price: 10 $
Left Amount: 18

lion Toy
Price: 10 $
Left Amount: 18

panda Toy
Price: 10 $
Left Amount: 19

lion Toy
Price: 10 $
Left Amount: 20

bird Toy
Price: 10 $
Left Amount: 20

Bird Plush Toy
Price: 10 $
Left Amount: 40

Scarf Toy
Price: 15 $
Left Amount: 10

Lion Hat Toy
Price: 7 $
Left Amount: 59

Panda Hat Toy
Price: 7 $
Left Amount: 40

Bird Hat Toy
Price: 7 $
Left Amount: 60

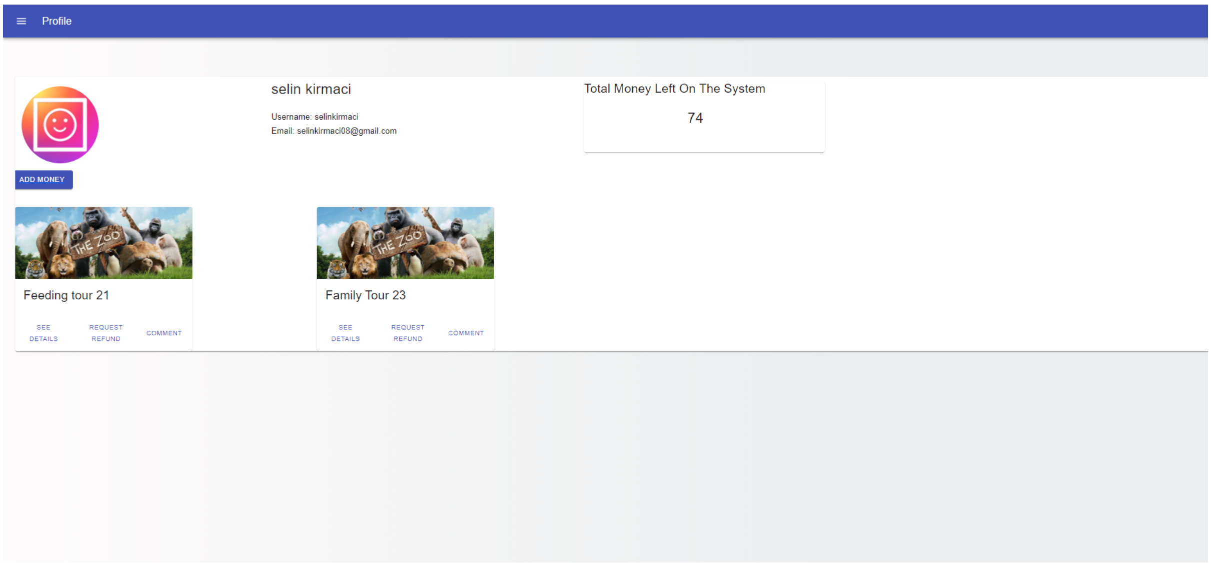
Lion Plush Toy
Price: 10 $
Left Amount: 50

Panda Plush Toy
Price: 10 $
Left Amount: 50

Figure 7: Gift Shop page

All the items of the gift shop are displayed on this page along with the buy button.. S/he will click to buy to purchase if they have enough money on the system. If not they will go to the upload money page to load more money to the system.

6.2.5 Profile Page



selin kirmaci

Username: selinkirmaci
Email: selinkirmaci08@gmail.com

Total Money Left On The System
74

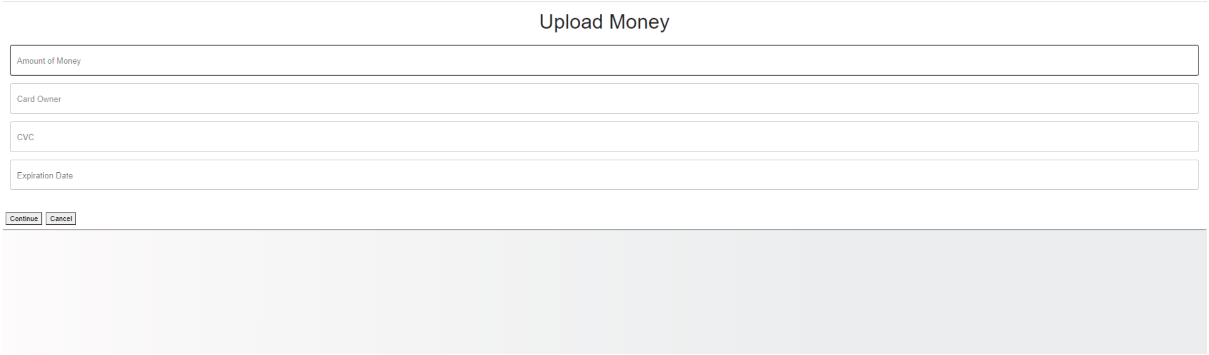
Feeding tour 21

Family Tour 23

Figure 8: Visitor profile page

In this page there is the visitor's information such as name, surname, email and left money on the system. Also, there are all the events that the visitor has already gone to. They can comment or make a complaint about the tour by clicking those buttons and opening the complaint form. There are also registered events that they have not gone to yet. They can cancel and request a refund for those tours by clicking the refund button.

6.2.6 Upload Money Page



Upload Money

Figure 9: Upload money page

If the visitor is lacking money and wants to make a payment they need to load more money to the system. They will enter the amount of money they want to load along with the card information such as card owner name, card number, expiration date and CVC to do the loading.

6.2.7 Complaint Form

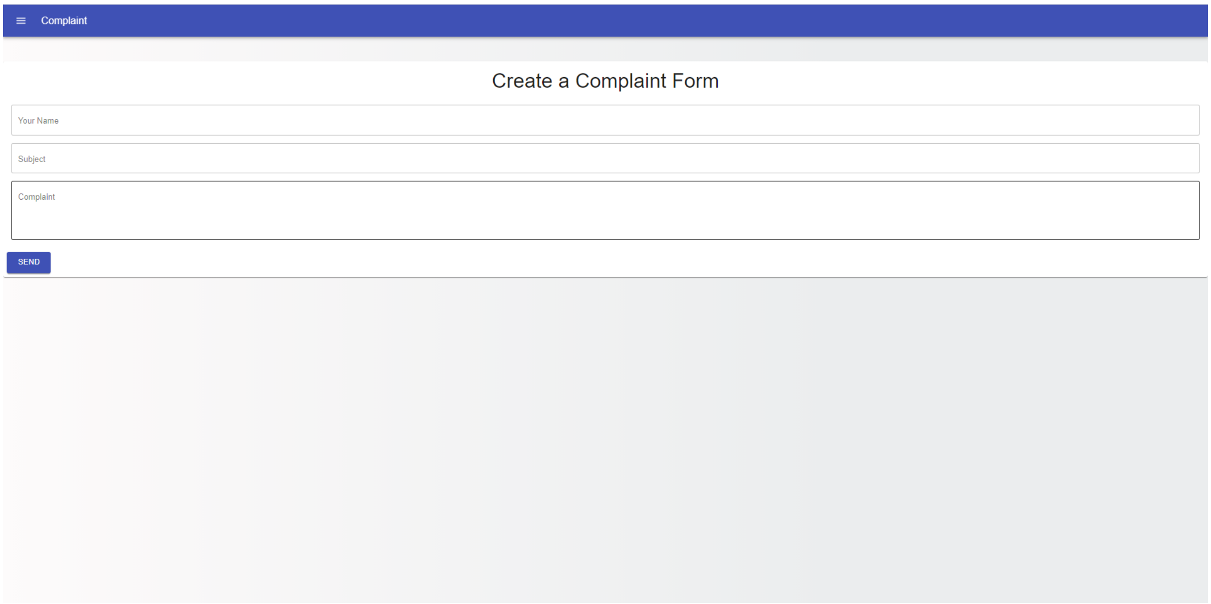


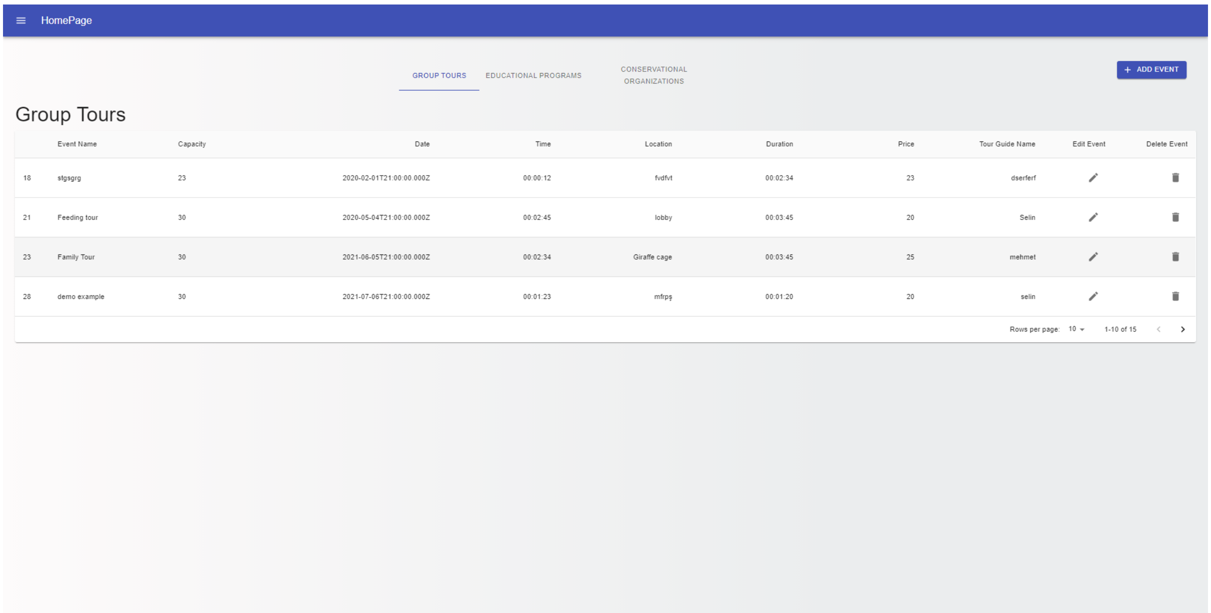
Figure 10: Complaint form page

Here visitors should enter the subject of the complaint and the details of the complaint. by clicking the send button, complaints will be sent to coordinators where they can respond.

6.3 Coordinator Pages

Only coordinators are able to see these pages.

6.3.1 Coordinator Homepage



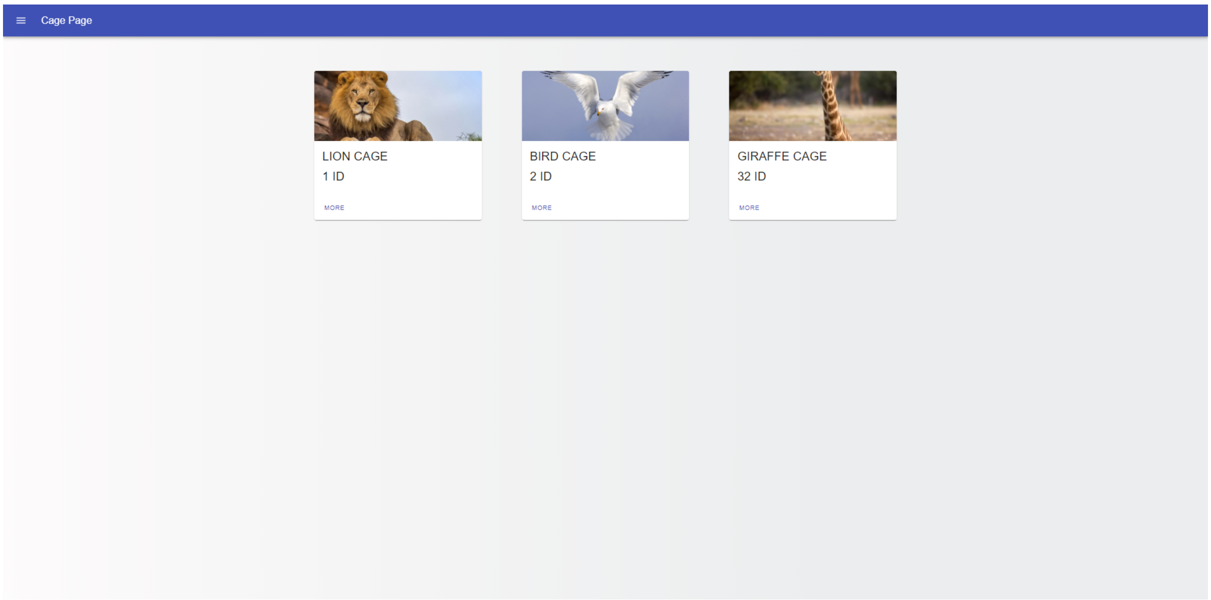
Group Tours

	Event Name	Capacity	Date	Time	Location	Duration	Price	Tour Guide Name	Edit Event	Delete Event
18	stgsgrg	23	2020-02-01T21:00:00.000Z	00:00:12	fvdfvt	00:02:34	23	dserferf	✎	🗑
21	Feeding tour	30	2020-05-04T21:00:00.000Z	00:02:45	lobby	00:03:45	20	Selin	✎	🗑
23	Family Tour	30	2021-06-05T21:00:00.000Z	00:02:34	Giraffe cage	00:03:45	25	mehmet	✎	🗑
28	demo example	30	2021-07-06T21:00:00.000Z	00:01:23	mfrpş	00:01:20	20	selin	✎	🗑

Figure 11: Coordinator homepage

In this page coordinator is able to see all the events in a categorized manner according to their type which can be group tour, educatiınal program and conservation organization. For each type there are different functionalities. For group tours coordinator will be able to display complaints, for educational programs coordinator will be able to invite veterinarians.

6.3.2 Coordinator Cage Page



LION CAGE
1 ID

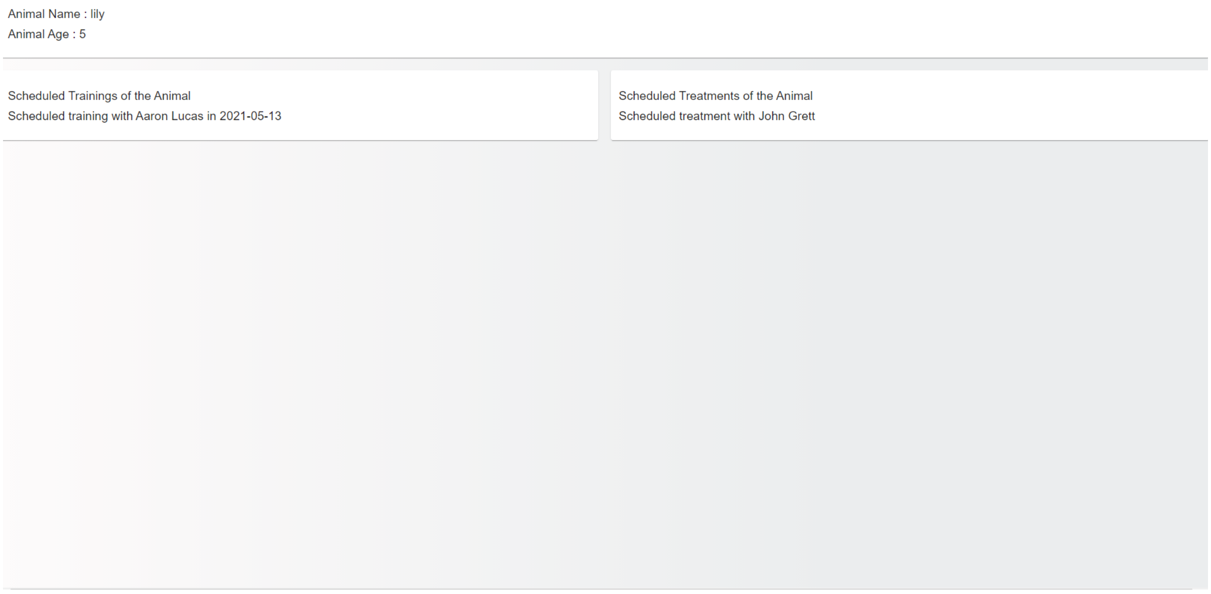
BIRD CAGE
2 ID

GIRAFFE CAGE
32 ID

Figure 12: Coordinator cage page

Coordinator is able to see all the cages currently in the zoo.

6.3.4 Coordinator Animal Information Page



Animal Name : lily
Animal Age : 5

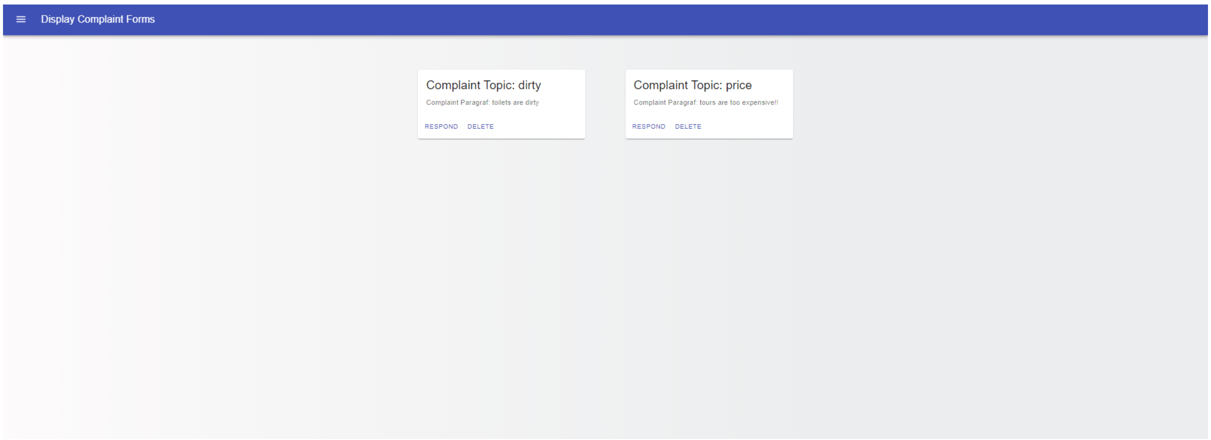
Scheduled Trainings of the Animal
Scheduled training with Aaron Lucas in 2021-05-13

Scheduled Treatments of the Animal
Scheduled treatment with John Grett

Figure 13: Coordinator animal information page

Page displays the information about the selected animal such as name, age and the keeper of the animal on top of the page. On the bottom left all the scheduled training for that animal is shown while on the bottom right all the scheduled treatments for that animal is shown.

6.3.5 Coordinator Complaint Display Page



Complaint Topic: dirty
Complaint Paragraf: toilets are dirty

Complaint Topic: price
Complaint Paragraf: tours are too expensive!!

Figure 14: Coordinator complaint display page

List of all the complaints with a brief explanation is displayed on this page. By clicking respond a modal is displayed with all the information of the complaint and a response text where coordinator can write their response and send it after.

6.3.6 Adding a New Event

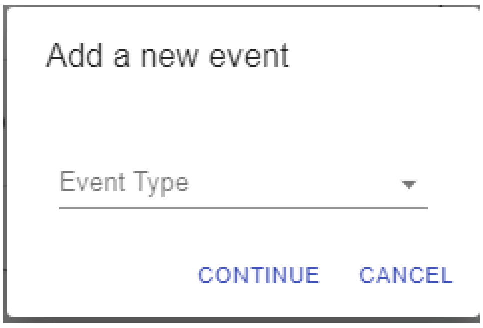
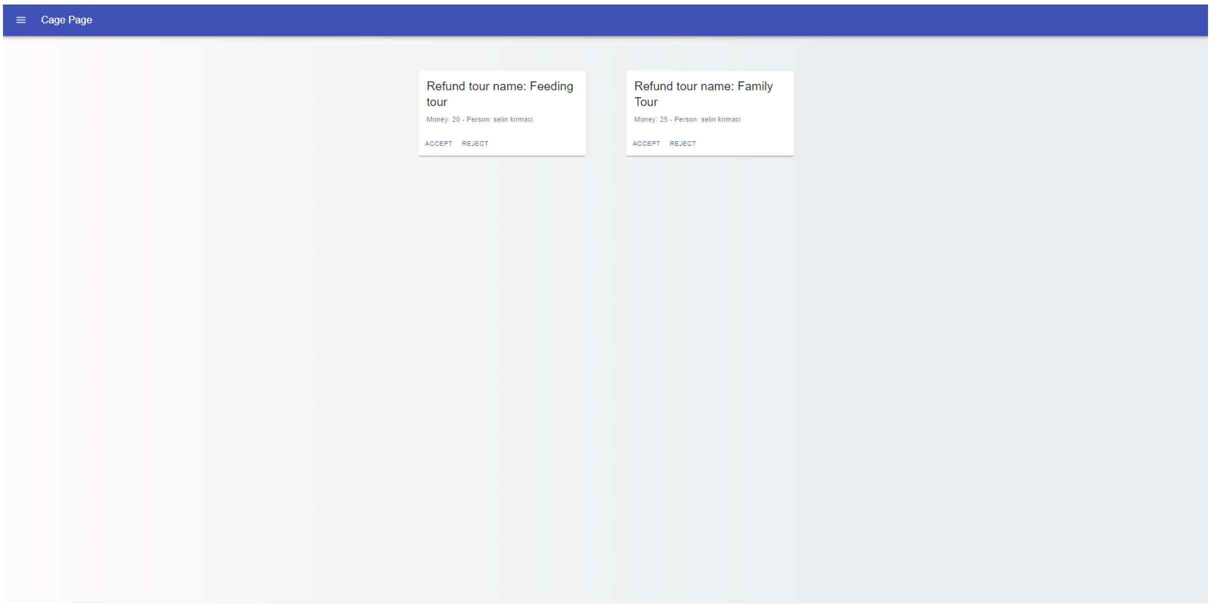


Figure 15: Adding a new event

When the coordinator decides to add a new event system will first ask the type of the event that they would like to add. After choosing the type, information fields suitable for that type are displayed to be filled. Common fields are the name of the event, date, time ,capacity, duration, location. For group tours there are extra fields such as price and tour guide name. For educational programs there are extra fields such as speaker and topic. For conservation organizations there is an extra field which is goal money. After filling all the information, the event is successfully created.

6.3.7 Refund Page



Refund tour name: Feeding tour

Money: 20 - Person: selin kirmaci

Refund tour name: Family Tour

Money: 25 - Person: selin kirmaci

Figure 16: Refund page

In this page all the refund requests will be displayed where the coordinator can reject or accept the request.

6.3.8 Sidebar

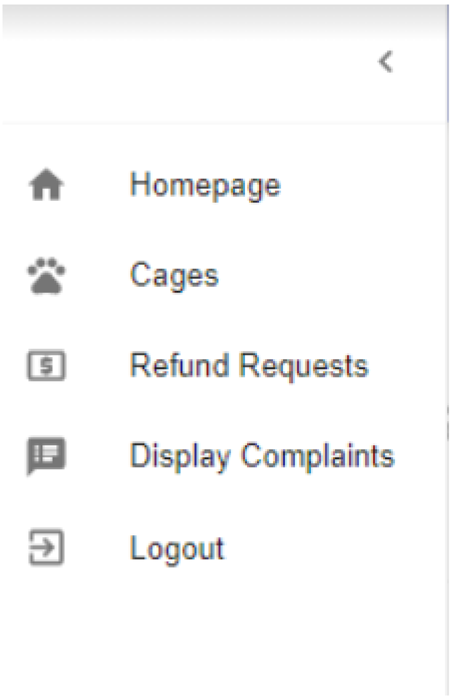


Figure 17: Coordinator sidebar

We have created a sidebar for the coordinator to go among the pages easier and faster. Sidebar allows the coordinator to go to the homepage, cage page and refund requests page.

6.4 Keeper Pages

Only keepers are able to see these pages.

6.4.1 Keeper Homepage

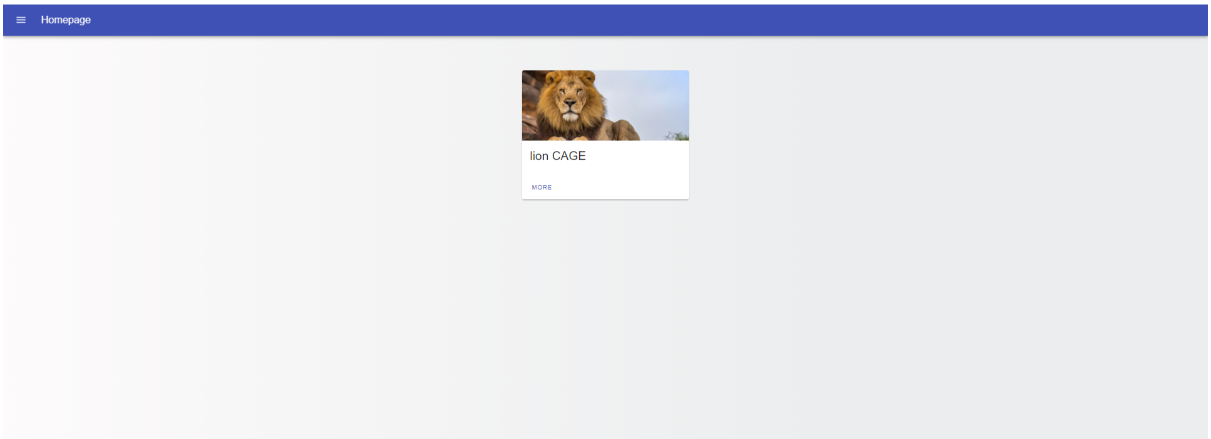
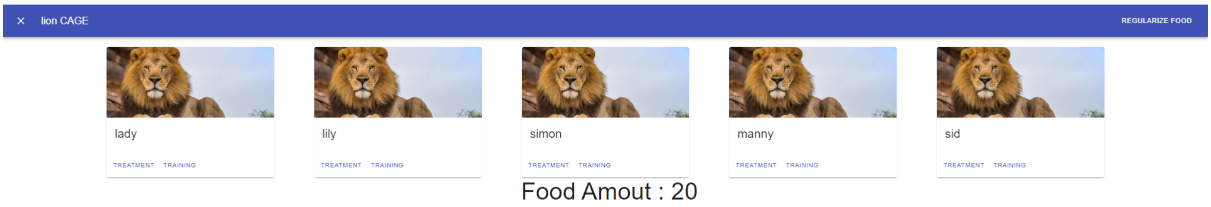


Figure 18: Keeper homepage

All the cages that the keeper is assigned to are displayed on this page. By clicking one of them the keeper will be directed to the cage information page.

6.4.2 Keeper Cage Information Page



Food Amout : 20

Figure 19: Keeper cage information page

All the animals of the selected cage are displayed with two buttons one for scheduling training and one for requesting treatment. Training button will display a modal for the keeper with all the available dates where the keeper can choose and schedule a training for the animal. By clicking the treatment button, a modal with all the veterinarians is displayed where the keeper can choose the veterinarian and send the treatment request to them.

6.4.3 Training Calendar

This page displays all the scheduled trainings of that keeper in a sorted manner starting from the closest.

6.4.4 Regularizing Food

All the animals are displayed with their prefered food next to them. With the slider, the keeper can change the amount of the food that they want to give to the animal.

6.4.5 Sidebar

We put a sidebar so that the keeper can go to the pages easier and faster. Sidebar allows the keeper to go to the homepage and training calendar.

6.5 Veterinarian Pages

Only veterinarians are able to see these pages.

6.5.1 Veterinarian Homepage

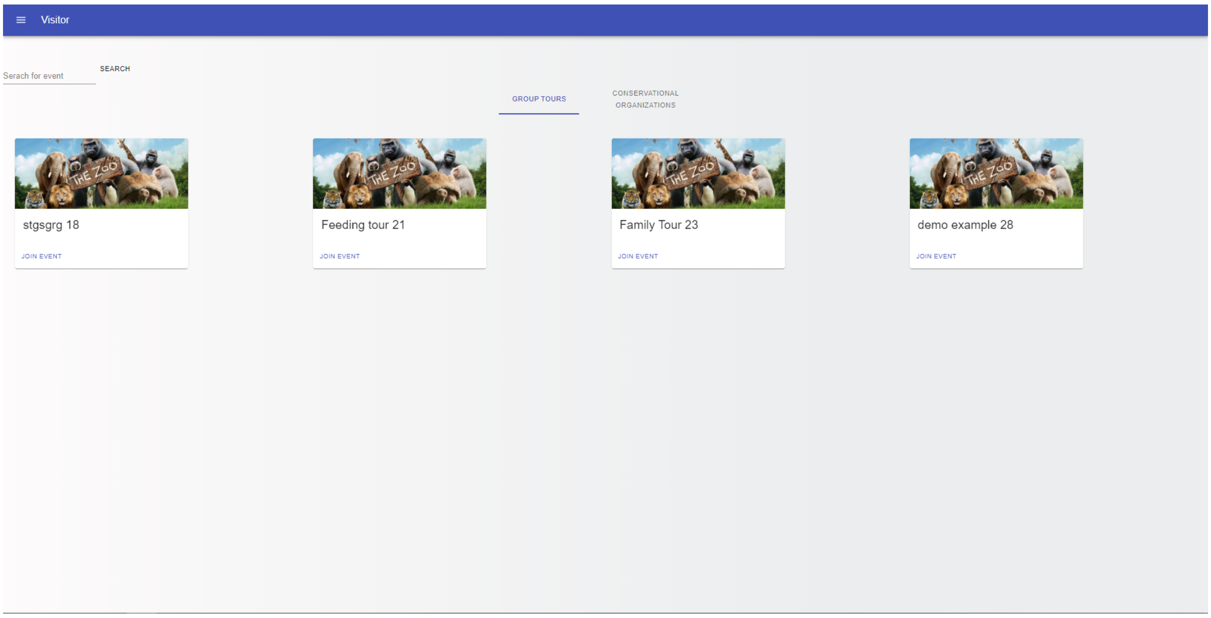
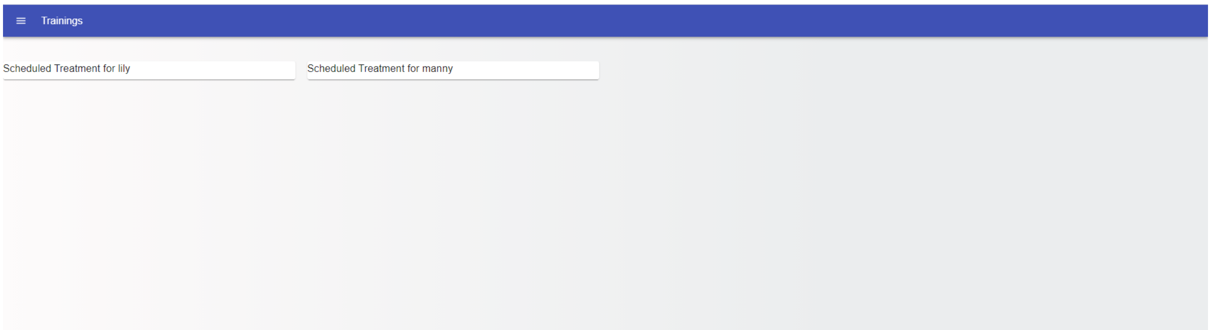


Figure 20: Veterinarian homepage

All the requests for the veterinarian are displayed in these pages in a categorized manner, one category being educational program requests and other being treatment requests. Veterinarians can display each category using the slider displayed at the top of the page. Veterinarians can accept or reject the educational program requests by clicking the accept or reject buttons. If the veterinarian wants to accept and schedule a treatment for an animal, by clicking the schedule treatment button a modal will be displayed where they can enter a date for the treatment.

6.5.2 Overall Treatment Calendar



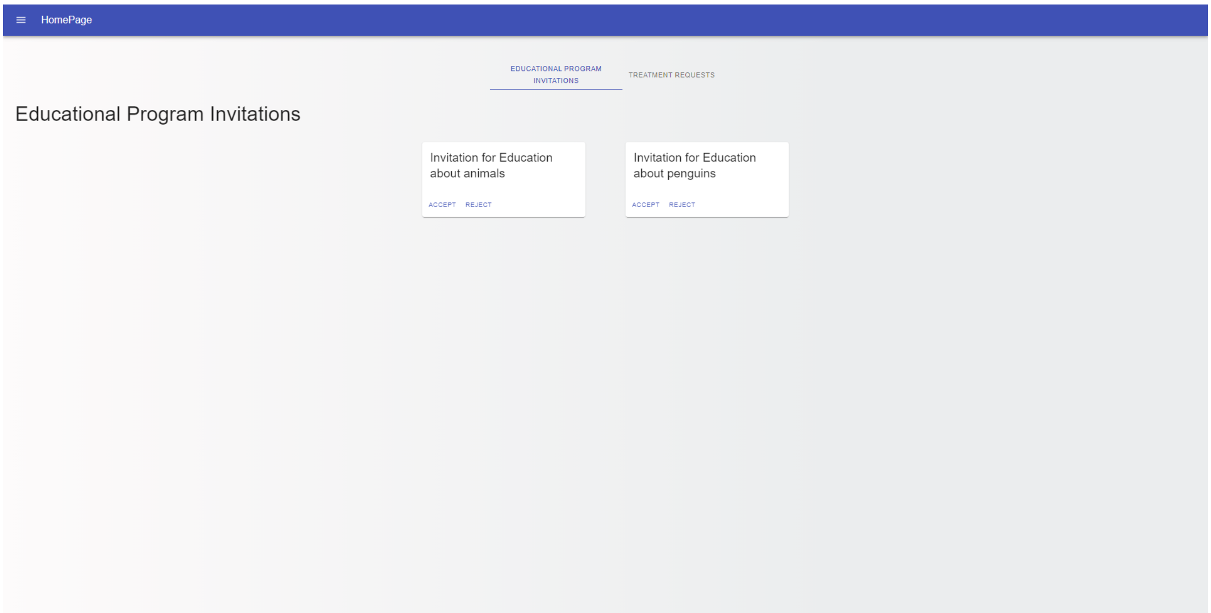
Scheduled Treatment for lily

Scheduled Treatment for manny

Figure 21: Treatment calendar page

Here veterinarians can display all the treatments they need to do in a sorted manner starting from the closest one.

6.5.3 Veterinarian Invitations



Educational Program Invitations

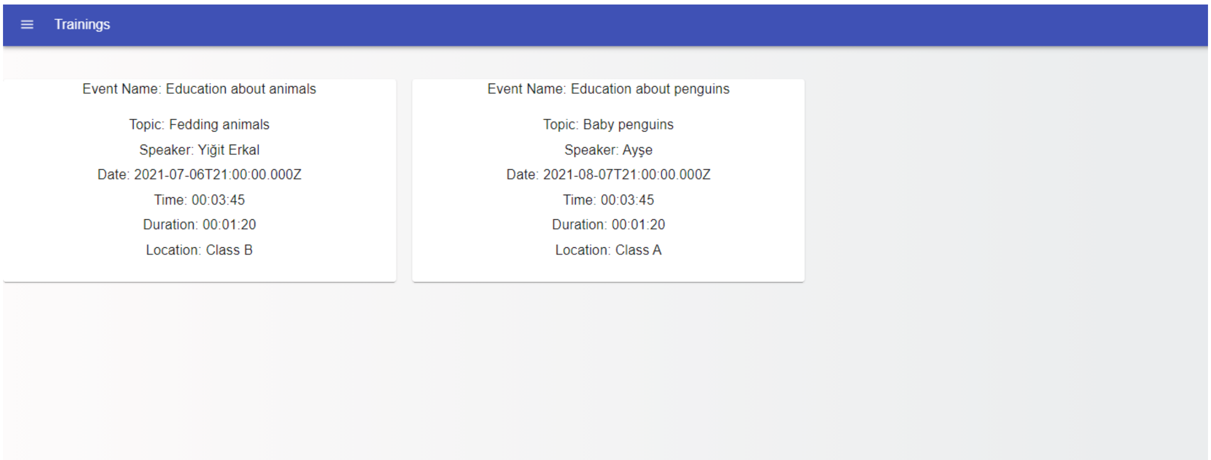
Invitation for Education about animals

Invitation for Education about penguins

Figure 22: Veterinarian invitations page

Here veterinarians can display all the invitations for educational programs. They can accept or reject these invitations.

6.5.4 Veterinarian Agreed Invitations



Event Name: Education about animals

Topic: Fedding animals
Speaker: Yiğit Erkal
Date: 2021-07-06T21:00:00.000Z
Time: 00:03:45
Duration: 00:01:20
Location: Class B

Event Name: Education about penguins

Topic: Baby penguins
Speaker: Ayşe
Date: 2021-08-07T21:00:00.000Z
Time: 00:03:45
Duration: 00:01:20
Location: Class A

Figure 23: Veterinarian agreed invitations page

Here veterinarians can display all the accepted invitations.

6.5.5 Sidebar

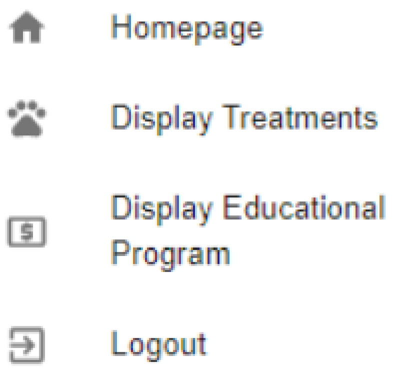


Figure 24: Veterinarian sidebar

We put a sidebar so that the veterinarians can go to the pages easier and faster. Sidebar allows the veterinarian to go to the homepage or display agreed educational programs or treatments.