DONOR MANAGEMENT SYSTEM
DATA STRUCTURES AND ALGORITHMS

DONE BY:

SRI SHESHAADHRI

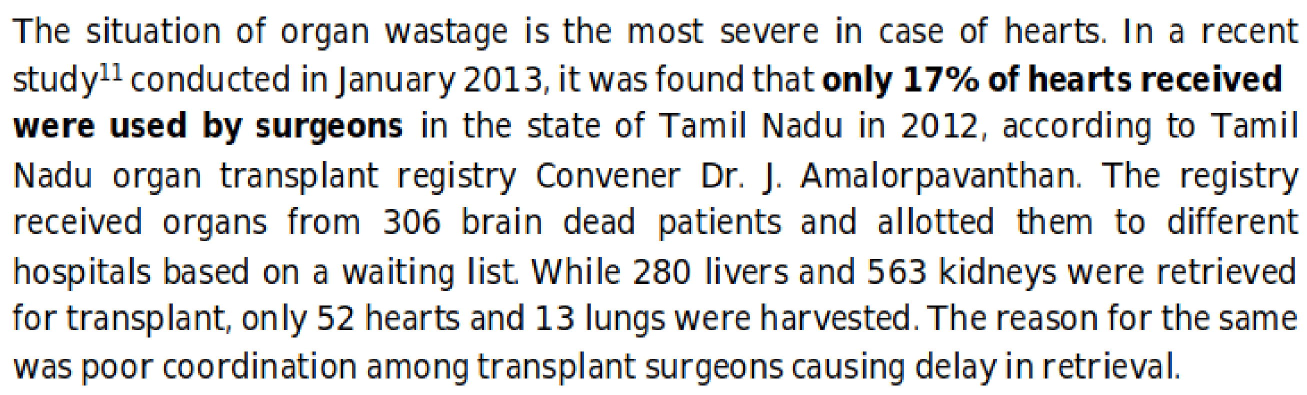
Title: Donor Management System

Problem Statement:

Organ transplantation is a medical procedure in which an organ is removed from one body and placed in the body of a recipient to replace a damaged or missing organ. The donor and recipient may be at the exact location, or organs may be transported from a donor site to another location.

Organ Donation and Procurement Organizations are pivotal in today's medical institutions. Such organisations are responsible for evaluating and procuring organs for organ transplantation. These organisations represent the front line of organ procurement, having direct contact with the hospital and the family of a recently deceaseddonor. The work of such organisations includes identifying the best candidates for the available organs and coordinating with the medical institutions to decide on each organ recipient. They are also responsible for educating the public to increase awareness ofand participation in the organ donation process. Also, it keeps track of all transplantation operations carried out to date.

The Donor Management System is a database management system that uses database technology to construct, maintain and manipulatevarious kinds of data about a person's donation or procurement of a particular organ. It keeps a comprehensive medical history and other critical information like blood group, age, etc, of every person in the database design. In short, it maintains a database containing statistical information regarding the network of organ donation and procurement in different countries.


The situation of organ wastage is the most severe in case of hearts. In a recent study[11] conducted in January 2013, it was found that **only 17% of hearts received were used by surgeons** in the state of Tamil Nadu in 2012, according to Tamil Nadu organ transplant registry Convener Dr. J. Amalorpavanthan. The registry received organs from 306 brain dead patients and allotted them to different hospitals based on a waiting list. While 280 livers and 563 kidneys were retrieved for transplant, only 52 hearts and 13 lungs were harvested. The reason for the same was poor coordination among transplant surgeons causing delay in retrieval.

*Analysis by https://www.organindia.org

Organ Wastage is a significant issue that can only be solved by having a proper database of allPatient and Donors in a well-formed way, that can be processed efficiently.

Records of donors and patients are created when a person donates or procures an organ from a Medical Institution. Records may include the following information:-

1. Personal Information
2. Medical History
3. Medical insurance, if any
4. Allergies to any medicine, if any
5. The need for an organ presently
6. Medical Insurance provided by any private or government insurers.
7. Address

This record serves various purposes and is critical to the proper functioning of Organ Donation and Procurement Network, especially in today's complicated health care environment. These records provide statistical information regarding the number of organs needed and available at a particular time. It is essential for planning, evaluating and coordinating organ donation and procurement.
In India, the Transplantation of organs is done according to the Transplantation of Human Organs (THO) Act,1994. Later on, many new rules had been added to the act to cater to current needs. According to this Act, the Government Organization should approve every transplantation operation. So, the records of transplantation are there with the organisation. Also, these operations can only be done in Government-authorized Hospitals.

Our aim is to create a solution that effectively deals with the problems of finding donors andalso provide Statistical data of the transplants that can help the government to form better rules and regulations.

Basic Statistics :

Year	Transplants	Donors	Waiting list
2017	34770	16473	115759
2018	36529	17554	113759

*Statistical data from www.organdonor.gov

Basic Steps in Implementation:

- Every user has an account that can only be registered by a government-certified hospital, which will keep all the information as defined in the Problem Statement.

- Only Hospitals are eligible to request a donation or procurement transaction.
- Government organisations will watch the pairing of donors and Patients and can approve a transplantation operation if all the rules are satisfied.
- Collecting Statistical Data through the history of Transplantation Transactions.

Technologies Used:

- MYSQL
- HTML
- CSS
- Python
- Flask

ER Analysis: Identifying Entity Sets and Relationship Sets:

Entity Sets:

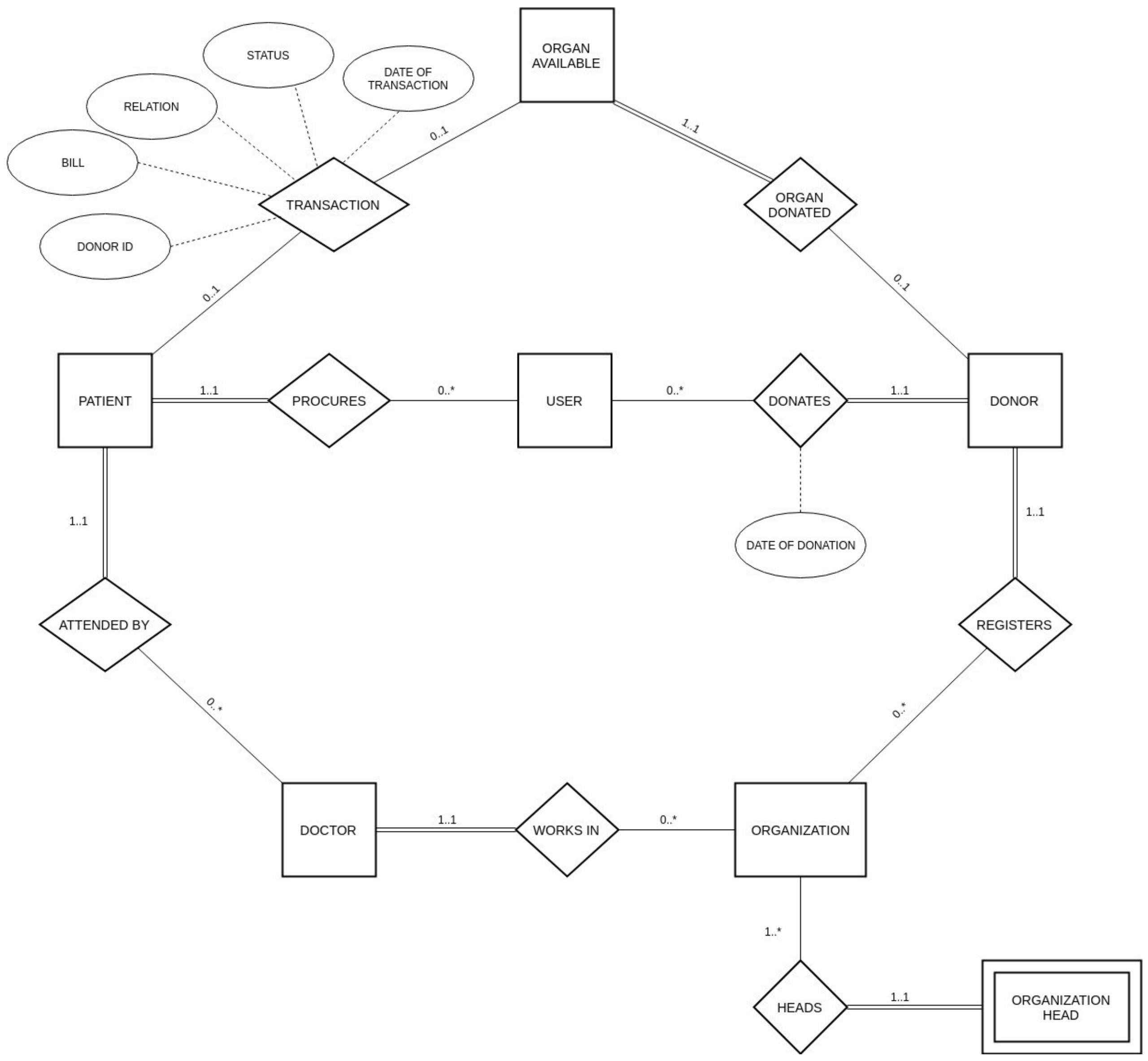
1. **User**
    1. User ID
    2. Name
    3. Date of birth
    4. Phone Number (multi-valued)
    5. Medical Insurance
    6. Medical History
    7. Address
2. **Patient**
    1. Patient_ID
    2. Organ Required
    3. Reason of procurement
    4. User_ID (foreign key)
3. **Donor**
    1. Donor_ID
    2. Organ Donated
    3. Reason for donation
    4. User_ID (foreign key)
4. **Organ Available**
    1. Organ_ID
    2. Organ Name
    3. Donor_ID (foreign key)
5. **Organization**
    1. Organization ID
    2. Organization Name
    3. Location
    4. Government-approved organization or not
    5. Phone Number (multi-valued)
6. **Doctor**

    1. Doctor_ID
    2. Doctor_Name
    3. Phone_Number (multi-valued)
7. **Organization Head**
    1. Head Name
    2. Date of Joining
    3. Term Length

Relationship Sets:

1. **Donates –** The act of donation of an organ from a donor
    1. Date – Date of donation
2. **Procures -** The act of procuring an organ by the patient
3. **Transaction**
    1. Date of transaction
    2. Status – whether the surgery was successful or not
4. **Organ Donated -**The organ donated by a donor, which is then stored in the Organ_availabletable.
5. **Attended By -**The transplantation performed by a doctor – procuring an organ from a donorand transplanting it to the patient by surgery.
6. **Registers -** Donor is registered in which organisation
7. **Works in –** The organisation where the doctor works.
8. **Headed By –** The organisation is headed by which person

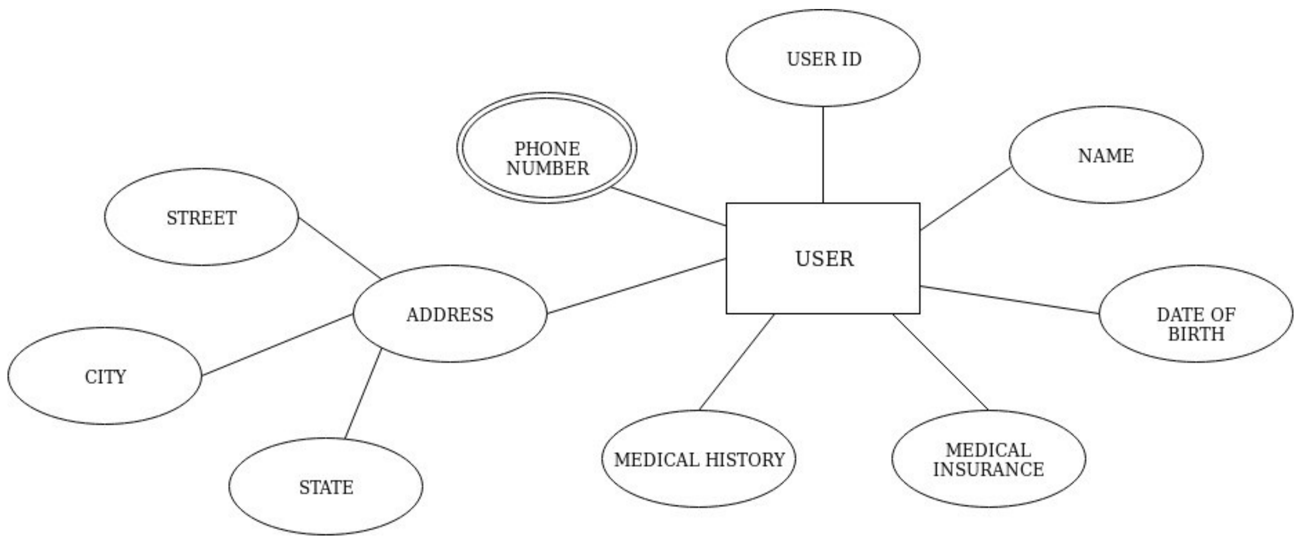
ER DIAGRAM



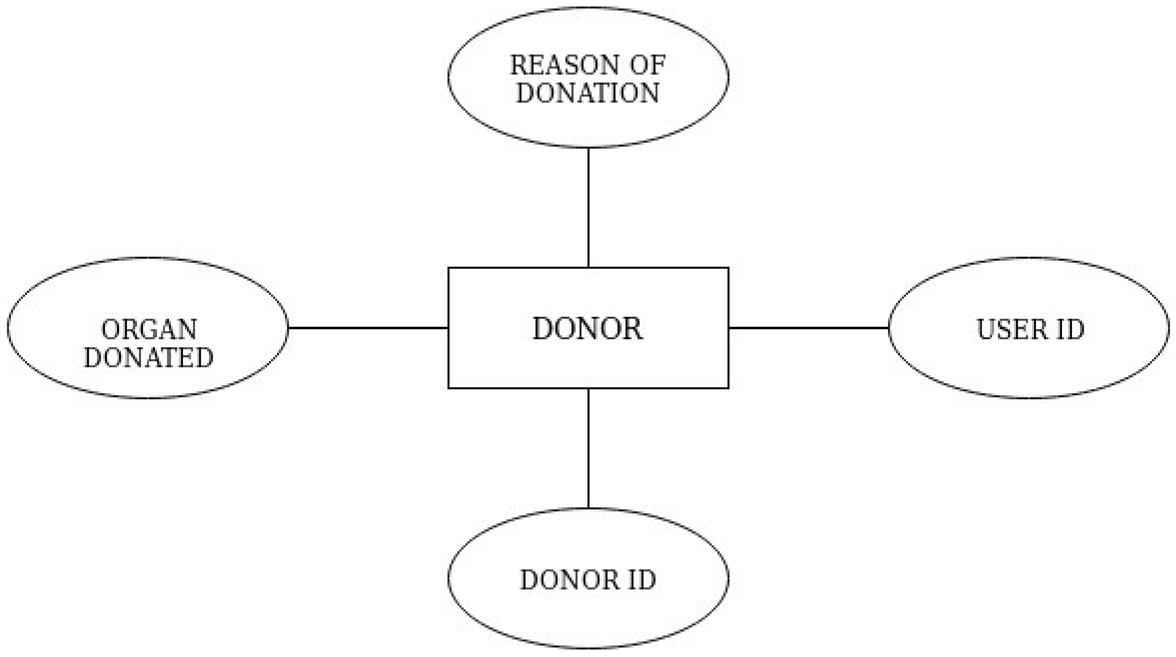
STATUS
DATE OF TRANSACTION
ORGAN AVAILABLE
RELATION
BILL
TRANSACTION
DONOR ID
0..1
1..1
ORGAN DONATED
0..1
0..1
PATIENT
1..1
PROCURES
0..*
USER
0..*
DONATES
1..1
DONOR
DATE OF DONATION
1..1
1..1
ATTENDED BY
REGISTERS
0..*
0..*
DOCTOR
1..1
WORKS IN
0..*
ORGANIZATION
1..*
HEADS
1..1
ORGANIZATION HEAD

Entity Sets

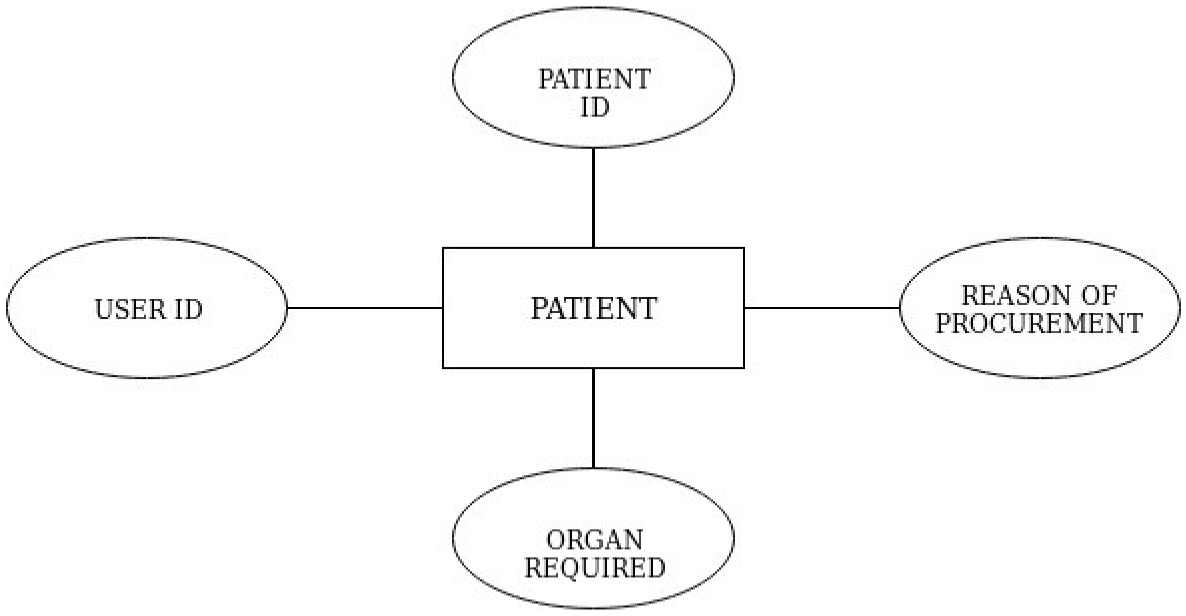
1) User -



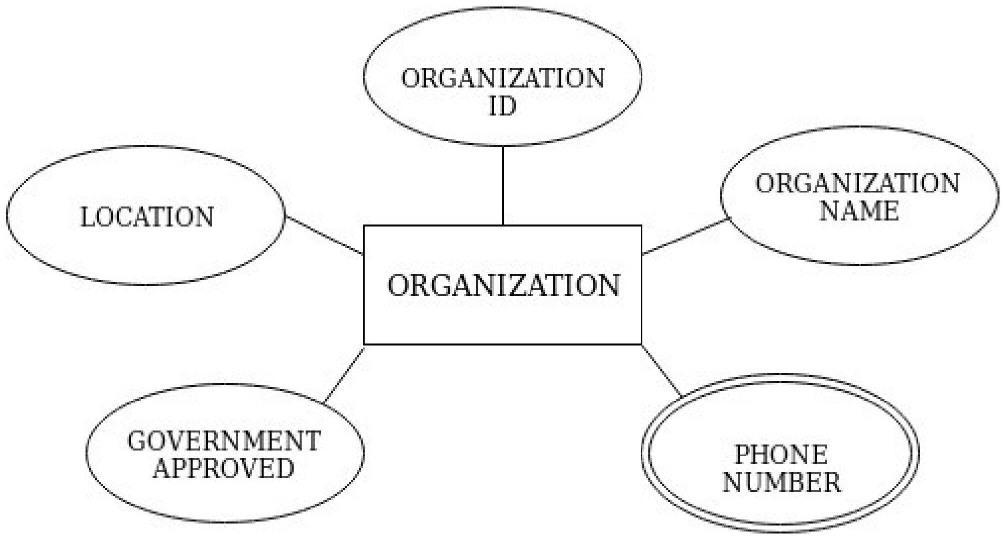
2) Donor



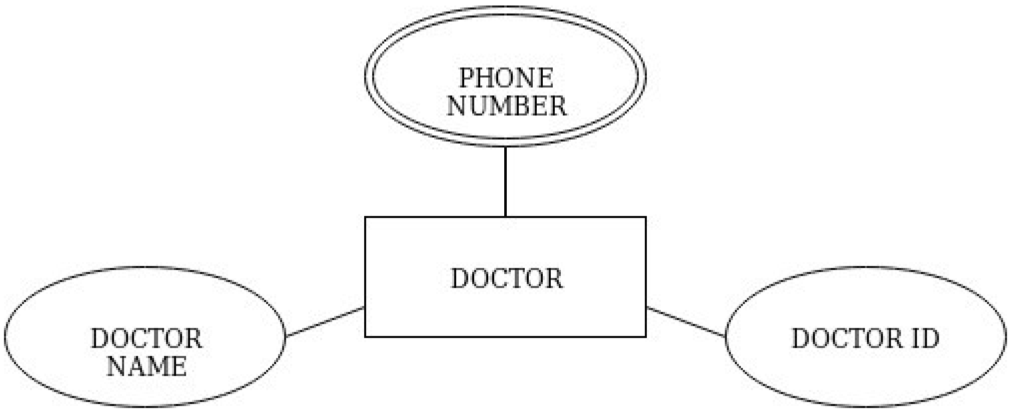
3) Patient



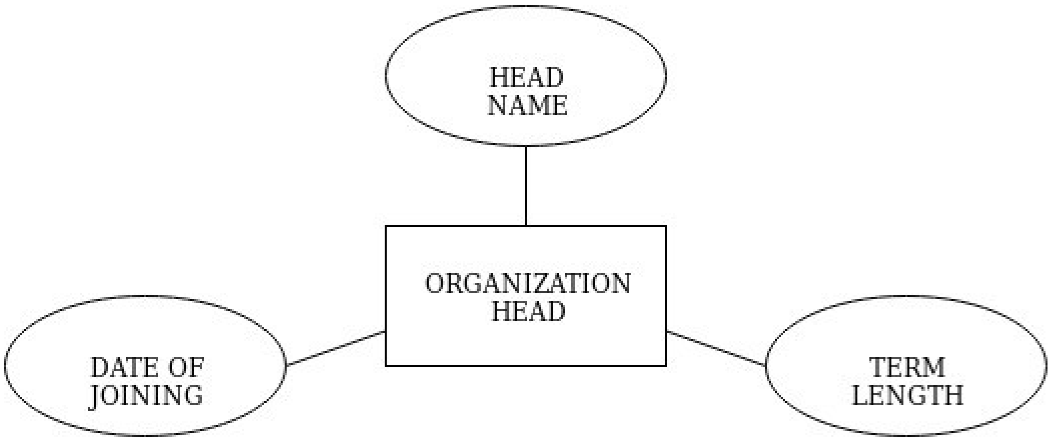
4) Organization



6) Doctor



7) Organization Head



Tables and their Functional Dependencies:-

1) User(<u>User_ID</u>, Name, Date _of_birth, Medical_Insurance, Medical_History, Street, City, State)

FD={User_ID → Name, Date _of_birth, Medical Insurance, Medical History, Street, City, State**}**

2) User_phone_no(<u>User_ID</u>, phone_no)

FD={User_ID -> phone_no**}**

{User_ID**}** is a foreign key constraint

3) Patient(<u>Patient_ID, organ_req</u>, reason_of_procurement, Doctor_ID, User_ID)

FD={Patient_ID, organ_req -> reason_of_procurement, Doctor_ID, User_ID**}**

{User_ID, Doctor_ID} are foreign key constraints

4) Donor(<u>Donor_ID, organ_donated</u>, reason_of_donation, Organization_ID, User_ID)

FD={Donor_ID, organ_donated -> reason_of_donation, Organization_ID, User_ID**}**

{User_ID, Organization_ID**}** are foreign key constraints

5) Organ Available(<u>Organ_ID</u>,Organ_name, Donor_ID)

FD={Organ_ID -> Organ_name,Donor_ID**}**

{Donor_ID**}** is a foreign key constraint

6) Transaction(<u>Patient_ID, Organ_ID,</u> Donor_ID, Date_of_transaction, Status)

FD={Patient_ID, Organ_ID -> Donor_ID,Date_of_transaction, Status}

{Patient_ID, Donor_ID} are foreign key constraints

7) Organization(Organization_ID, Organization_name, Location, Government_approved)

FD={Organization_ID -> Organization_name, Location, Government_approved**}**

8) Organization_phone_no(Organization_ID, phone_no)

FD={Organization_ID -> phone_no**}**

{Organization_ID**}** are foreign key constraints

9) Doctor(Doctor_ID, Doctor_name, Department_name, Organization_id)

FD={Doctor_ID -> Doctor_name, Organization_id**}**

{Organization_ID**}** is a foreign key constraint

10) Doctor_phone_no(Doctor_ID, phone_no)

FD={Doctor_ID -> phone_no**}**

{Doctor_ID} is a foreign key constraint

11) Organization_head(Organization_ID, Employee_ID, Name, Date_of_joining, Term_length)

FD={Organization_ID, Employee_ID -> Name, Date_of_joining, Term_length**}**

Triggers

The following triggers are added to create a log of actions done on the database. The logsare added to the log table.

1) Trigger for adding Donor information to the Log table.

```
delimiter //
create trigger ADD_DONOR_LOG
after insert
on Donor
for each row,
begin
insert into log values
(now(), concat("Inserted new Donor",
cast(new.Donor_Id as char)));
end //
delimiter ;
```

2) Trigger for adding “Update” action information in the Log table.

```
create trigger UPD_DONOR_LOG
after update
on Donor
for each row
begin
insert into log values
(now(), concat("Updated Donor Details",
cast(new.Donor_Id as char)));
end //
delimiter ;
```

3) Trigger for adding “Delete” action information in Log table.

```
create trigger DEL_DONOR_LOG
after delete
on Donor
for each row
begin
insert into log values
(now(), concat("Deleted Donor ",
cast(old.Donor_Id as char)));
end //
delimiter ;
```

4) Trigger for adding “Add patient” action information in Log table

```
create trigger ADD_PATIENT_LOG
after insert
on Patient
for each row
begin
insert into log values
(now(), concat("Inserted new Patient
", cast(new.Patient_Id as char)));
end //
delimiter ;
```

5) Trigger for adding “Update information” action information in Log table

```
create trigger UPD_PATIENT_LOG
after update
on Patient
for each row
begin
insert into log values
(now(), concat("Updated Patient Details
", cast(new.Patient_Id as char)));
end //
delimiter ;
```

6) Trigger for adding “Delete information” action information in Log table

```
create trigger DEL_PATIENT_LOG
after delete
on Donor
for each row
begin
insert into log values
(now(), concat("Deleted Patient ",
cast(old.Donor_Id as char)));
end //
delimiter ;
```

7) Trigger for adding “Add transaction” action information in Log table

```
create trigger ADD_TRASACTION_LOG
after insert
on Transaction
for each row
begin
insert into log values
(now(), concat("Added Transaction ::
Patient ID : ", cast(new.Patient_ID as
char), "; Donor ID :
" ,cast(new.Donor_ID as char)));
end //
delimiter ;
```

Transactions

1) Whenever a donor is added to the Donor Table, a corresponding organ must be added to the Organ_available table. So the two insert commands must be atomic. We have created the following transcation for this purpose

```
-- 1. start a new transaction
START TRANSACTION;

-- 2. insert into Donor table
INSERT INTO Donor values ( _ , _ , _ , _ , _ );

-- 3. insert into Organ_available table
INSERT INTO Organ_available ( _ , _ );

-- 4. commit changes
COMMIT;
```

2) Whenever a transaction takes place, the record corresponding to that Organ_ID must be deleted from Organ_available table. So the insert and delete commands must be atomic. We have created the following transaction for this purpose.

```
-- 1. start a new transaction
START TRANSACTION;

-- 2. insert into Donor table
INSERT INTO Transaction values ( _ , _ , _ , _ ,
_ );

-- 3. delete from Organ_available table
DELETE FROM Organ_available where Organ_ID = _;

-- 4. commit changes
COMMIT;
```

Procedure to run

Procedure to run on your computer:

The Project Uses:

1. MySql version 8
2. HTML 5
3. Python
4. Flask Framework
5. CSS
6. Bootsrap
7. Javascript

Steps to run:

Step 1. Making the database:
Import create_tables.sql to create the database

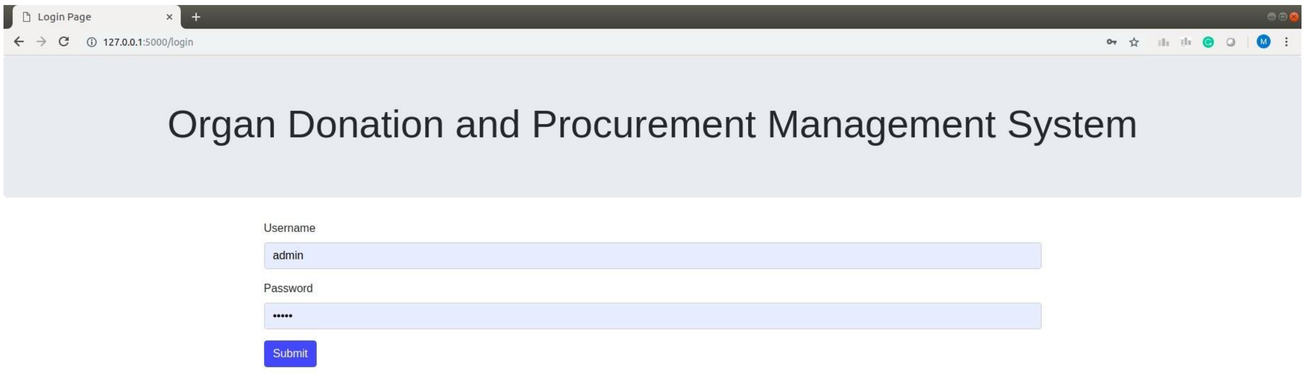
Step 2. Make sure to change the password in main.py to your MySQL password.

Step 3. Run main.py.

Step 4. Go to localhost:/5000 on browser.

Screenshots

1) Login Page



Login Page

127.0.0.1:5000/login

Organ Donation and Procurement Management System

Username

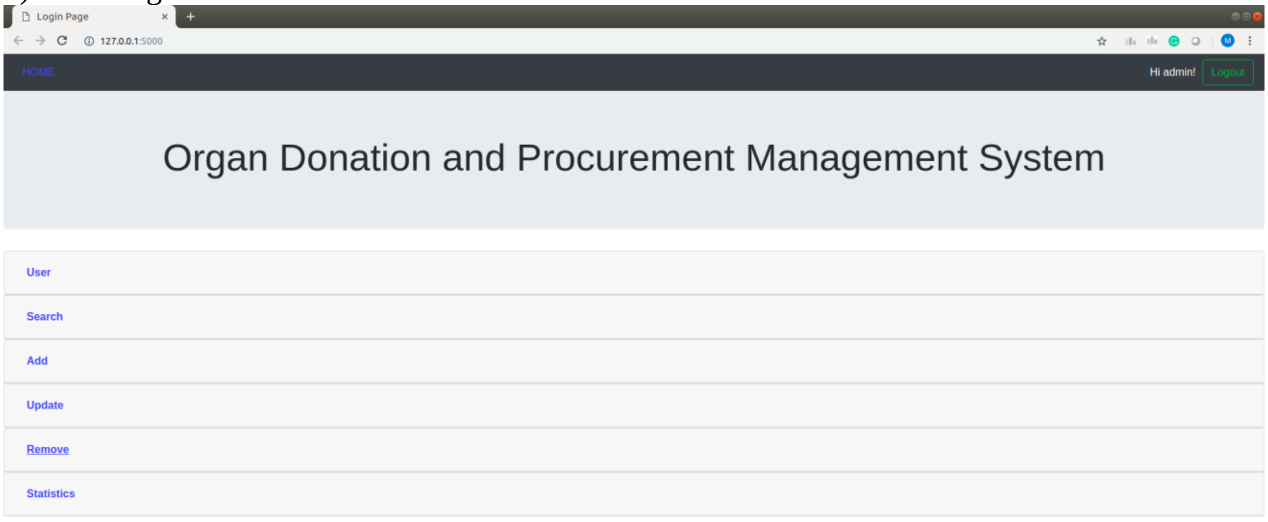
admin

Password

•••••

Submit

2) Main Page – GUI



Login Page

127.0.0.1:5000

HOME

Hi admin! Logout

Organ Donation and Procurement Management System

User

Search

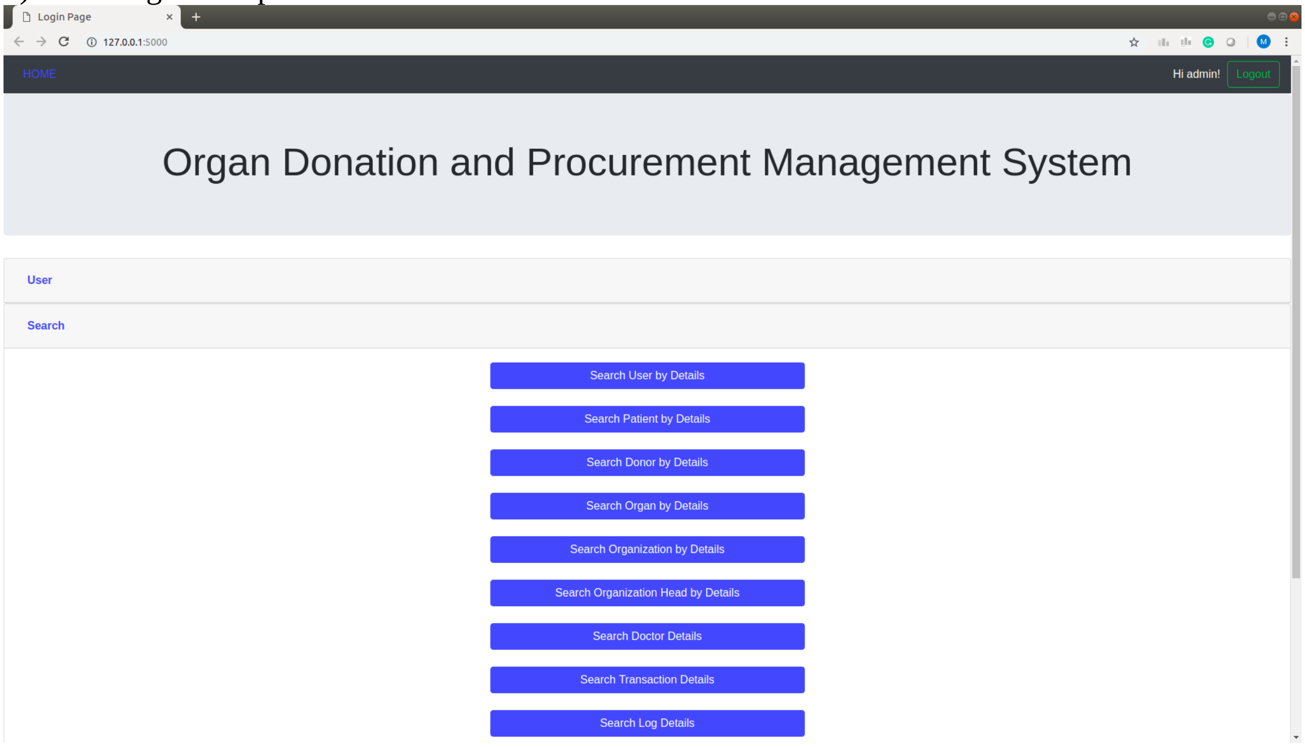
Add

Update

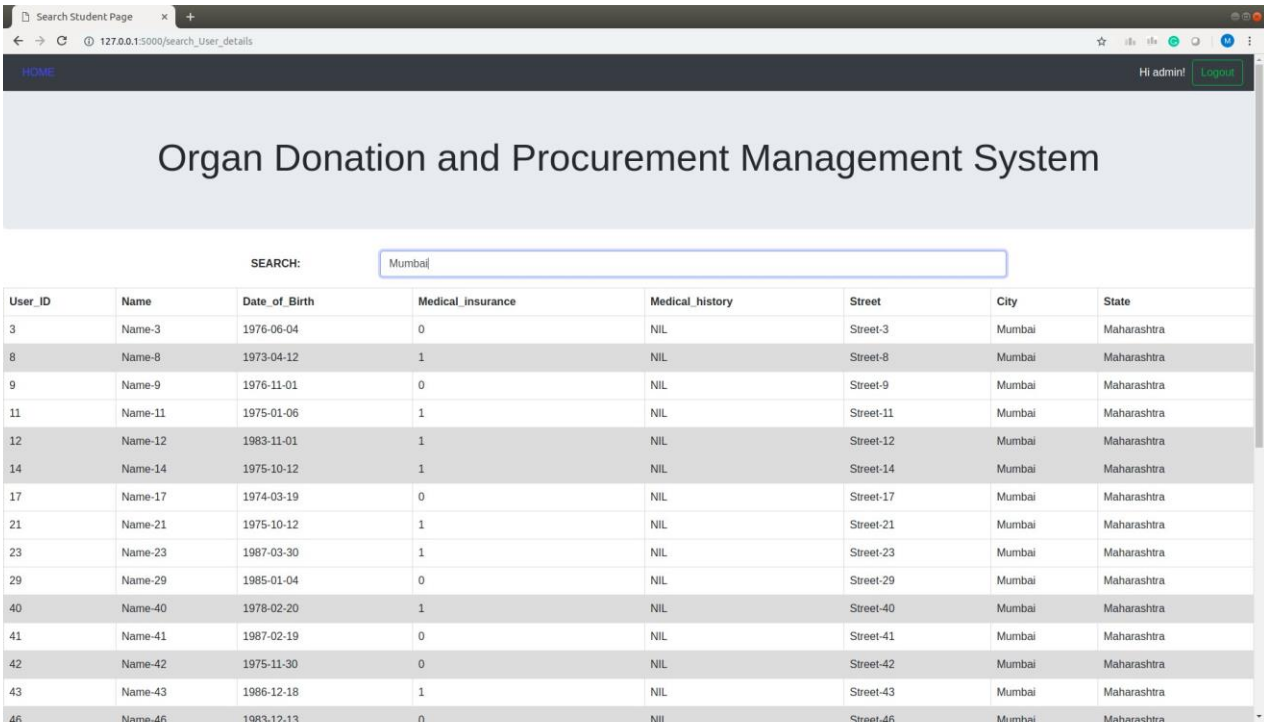
Remove

Statistics

3) Main Page – Drop Down Menu


Login Page
127.0.0.1:5000
HOME
Hi admin!
Logout
Organ Donation and Procurement Management System
User
Search
Search User by Details
Search Patient by Details
Search Donor by Details
Search Organ by Details
Search Organization by Details
Search Organization Head by Details
Search Doctor Details
Search Transaction Details
Search Log Details

4) Searching Option

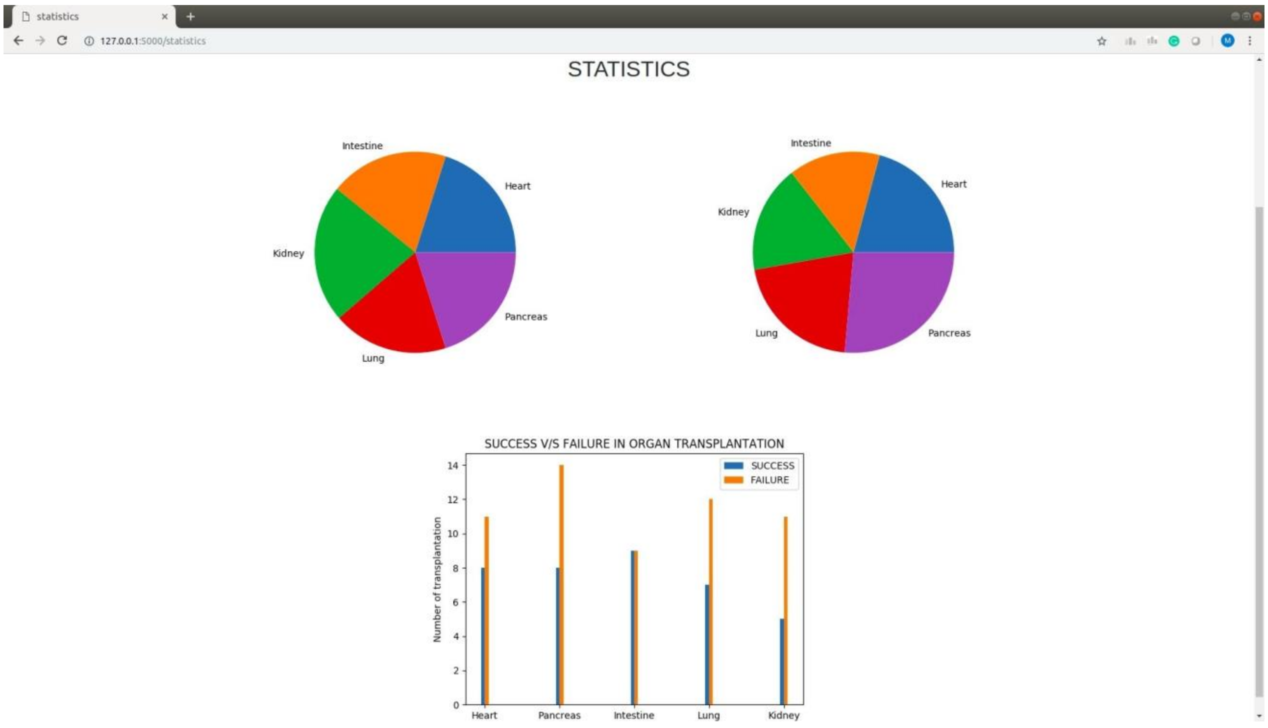


Organ Donation and Procurement Management System

SEARCH: Mumbai

User_ID	Name	Date_of_Birth	Medical_insurance	Medical_history	Street	City	State
3	Name-3	1976-06-04	0	NIL	Street-3	Mumbai	Maharashtra
8	Name-8	1973-04-12	1	NIL	Street-8	Mumbai	Maharashtra
9	Name-9	1976-11-01	0	NIL	Street-9	Mumbai	Maharashtra
11	Name-11	1975-01-06	1	NIL	Street-11	Mumbai	Maharashtra
12	Name-12	1983-11-01	1	NIL	Street-12	Mumbai	Maharashtra
14	Name-14	1975-10-12	1	NIL	Street-14	Mumbai	Maharashtra
17	Name-17	1974-03-19	0	NIL	Street-17	Mumbai	Maharashtra
21	Name-21	1975-10-12	1	NIL	Street-21	Mumbai	Maharashtra
23	Name-23	1987-03-30	1	NIL	Street-23	Mumbai	Maharashtra
29	Name-29	1985-01-04	0	NIL	Street-29	Mumbai	Maharashtra
40	Name-40	1978-02-20	1	NIL	Street-40	Mumbai	Maharashtra
41	Name-41	1987-02-19	0	NIL	Street-41	Mumbai	Maharashtra
42	Name-42	1975-11-30	0	NIL	Street-42	Mumbai	Maharashtra
43	Name-43	1986-12-18	1	NIL	Street-43	Mumbai	Maharashtra
46	Name-46	1983-12-13	0	NIL	Street-46	Mumbai	Maharashtra

6) Data visulaization using matplotlib in Python.



Future plans

- Improve GUI
- Add more Data Visualization options – graphs, scatter plots, pie-charts etc.
- Provide more query options
- Accomodate more transactions
- Using data scored in our database, we can suggest suitable donor and patient pair using various biological and geographical factors.