

RV COLLEGE OF ENGINEERING®, BENGALURU

560059

(Autonomous Institution Affiliated to VTU, Belagavi)

**DEPARTMENT OF COMPUTER SCIENCE AND
ENGINEERING**



**ORGAN DONATION AND TRANSPLANTATION
MANAGEMENT SYSTEM**

Mini - Project Report

Submitted by

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RV COLLEGE OF ENGINEERING®, BENGALURU - 560059
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CERTIFICATE

Certified that the project work titled **Organ Donation and Transplantation Management System** is carried out by **Shivani C H, Shivansh Ojha, Shivanshu Singh(1RV18CS154, 1RV18CS155, 1RV18CS156)**, who are bonafide students of RV College of Engineering®, Bengaluru, in partial fulfillment of the curriculum requirement of 5th Semester Database Design Laboratory Mini Project during the academic year **2020-2021**. It is certified that all corrections/suggestions indicated for the internal Assessment have been incorporated in the report deposited in the departmental library. The report has been approved as it satisfies the academic requirements in all respect laboratory mini-project work prescribed by the institution.

Signature of Faculty In-charge

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External Examination

Name of Examiners

Signature with date

1

2

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Abstract

In India, though organ and tissue donation is legally accepted, due to various reasons very less percentage of population steps up for the cause. Due to this, the availability of organs within required time is less. At the same time, due to lack of reach and limited time for which organs can be preserved, makes the situation vulnerable. This project of building a universal database to store the data regarding organ and tissue donors and transactions would increase this reach and can help save many lives.

In the existing model to store the details of organ donors, patients and transactions, most often it is documented and not completely digitalized. The legal procedures and verification of donors take a huge amount of time and delays the process. Currently, there doesn't exist any universal database for the above mentioned purpose which can make the process much easier. The proposed system aims to provide a universal database to record the data related to organ donation, availability and their transaction.

We make use of relational database management system to create the database for this system. The database is built to store the details of the organizations, donors, patients, hospitals, doctors and transplantations of organs. The statistics of different types of donations and transplantations can be derived from the information stored in the database. We make use of non-relational database for the same and that is, NoSQL by integrating it with the relational database to provide the analysis.

A system like this would make the process of finding the donors faster and easier making it less time consuming. It can provide the details of the required donors and patients to the organization user. The system can be further developed to extend its services and ensure more security.

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GLOSSARY

DFD	:	Data Flow Diagram
GUI	:	Graphical User Interface
RDBMS	:	Relational DataBase Management System
SRS	:	Software Requirement Specification

Chapter 1

INTRODUCTION

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 same location, or organs may be transported from a donor site to another location.

Organ donors may be living, or dead. Tissues may be recovered from donors who die of circulatory death as well as of brain death – up to some hours past the cessation of heartbeat. Unlike organs, most tissues can be preserved and stored for up to five years. Transplantation raises a number of bioethical issues, including when and how consent should be given for an organ to be transplanted, and payment for organs for transplantation.

Objective

The following are the objectives of the project:

- To engender a greater willingness amongst members of the public to donate their organs and tissue.
- To significantly increase the number of members of the public registered as organ and tissue donors, and to record these registered organ / tissue donors on an easily accessible database which will be used as a means of measuring the success of organ and tissue donor awareness drives;
- To assist medical professionals and stakeholders responsible for donor identification by helping with financial assistance towards organ donor and tissue referral programs and workshops, such assistance shall be provided
- Wherever possible, it shall assist in advocating the challenges of organ transplantation and donation and to increase the number of possible transport and delivery incidences that are required, and to do all such things as are consistent with the afore going objectives and aims.

Scope

The scope of the project is as follows:

- Organs available contain the information of donated organs by different donors.
- The transplantation of organs from donor to patient are contained in an entity named transplantations once the legal procedures and operations are completed.
- The reports of the patients will be uploaded in the database which upon a request for a particular organ will be checked into by the other organisations manually once the list of donors will be displayed along with the organization details. This process will take place once a query is made by the patient for list of donors of particular organ.

Chapter 2

SOFTWARE REQUIREMENT SPECIFICATION

This chapter consists of the different requirements of the proposed system

2.1 Hardware requirements

- 32 bit or 64-bit CPU (Intel / AMD architecture)
- Processor: minimum 1 GHz. Recommended 2 GHz or more.
- RAM - minimum 1 GB. Recommended 4 GB or more.
- Disk space - minimum 1 GB.
- Ethernet connection or wireless adapter.

2.2 Software requirements

- Operating System: Windows /Mac OS /Linux (almost all libraries also work in Ubuntu)
- Language support: Python 3.5 or later, HTML, CSS and Java Script.
- Relational Database required: MySQL
- NoSQL Database: MongoDB
- Web Browser support is required.

2.3 Functional requirements

Functional requirements for the project are as follows:

2.3.1. Registration of the organizations –

Primary actor: Government official

- Government registers the Organization by filling the required details of the organization (like Name, Organization ID provided by government, phone numbers etc.).
- On success, creates an account for the organization.
- On failure, registration is aborted.

2.3.2. Login –

Primary actor: authorized user in organization

- User gives correct login credentials (username and password) of the Organization to log into and use the portal.
- On success, go to the page to register or find the donor or patient.
- On failure, retry logging in again.

2.3.3. Registration of patients –

Primary actor: authorized user in organization

- User registers the patient with the organization by filling all the required details (Name, Patient ID, Blood Group, Phone numbers, Organ required etc.).
- On success, the patient is registered and go to Hospital and Doctor Details.
- User fills the details of hospital and doctor treating the patient.
- On failure, registration is aborted.

2.3.4. Registration of Donors –

Primary actor: authorized user in organization

- User registers donors with the organization by filling all the required details (Name, Patient ID, Blood Group, Phone numbers, Organ required etc.) for both types of donation (Living and post death donation)
- On success, the donor is registered.
- On failure, registration is aborted.

2.3.5. Finding Donors –

Primary actor: authorized user in organization

- User validates the details of the patient requesting information.
- Selects the type of organ required and fetch the list of donors and organization for both living donation and post death donation with expiry time greater than current time.
- On success, print the list of organizations and donors.
- On not finding a match, give a 'not found' message.

2.3.6. Finding appropriate patients –

Primary actor: authorized user in organization

- Immediately on receiving a registration of donor, the user enters the organ available and gets the list of patients who requested for the organ.
- On success, print the list of organizations and patients.
- On not finding a match, give a 'not found' message.

Internet connection is required during the whole process. Else, it will result in network failure and aborts the process.

2.4. Non-functional requirements

The non-functional requirements for the proposed system are given below.

Performance:

The response time of a particular request made by patient and organization for donors must be minimized in order to improve the overall performance of the system.

The system would allow concurrency to handle multiple requests made by users.

Security:

The intrusions to be avoided by using passwords. The web application or database cannot be accessed without the login information which is shared only with the authorized user. The donated organs and donor details would be given utmost importance. In later versions, password protection, encryption of database would avoid any security breach.

Maintainability:

The web application for managing the database must be maintained to adapt to a changed environment if necessary in the near future by government organizations dealing with organ transplantation.

Error Handling:

On unavailability of network, the errors must be handled appropriately and print messages accordingly.

Flexibility and Ease to use:

Support from multiple browsers and user friendly design for user interface for the web application.

Chapter 3

ER DIAGRAM

This chapter contains the ER diagram for the design of relational database that we use to store the details of organizations, hospitals, patients, donors, hospitals, transplantations and organ availability.

ER diagram describes the structure of the database. A basic ER model is composed of entity types and specifies relationships that can exist between entities.

In this ER diagram, we have seven entities and have their own attributes to describe them and the relationship between them along with cardinality are shown.

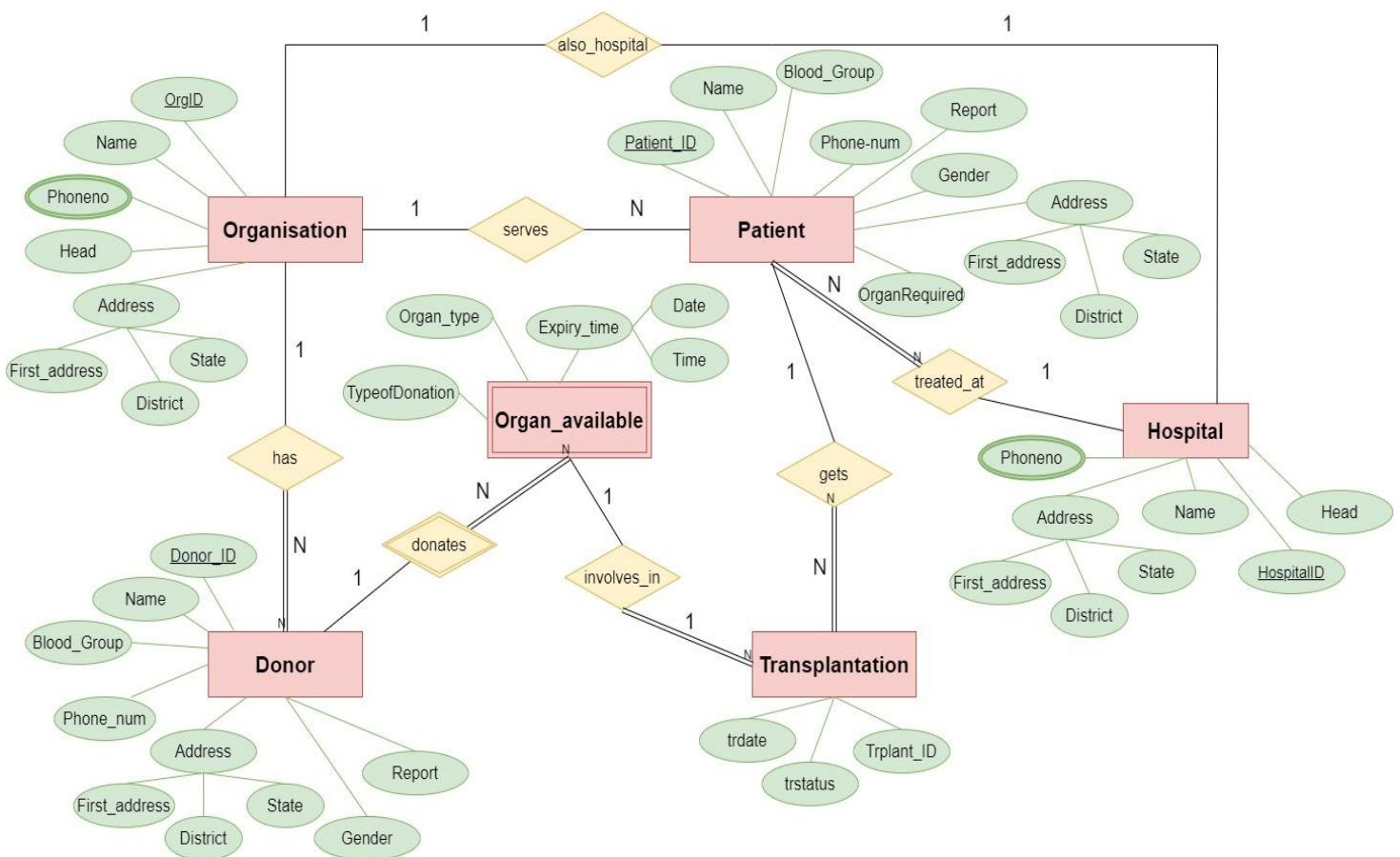


Fig 3.1. Entity Relationship diagram

Chapter 4

DETAILED DESIGN

A data-flow diagram is a way of representing a flow of data through a process or a system. The DFD also provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow, there are no decision rules and no loops but gives detailed view into the flow of data.

We have designed DFD up to level 2. Level 0 consists of the overview of the system with its input and output details. Level 1 has different major sub systems that come into picture. Level 2 consists of detailed internal view of each of the sub system.

4.1 DFD Level 0

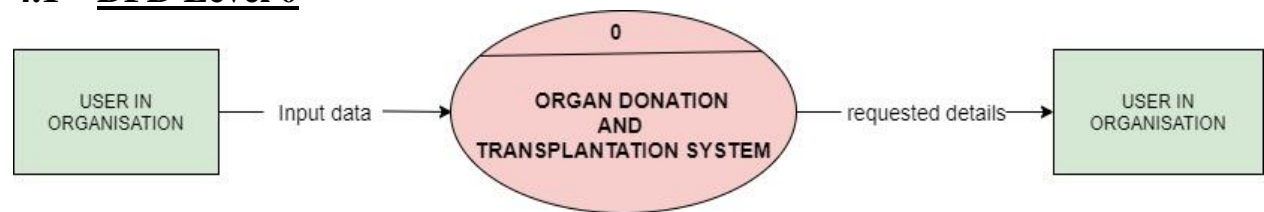


Fig 4.1. DFD Level 0 diagram

4.2 DFD Level 1

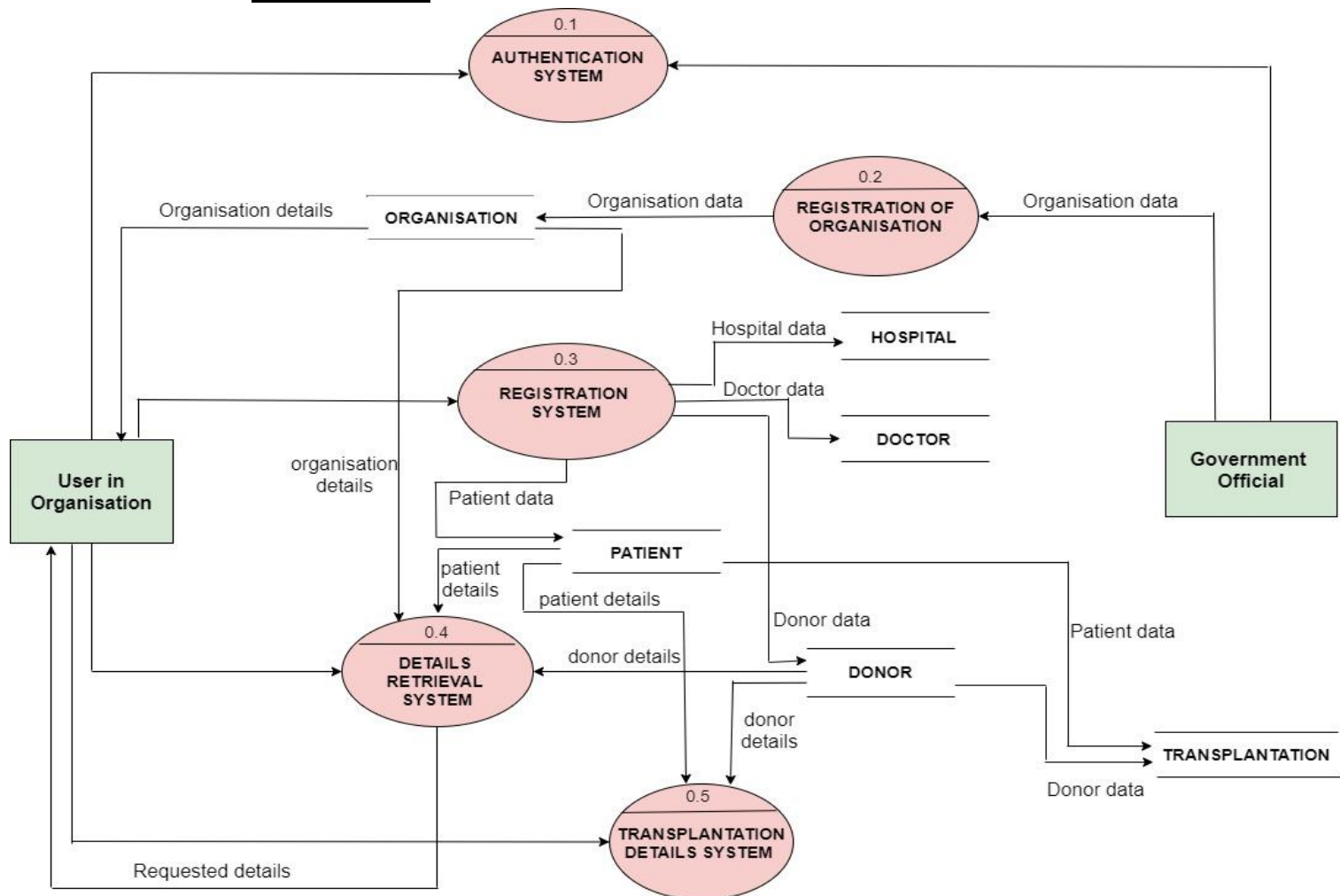


Fig 4.2. DFD Level 1 diagram

4.3. DFD Level 2

1. Authentication System

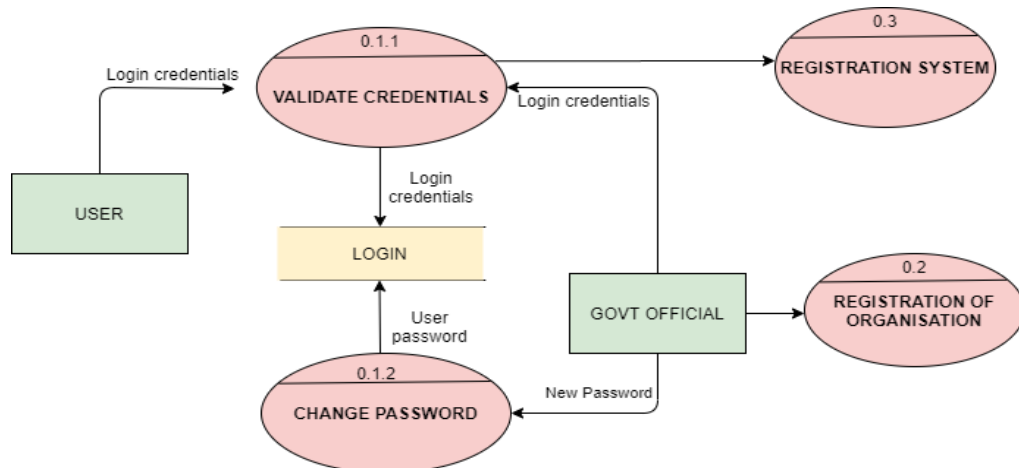


Fig 4.3.1. Level 2 diagram for authentication system

2. Registration of Organization

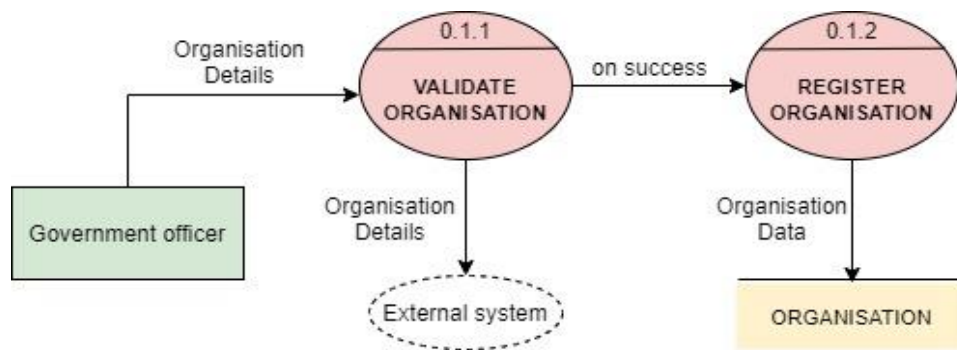


Fig 4.3.2. Level 2 diagram for registration of organisation system

3. Registration system

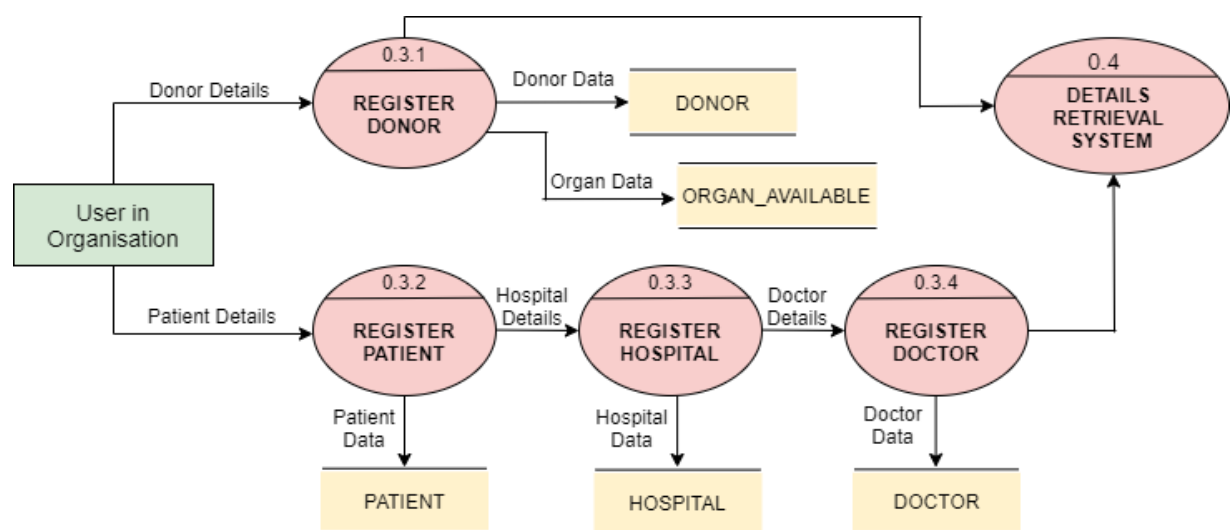


Fig 4.3.3. Level 2 diagram for registration system

4. Details retrieval System

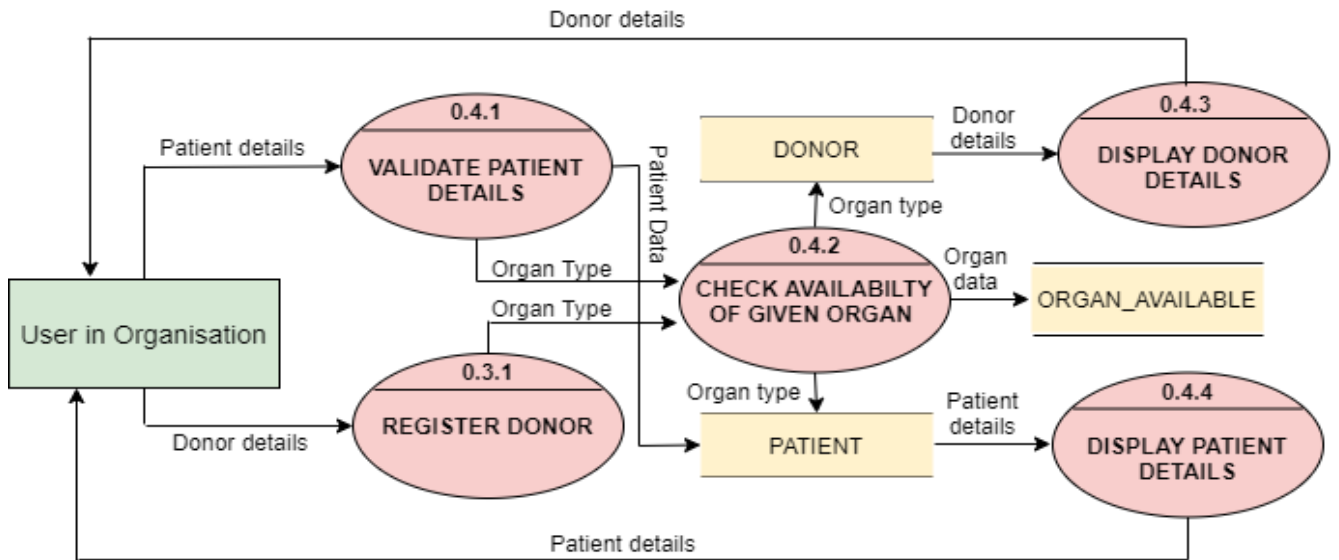


Fig 4.3.4. Level 2 diagram for details retrieval system

5. Transplantation System

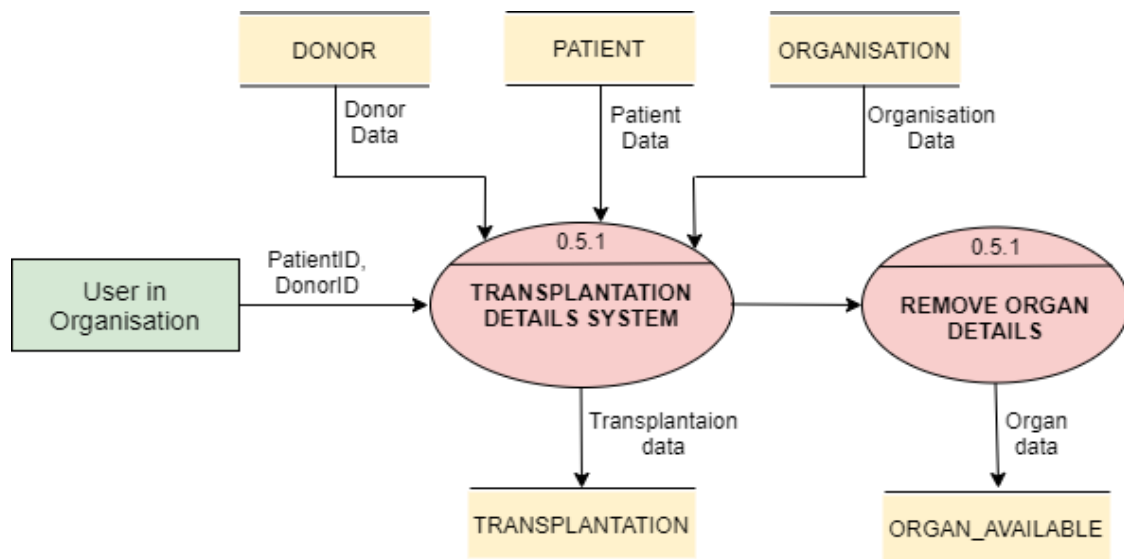


Fig 4.3.5. Level 2 diagram for transplantation system

Chapter 5

RELATIONAL SCHEMA AND NORMALIZATION

Relational schema refers to the meta-data that describes the structure of data within a certain domain. It is the blueprint of a database that outlines the way its structure organizes data into tables.

5.1. Schema diagram

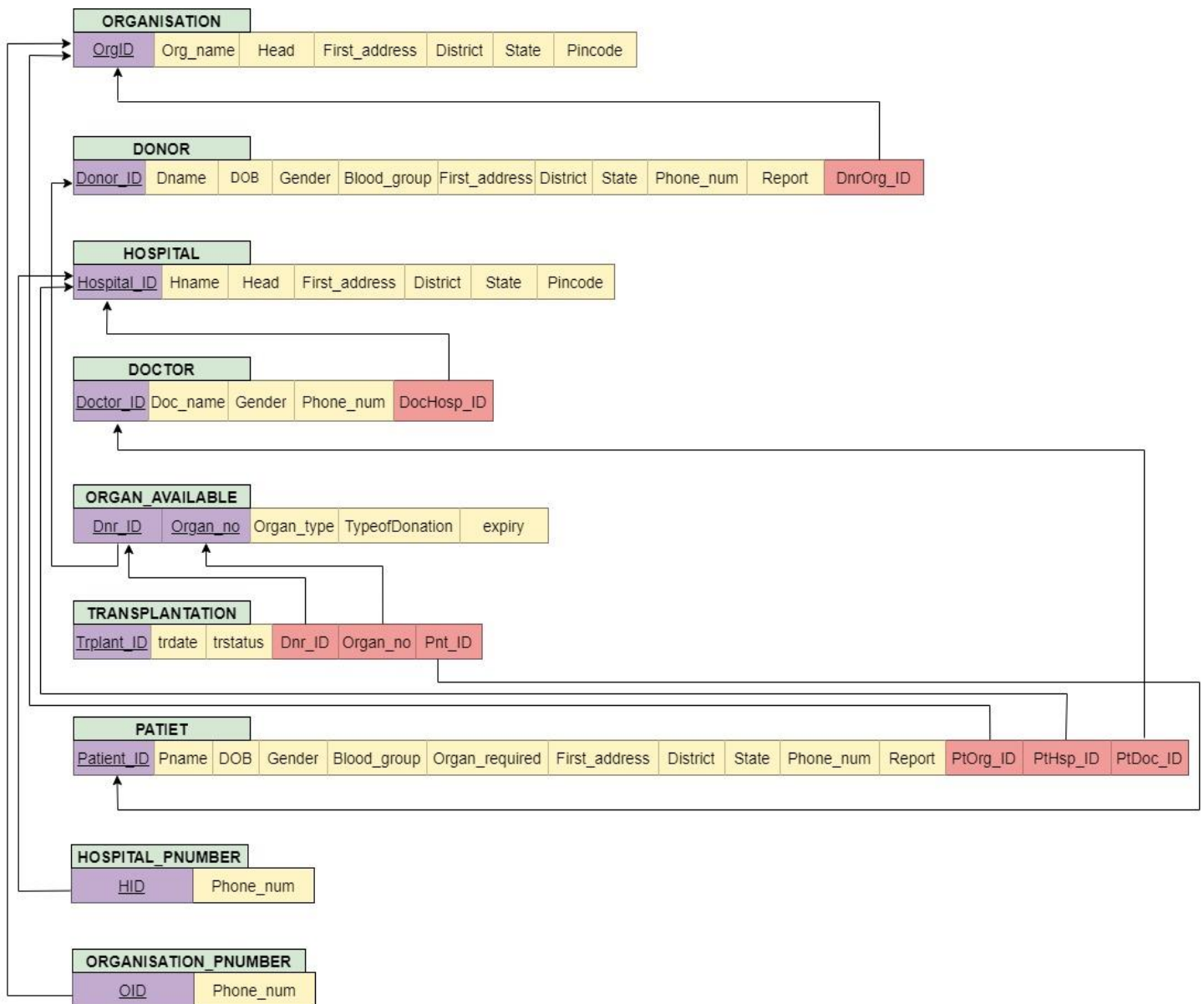


Fig 5.1. Schema diagram

5.2. Normalization and description

The above shown relational schema is in third normalization form. Hence, the schema is in 3NF which satisfies our system and reduces the redundancy.

Chapter 6

NOSQL

Integrating NOSQL database to SQL with complete system architecture

NoSQL is an approach to database design that can accommodate a wide variety of data models, including key-value, document, columnar and graph formats. NoSQL, which stand for "not only SQL" is an alternative to traditional relational databases in which data is placed in tables and data schema is carefully designed before the database is built. NoSQL databases are especially useful for working with large sets of distributed data.

6.1 NoSQL Component

A NoSQL database (MongoDB) has also been made use of for this project. It is being used to store the information/details of the transplantations and donations of various organs that are donated by the donors and the graph depicting number of successful transplantations.

MongoDB doesn't have its own query language, so the project uses a python package called Pymongo which acts an interface between the Flask server and MongoDB Atlas cloud database. All the MongoDB queries that are performed through the Flask server and the same is reflected in the MongoDB Atlas cloud server.

Setup:

The first step of using MongoDB database is to create models and initialize them accordingly. The models used in our application is:

1. organ: {
"name":,"value", "post_death":,"alive":,"donation":,"postdeath_donation":,"alive_donation":}
};
2. status: {"name":,"value":}

Chapter 7

CONCLUSION & FUTURE ENHANCEMENT

Most often, it becomes highly difficult to find an organ donor or organ availability in the vicinity of a patient. Many of the donated organs go in vain due to this and the limited time for preservation. The existence of a universal database at authorized hospitals and organ banks would help the authorities to readily contact the concerned hospitals, organizations and persons registered in those organizations who are available for the organ donation (considering post death donation and living donation). This can help improve the present donation versus transplantation ratio.

In future, the system can be improved to a greater extent, in terms of its services, efficiency and security. The optimization while displaying the details of the donors, patients can be looked into by showing the most suitable ones at the top so as to make the process faster. We can further try to incorporate ML and Image Processing or Virtual Reality to determine whether the organ donated would be fit for transplantation or not in the specified time. We can review the reports at a faster pace to find the match for the patient or the available donor.

Appendix

Screenshots with descriptions

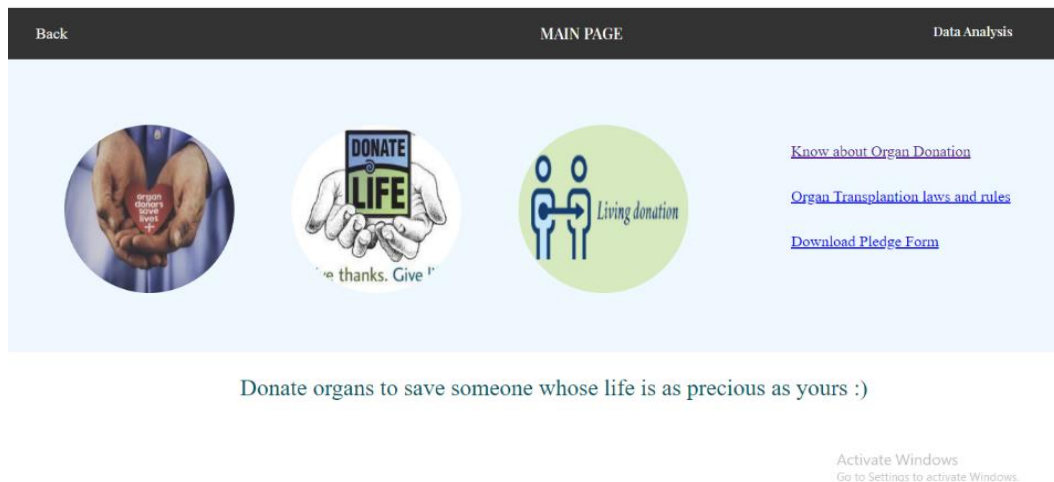


Fig. 7.1. This page gives some information about organ donation, its rules and related rules to the user and allows them to download the pledge form.

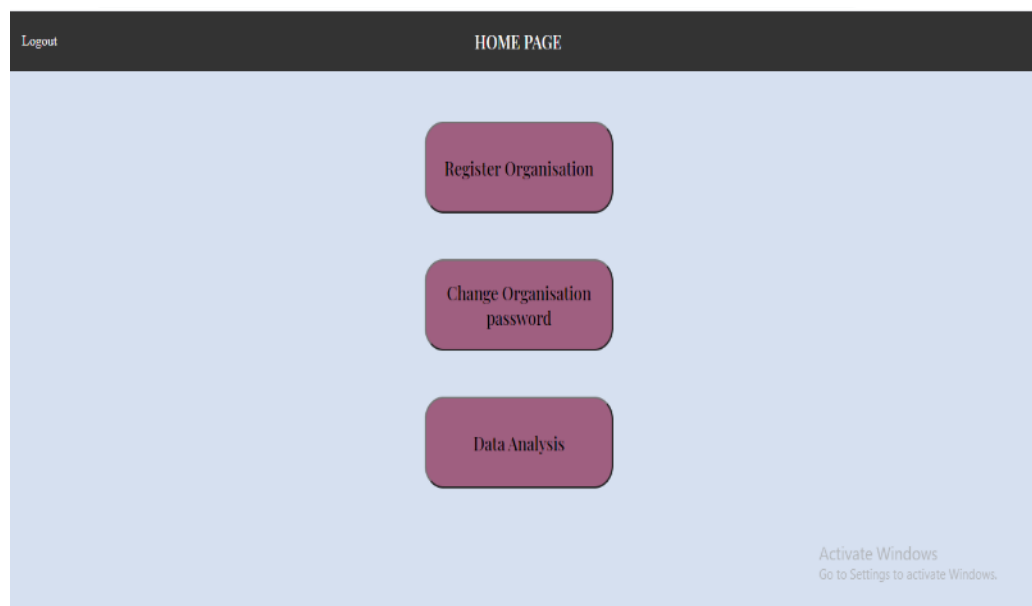


Fig. 7.2. Home page for the government official. Shows the options available for a government official



Fig. 7.3. Home page of the user in the organisation. All the available operations the user can perform are given

Back to Home

PATIENT REGISTRATION

Aadhaar No : 762657890176

Full Name : Gayatri Devi

Date of birth : 11/13/1979

Phone Number : 9283432876

Please select your gender:

☐ Male ☒ Female ☐ Other

Blood group : AB+ve

Organ Required : Lung

875/15 'A', beside park, Balaji Nagar, vivekananda Road

Activate Windows
Go to Settings to activate Windows.

Fig. 7.4. Page for Patient registration. The required patient details are collected through a form. These details include aadhar no., Name, contact details, requested organ and test report

DOCTOR REGISTRATION

Doctor :

Doctor ID :

Full Name :

Phone Number :

Please select gender:

☒ Male ☐ Female ☐ Other

Activate Windows
Go to Settings to activate Windows.

Fig. 7.5. Page for doctor registration. The required doctor details are collected through a form. If already exists, the user can select them instead of registering a new one

[Back to Home](#)

DONOR REGISTRATION

District :

State :

Please select your gender:

☒ Male ☐ Female ☐ Other

Blood group :

Donation type :

Organ Donated :

Expiry :

Report : report 2.pdf

Activate Windows
Go to Settings to activate Windows.

Fig. 7.6. Page for Donor registration. The required donor details are collected through a form. These details include aadhar no., Name, gender, contact details, donated organ and test report. The type of donation can be post death or living.

[Back to Home](#)
SEARCH FOR Patients/Donors

Provide the Aadhar ID of patient to search for a donor and vice versa for patient !!

Aadhar ID :

Organ Type :

Whom are you searching for?

☐ Donors
 ☒ Patients

Activate Windows
 Go to Settings to activate Windows.

Fig. 7.7. Search for a list of patients or donors giving the type of organ required. Here, we provide the aadhar ID of the patient for whom we are searching a donor to search for a list of donors and vice versa to search for a list of patients. Any discrepancies in the given data will produce an error message stating the error. We provide the patient or donor details so as to not lose track of them once going to the next page as that page contains an option to find their details.

Back to Home Back to search		LIST OF PATIENTS						Get donor details
Aadhar ID	Patient Name	Age	Phone Number	Gender	Blood Group	state	Organ Required	Report
718839014511	Pooja Mittal	43	7088913001	female	B-ve	Jharkhand	Pancreas	Download
628002789320	Vivek S	31	8982393724	male	A-ve	Karnataka	Pancreas	Download
129382834972	Chitra KT	34	9283432876	female	A+ve	Karnataka	Pancreas	Download

Fig. 7.8. The list of patients is being displayed here as per the request given by the user earlier. The display is optimised in a way to show the patients according to state they belong to in ascending order. The user can also download the patient's report.

[Back to Home](#)
SEARCH FOR Patients/Donors

Provide the Aadhar ID of patient to search for a donor and vice versa for patient !!

Aadhar ID :

Organ Type :

Whom are you searching for?

☒ Donors
 ☐ Patients

[Search](#)

Activate Windows
 Go to Settings to activate Windows.

Fig. 7.9. Here, the aadhar ID of patient for whom we are searching donors is given along with the organ type. Any discrepancies in the given data will produce an error message stating the error. We provide the patient or donor details so as to not lose track of them once going to the next page as that page contains an option to find their details.

Back to Home Back to search		LIST OF DONORS							Get patient details
Aadhar ID	Donor Name	Age	Gender	Blood Group	Expiry	State	Organ Type	Donation Type	Report
801906701201	Lavanya T	42	female	A+ve	2021-01-23 04:23:00	Arunachal Pradesh	Kidney	Post-death	Download
309809891231	Rajath VM	59	male	O+ve	2021-01-07 21:34:00	Karnataka	Kidney	Post-death	Download
304509290124	Manikanta UB	26	male	A+ve	2021-01-09 02:41:00	Karnataka	Kidney	Post-death	Download
491109198001	Naitik Goenka	41	male	O-ve	2021-01-12 15:12:00	Karnataka	Kidney	Post-death	Download
807507251531	Rajni Chahal	57	male	B-ve	2021-01-14 20:50:00	Karnataka	Kidney	Post-death	Download
310086701201	Aryan Agarwal	51	male	O+ve	2021-01-09 23:45:00	Tripura	Kidney	Post-death	Download
620318511865	Chiranjeevi K	36	male	O+ve	----	Andhra Pradesh	Kidney	Alive	Download
462091086091	Charitha Shah	42	female	B-ve	----	Odisha	Kidney	Alive	Download
509610927089	Jagadeesh U	52	male	AB+ve	----	Punjab	Kidney	Alive	Download
582482762318	Nalini Kale	36	female	O-ve	----	Rajasthan	Kidney	Alive	Download
417926170086	Priyanka MB	24	female	B+ve	----	West Bengal	Kidney	Alive	Download

Fig. 7.10. The list of donors are displayed here according to the request given earlier. We can also find the details of the patient who requested for the donors. The display is optimised in way where only the organs that are not yet expired and the values are sorted according to alphabetical order of the states within which they are again sorted on increasing expiry date.

[Back to Home](#)
SEARCH FOR Patients/Donors

Organ Type : Lung

Whom are you searching for?

☐ Donors
☒ Patients

Search

Activate Windows
Go to Settings to activate Windows.

Fig. 7.11. The list of patients or donors can be searched without giving the aadhar ID of the person requesting for these details.

[Back to Home](#)
[Back to search](#)
LIST OF PATIENTS

Aadhar ID	Patient Name	Age	Phone Number	Gender	Blood Group	state	Organ Required	Report
701290230116	Vansh Agarwal	28	9087665511	male	A+ve	Bihar	Lung	Download
130287625134	Aryan Agarwal	38	9077821311	male	O+ve	Karnataka	Lung	Download
409615021120	Harshitha M	44	8990176111	female	B+ve	Karnataka	Lung	Download
203981293812	Rohit Desai	26	9023991271	male	O-ve	Maharashtra	Lung	Download
629809291159	Eshwar Pai	27	8720063894	male	O+ve	Maharashtra	Lung	Download

Fig. 7.12. The list of patients is being displayed here as per the request given by the user earlier. The display is optimised in a way to show the patients according to state they belong to in ascending order. The user can also download the patient's report.

[Back to Home](#)
FIND DETAILS

☒ Donor
☐ Patient

Aadhar ID : 123456789023

SEARCH

Fig. 7.13. Finding donor/patient details. The user can find the details of each patient or donor by providing their aadhar ID

[Back to Home](#)[FIND DETAILS](#)

☐ Donor☐ Patient

Aadhar ID :

SEARCH

Aadhar No :	123456789023
Full Name :	Shivani C H
Role :	Donor
Phone number :	8347658983
Organ Donated :	Pancreas
Donation type :	Post-death
Report :	Download

Delete Donor

Update

Activate Windows
Go to Settings to activate Windows.

Fig. 7.14. The details of the donor requested earlier are displayed. The donor/patient can be deleted or their reports can be updated from here.

[Back to Home](#)[Back to search](#)[UPDATE REPORT](#)

Role :

Patient

Adhaar No :

109876251342

p Full Name :

Rishi Kumar

Report :

Choose Filereport 1.pdf

UPDATE

Fig. 7.15. The report of the patient/donor can be updated here.

[Back to Home](#)
TRANSPANTATION DETAILS

Donor ID :

123456789023

Patient ID :

129382834972

Organ :

Pancreas

Date of transplantation :

12 / 28 / 2020

Status :

Success

Add Details

Fig. 7.16. The transplantation details can be added by providing the donor ID and patient ID who got the transplantation along with the data and status of transplantation.

ANALYSIS OF DATA:

By making use of MongoDB for NoSQL database and analysing the input data, the following graphs are produced which show the ratio between various types of organs in donations and transplantations.

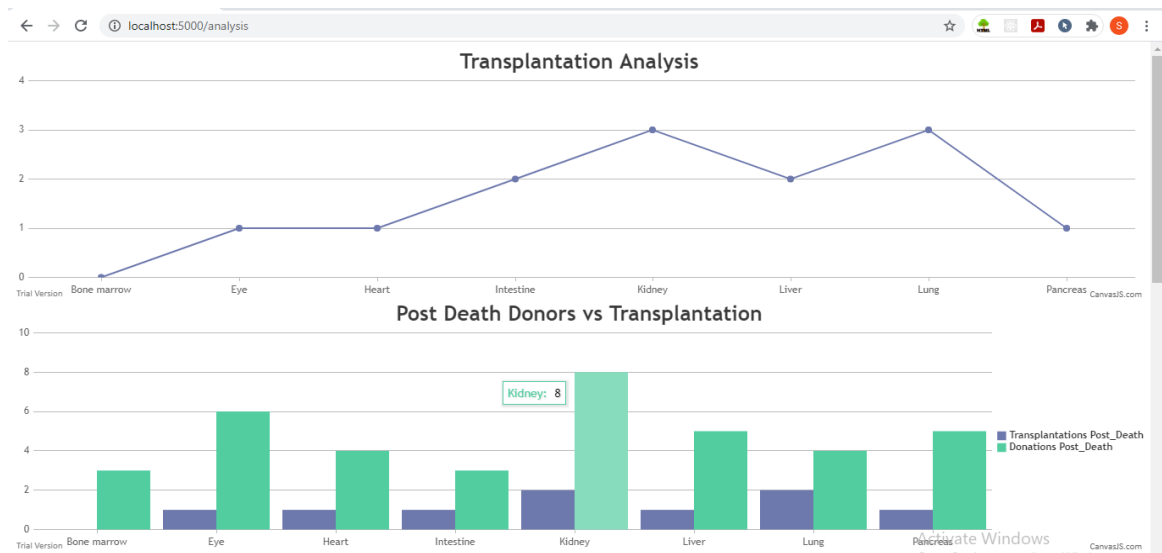


Fig. 7.17. The first one gives the graph of the total number of transplantations taken place for each type of organ. The second one gives the bar graph to compare the total number of post death donations and transplantations for each type of organ.

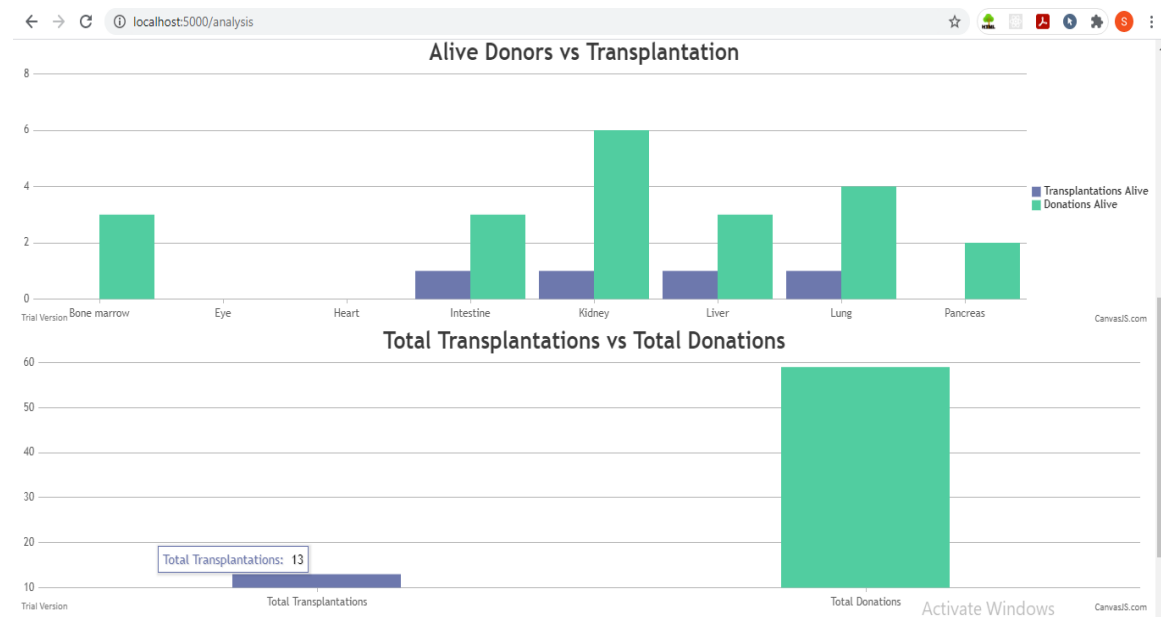


Fig. 7.18. The first one gives the bar graph to compare the total number of living donations and transplantations for each type of organ. The second one is a graph of total number of donations versus total transplantations done irrespective of the type of organ.

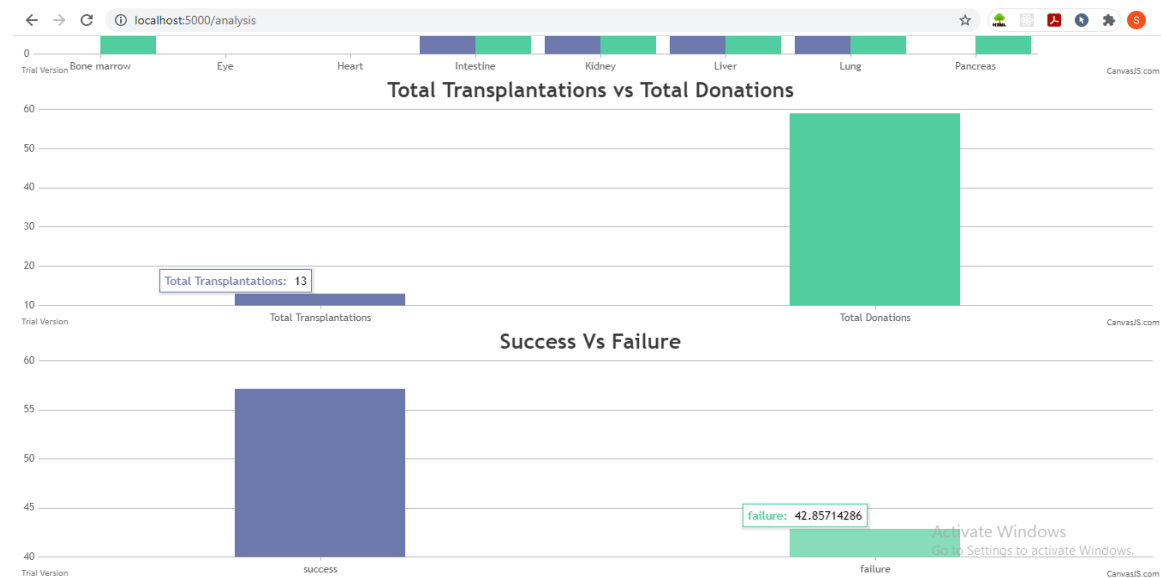


Fig. 7.19. The success versus failure graph gives the comparison between the total number of successful transplantation and total number of failed transplantations.