Database Management Systems

Project Report

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Abstract

The Blood Donation Management System (BBMS) is a browser-based system that is designed to store, process, retrieve and analyze information concerned with the administrative and inventory management within a blood bank. The aim of this project is to maintain all the information pertaining to blood donors, different blood groups available in each of the different clinics and help them manage in a better way. The aim is to provide transparency in this field, make the process of obtaining blood from a blood bank quick, effective, and easy with little or no bureaucracy, hassle free. There is no storage of blood so no complications in the project. The software is fully integrated with CRM (customer relationship management) as well as CMS (content management system) solution. It is developed in a manner that is easily manageable, time saving and relieving one from manual work. The requirement of the blood must be requested, and the information of the donor is provided.

Introduction

The aim of this project is to create an effective and well-structured management system for the Blood Donation banks.

One way to accomplish this is to build a functional website for the system and an effective management system that accepts, manages, and stores information on customers and donors. The website will retrieve information like personal and medical information from donors through a web form that will store the customer's information in a database and each customer will be assigned an ID which will serve as the primary key for the customers data.

Our group adopted this idea because it encompasses all the concepts learned in class as well as the lab sessions. This project will allow us to use what we have learned to create a tangible product with real world applications. Our team will develop this website using HTML, CSS, JavaScript, PHP and MYSQL for the database.

RELATED WORK AND HOW IT DIFFERS FROM EXISTING WORKS

Currently, blood donation systems are mainly built for clinic employees and not the blood donors themselves. As a result, many donors are unaware of their own blood statistics such as if they're eligible to donate blood in the first place, their blood type, whether or not their blood has been used yet, the supply of blood available to the clinics, and when one can donate blood again. This lack of information conveyed to both donors and potential donors may lead them to be unmotivated and dissuade their decision to donate blood, further contributing to the blood donation crisis currently occurring in Ontario. Blood Bank Management is the solution to this, as it is a presentable and accessible browser based application that will be responsible for storing, retrieving, and sharing clients information.

Main Body

Objective

We focused on combining both the database and the frontend of the website to allow functionality. The first phase of the project focuses mainly on designing and constructing the data store for the application. All the ideas put forward on the proposal gets implemented in this phase. We designed the database using MYSQL creating the different tables for each individual entity. We created a relational database schema for the system, populated the tables with several users and passed some queries to check the functionality of the system.

During this phase, we also focused on building the frontend part of the website with HTML, PHP, and JavaScript. The goal was to make a user-friendly website that can be accessed by any and every device. The frontend collects all the information from users which are saved on the database.

Creating Tables

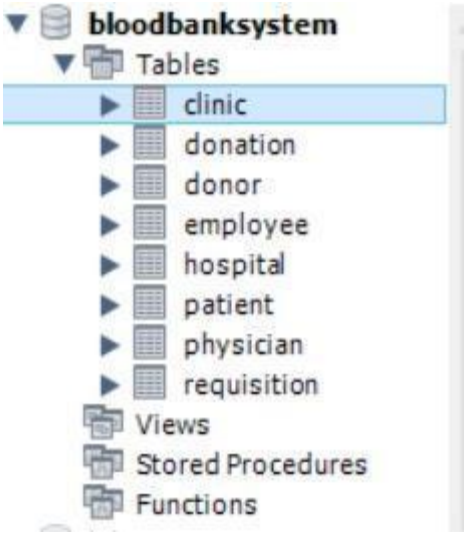
We created the tables for each individual entity with their respective attributes in the database using the table commands.

- Patient table: Personal information about the patient, donor, and physician are being recorded on this table .
- Donor table: Personal information like the blood type and medical history about the donor, and information about the physician are being recorded on this table .
- Physician table: Personal information physicians are being recorded on this table .
- Employee table: Information about the clinic employees is being saved and recorded on this table to allow easy access for the clinic.

- Hospital, Requisition, Donation tables.

```
1   CREATE SCHEMA `bloodbanksystem` ;/**/
2
3   /* create tables */
4
5   CREATE TABLE `bloodbanksystem`.`patient` (
17
18  CREATE TABLE `bloodbanksystem`.`donor` (
30
31  CREATE TABLE `bloodbanksystem`.`physician` (
41
42  CREATE TABLE `bloodbanksystem`.`donation` (
50
51  CREATE TABLE `bloodbanksystem`.`clinic` (
58
59  CREATE TABLE `bloodbanksystem`.`employee` (
70
71  CREATE TABLE `bloodbanksystem`.`hospital` (
77
78  CREATE TABLE `bloodbanksystem`.`requisition` (
87
```

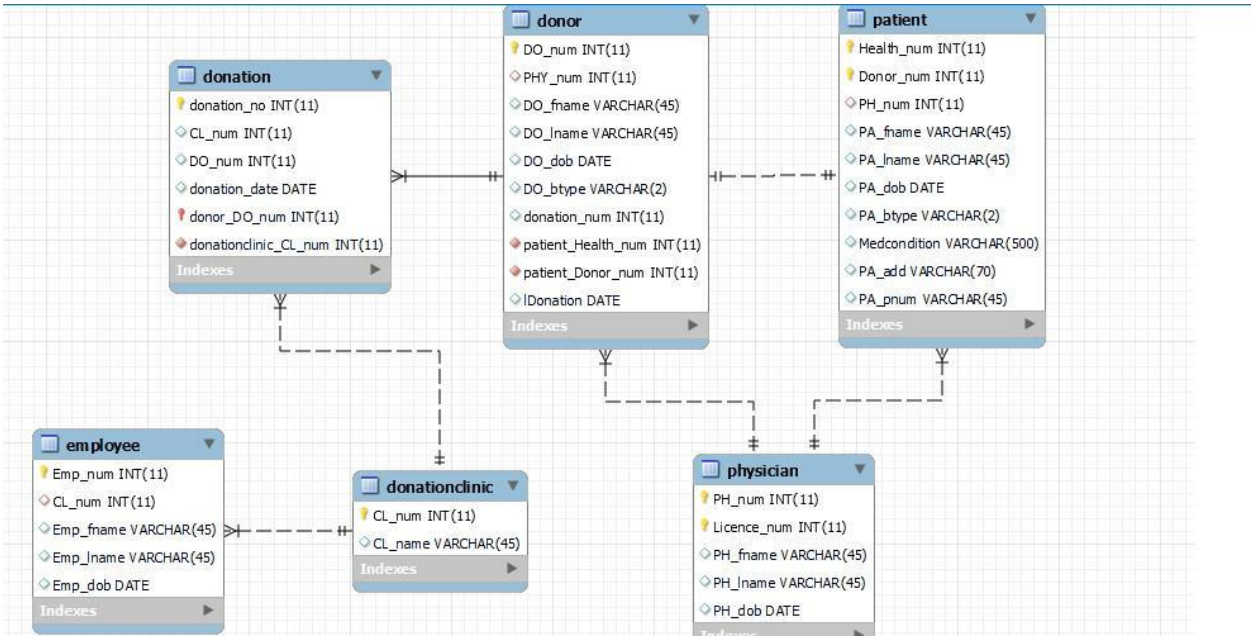
The above table commands will result in the following table displayed in the database



Object Diagram

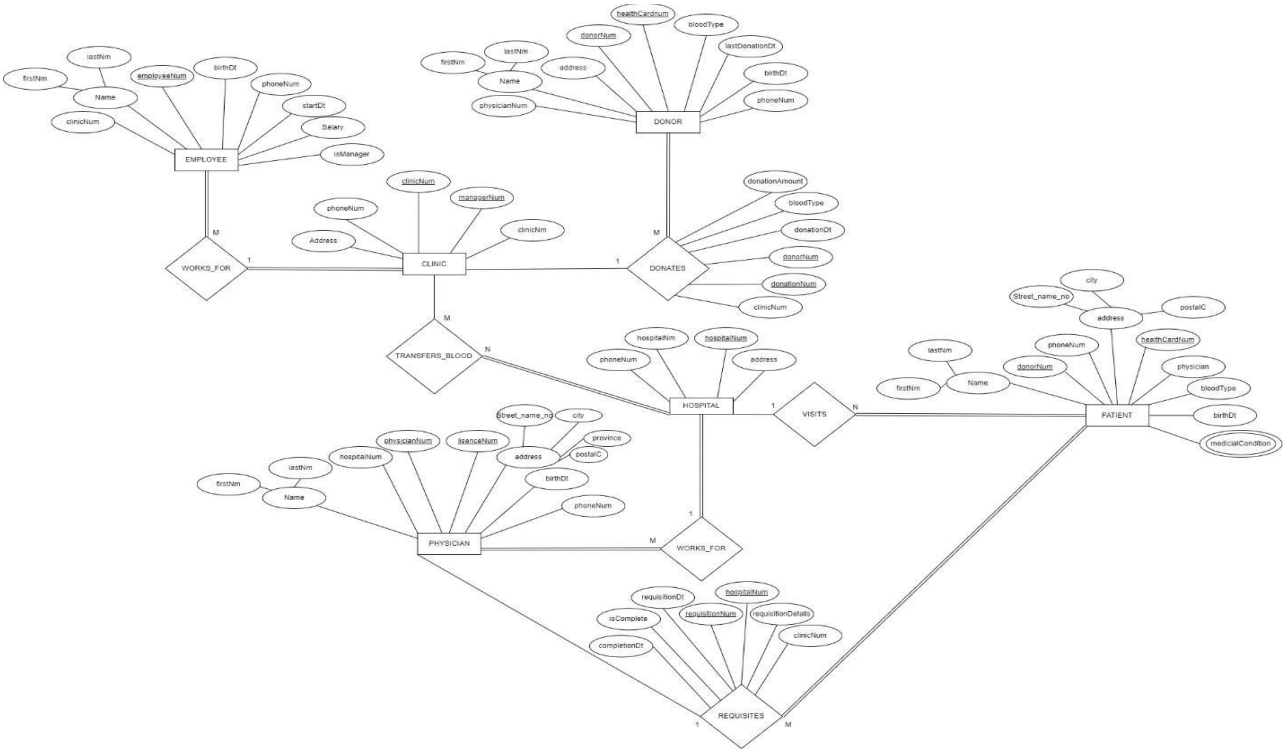
This shows the relationship between the different instantiated classes and its relation with the system.

The object diagram depiction of the Blood Donation System Schema is as follows:



Entity Relationship Diagram

The following is the Entity-Relationship (ER) diagram that represents the relationships between the tables in the Blood Donation Management database. This diagram shows the different entities and their attributes and their relation with each other.



The definition of the diagram can be analysed below;

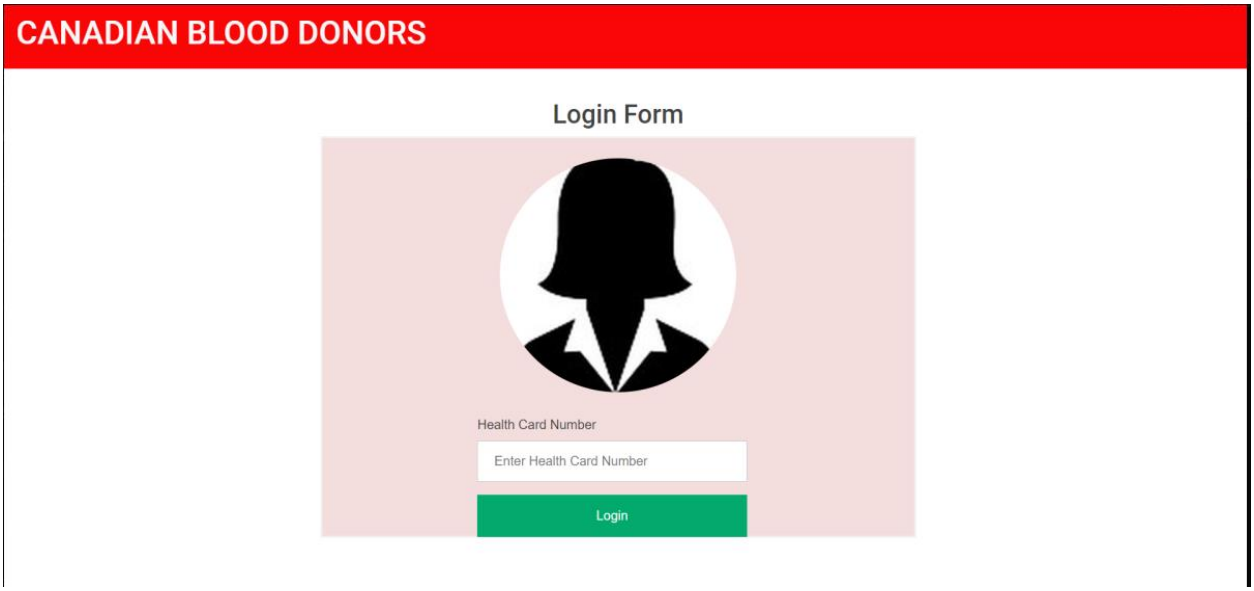
- Employee has a WORKS_FOR type of relationship with the Clinic, with a cardinality ratio of M:1 (many-to-one)
- Clinic has a TRANSFERS_BLOOD type of relationship with the Hospital, with a cardinality ratio of N:N and it has a DONATES type relationship with DONOR with a cardinality of 1:M
- Physician has a WORKS_FOR type of relationship with the Hospital, with a cardinality ratio of M:1 and it has a REQUISITES type relationship with Patient with a cardinality of 1:M
- Patient has a VISITS type of relationship with the Hospital, with a cardinality ratio of N:1.

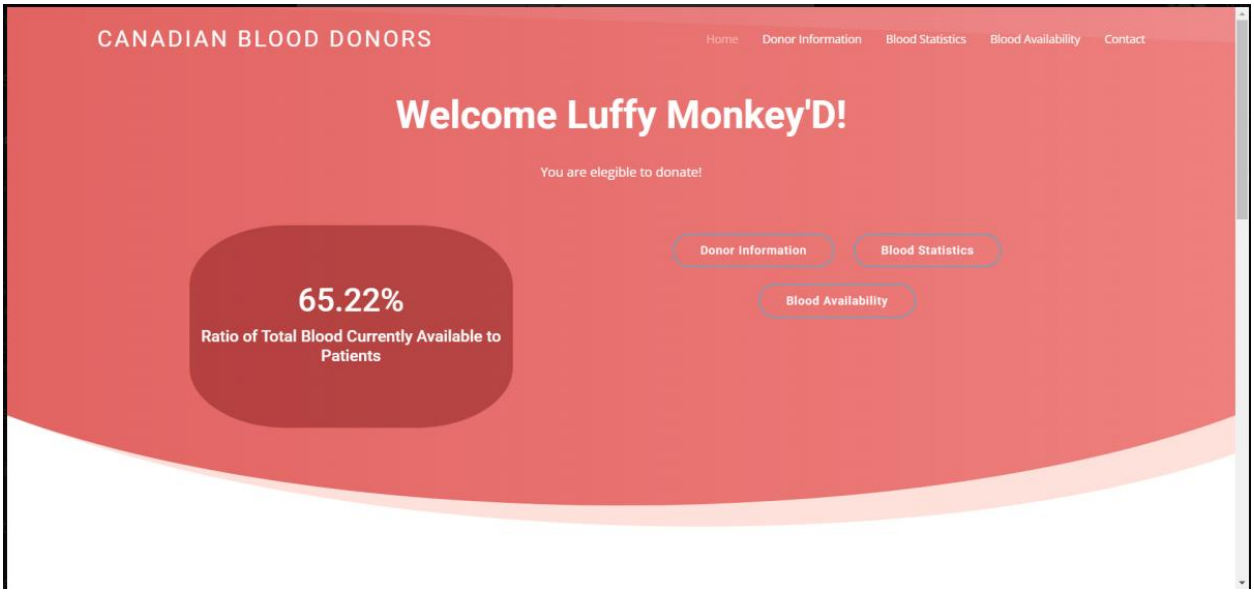
Frontend Design Application

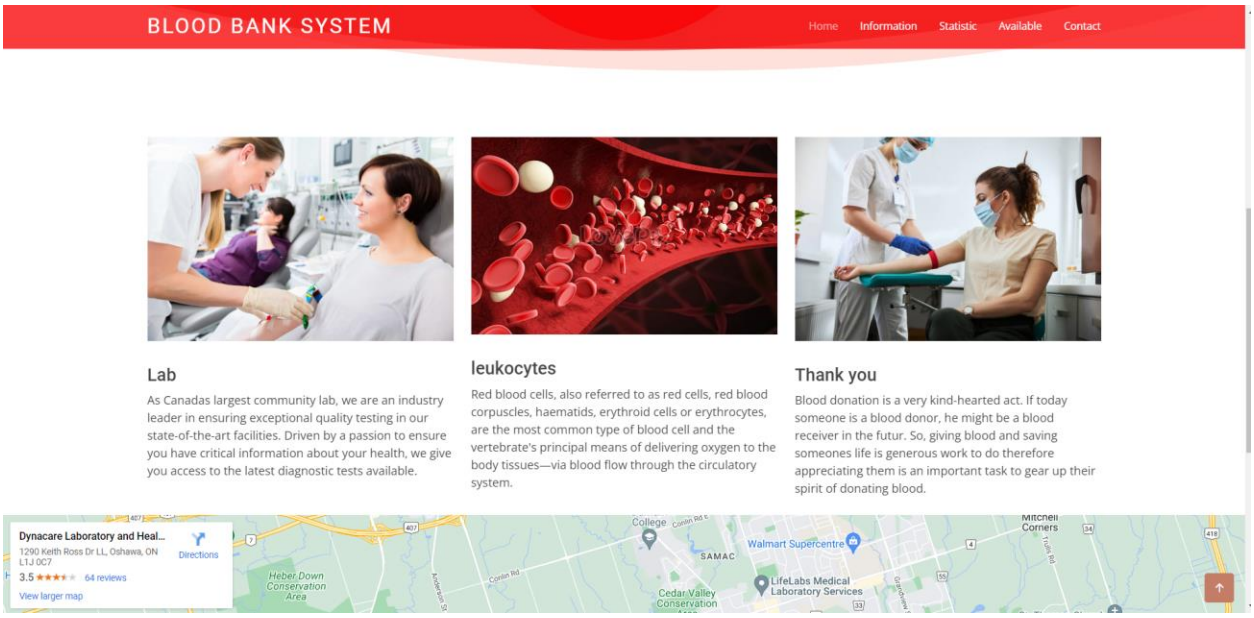
The development and designing of the frontend application was done using HTML, CSS, PHP and JAVASCRIPT web programming languages for the functionality of the system. It displays the client-side and graphical user interface of the website that includes the forms for the donors and patients, request forms for the hospital and clinics and so on. Each section is carefully designed to meet the needs of the clients or users and it is connected effectively to the database. The website is designed to be compatible with any device and easily accessible. Patients can easily fill out the forms required of them and their information is being stored in the database. Hospitals that require information of the donors or patients can easily navigate through the website and pull up the respective information which are stored in the database.

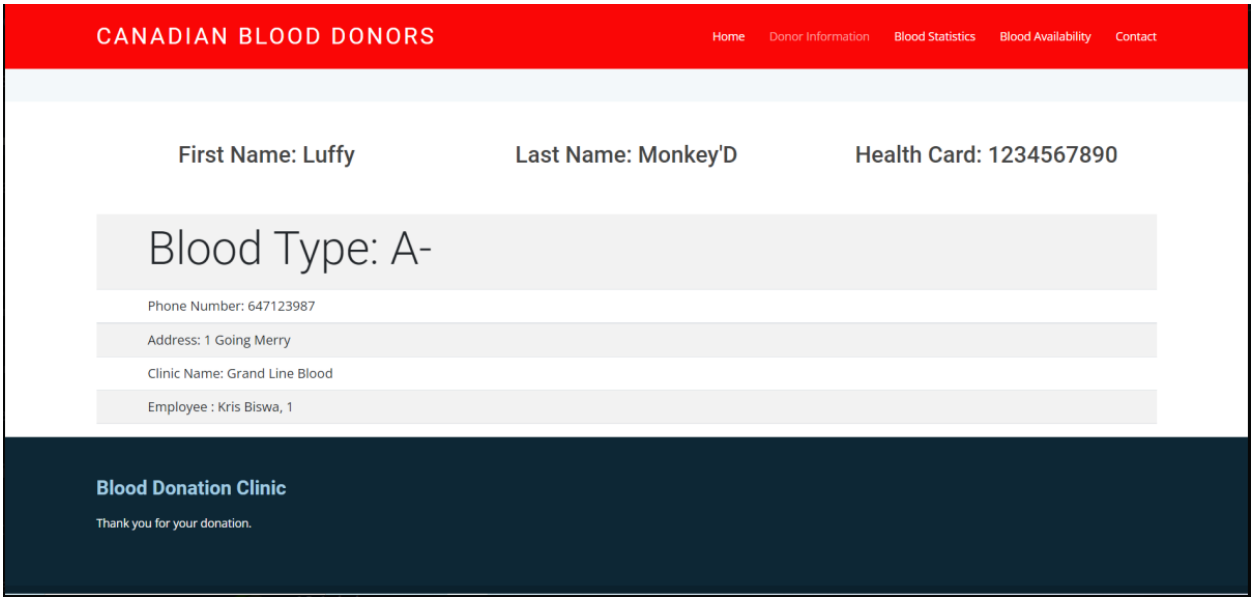
A sample of the login home page is displayed below, a patient inputs his or her health card information in the system. When this is done, the user is redirected to the homepage. An incorrect information returns an invalid message.

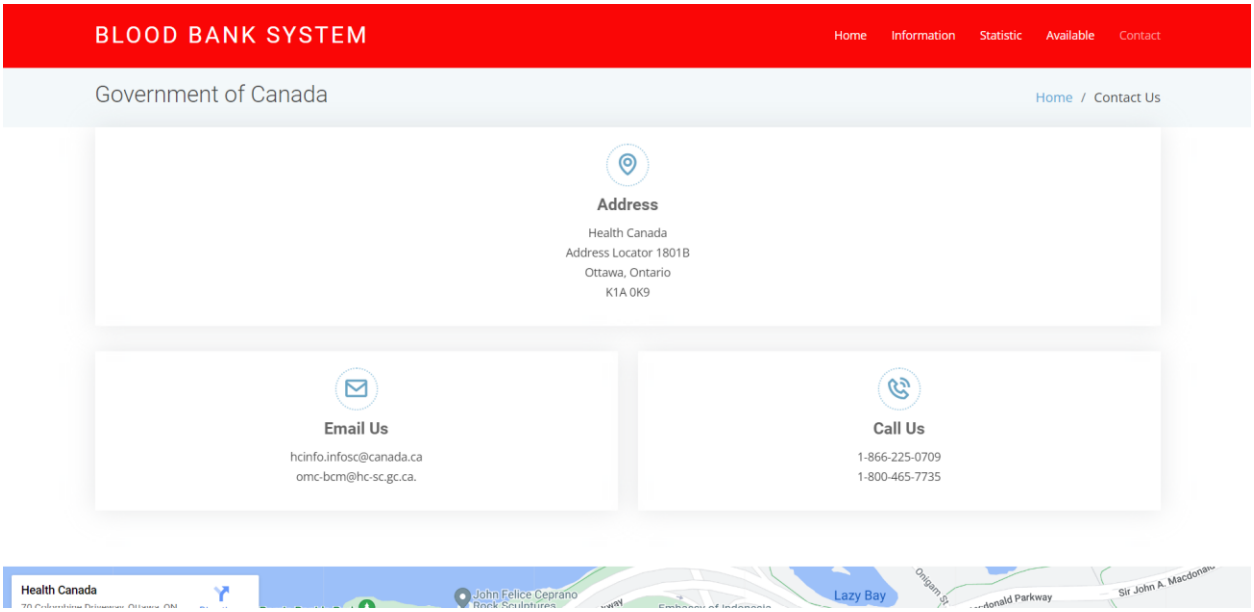
Using the $_SESSION array, we can keep information from previous queries across multiple pages. In this case, the entire "donor" table is stored in this array under the identifier "userID". We use a new view (view5) to receive the clinic name where the donor donated their blood to, while the other view (view6) retrieves information about the employee's name, and id number.

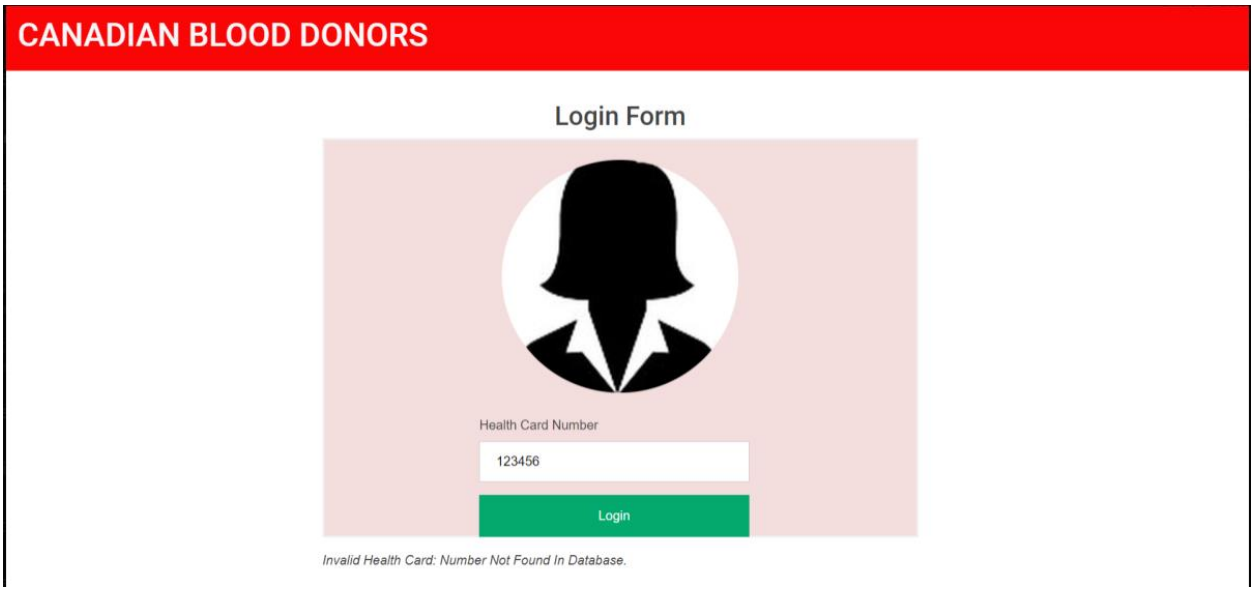

CANADIAN BLOOD DONORS
Login Form
Health Card Number
Enter Health Card Number
Login


CANADIAN BLOOD DONORS
Home
Donor Information
Blood Statistics
Blood Availability
Contact
Welcome Luffy Monkey'D!
You are elegible to donate!
65.22%
Ratio of Total Blood Currently Available to Patients
Donor Information
Blood Statistics
Blood Availability


BLOOD BANK SYSTEM
Home
Information
Statistic
Available
Contact
Lab
As Canadas largest community lab, we are an industry leader in ensuring exceptional quality testing in our state-of-the-art facilities. Driven by a passion to ensure you have critical information about your health, we give you access to the latest diagnostic tests available.
leukocytes
Red blood cells, also referred to as red cells, red blood corpuscles, haematids, erythroid cells or erythrocytes, are the most common type of blood cell and the vertebrate's principal means of delivering oxygen to the body tissues—via blood flow through the circulatory system.
Thank you
Blood donation is a very kind-hearted act. If today someone is a blood donor, he might be a blood receiver in the futur. So, giving blood and saving someones life is generous work to do therefore appreciating them is an important task to gear up their spirit of donating blood.
Dynacare Laboratory and Heal...
1290 Keith Ross Dr LL, Oshawa, ON L1J 0C7
3.5
64 reviews
View larger map
Directions
Heber Down Conservation Area
College
SAMAC
Walmart Supercentre
LifeLabs Medical Laboratory Services
Cedar Valley Conservation
Mitchell Corners


CANADIAN BLOOD DONORS
Home
Donor Information
Blood Statistics
Blood Availability
Contact
First Name: Luffy
Last Name: Monkey'D
Health Card: 1234567890
Blood Type: A-
Phone Number: 647123987
Address: 1 Going Merry
Clinic Name: Grand Line Blood
Employee : Kris Biswa, 1
Blood Donation Clinic
Thank you for your donation.


BLOOD BANK SYSTEM
Home
Information
Statistic
Available
Contact
Government of Canada
Home / Contact Us
Address
Health Canada
Address Locator 1801B
Ottawa, Ontario
K1A 0K9
Email Us
hcinfo.infosc@canada.ca
omc-bcm@hc-sc.gc.ca.
Call Us
1-866-225-0709
1-800-465-7735
Health Canada
Lazy Bay


CANADIAN BLOOD DONORS
Login Form
Health Card Number
123456
Login
Invalid Health Card: Number Not Found In Database.

Conclusion

Finally, through a series of steps, we were able to design a fully functional Blood Donation Management System (BBMS) that can be deployed on a web browser and that satisfies all the software requirements of a standard database, it is able to store, process, retrieve and analyze information concerned with the administrative and inventory management. We were also able to address the primary concern of most similar management systems which is transparency, our innovative solution is more efficient as there is no blood storage involved, once blood requirement is met, the donor is provided. Additionally, our system was also able to cater to the pressing need of increasing blood donor reach thereby making the blood donation process more smooth. Blood donors can now view all the intricate details of the donation process, make a donor request and submit eligibility at the click of their fingers.

In relation to the course, the knowledge acquired in class and during the course of the semester has helped in the development of this website. We are able to incorporate the frontend and database together in order to achieve a fully functional website. Information can be pulled up from the database by passing different queries no matter how difficult it may seem to obtain.

Appendix

Below are a few screenshots of parts of the project and pieces of code that have helped in achieving this project as well as some queries passed in the database.

```php
// This file uses an html form to get a user's submission and validate their inputted credentials using the database.

<?php
include 'connect2DB.php'; // Must include connect2DB.php in order to connect to the database.

    $invalidHCN = false; // Variable meant to indicate if the entered credentials are valid.

    if ($_SERVER['REQUEST_METHOD'] === "POST") { // If

        $conn = OpenConnection(); // Open connection to the database.

        $healthCardNum = $_POST['healthCardNum']; // Store the username from the POST global array (user input collection) into healthCardNum.

        $view1 = sprintf("SELECT * FROM donor
                          WHERE healthCardNum='%s'",
                          $conn->real_escape_string($healthCardNum)); // Query instructions which fetches any results (tuples) that matches the
                          inputted username.

        $view1Result = $conn->query($view1); // Connect to the database, execute the query, and store the results into the database.
        $user = $view1Result->fetch_assoc(); // Store the query result in an array.

        if ($user){ // If a match was found...

            session_start(); // Start a session to keep the user's information between pages.
            session_regenerate_id(); // Regenerate session id

            $_SESSION["userID"] = $user["healthCardNum"]; // Store the username in the SESSION global array under the name "userID"

            header('Location: index.php'); // Redirect user to home page.
            exit; // Exit from this script (rest of it does not execute).
        }

        $invalidHCN = true; // If the script makes it this far (doesn't exit), then the credentials were incorrect and this variable is set to true.

        CloseConnection($conn); // Close the connection to the database.
    }
?>
```

```php
    <form method="post">
      <div class="imgcontainer">
        <img src="picture8.PNG" alt="Avatar" class="avatar">
      </div>

      <div class="container" style="margin-left:175px;">
        <label for="uname">
          <div>
            <span style="text-align:center; margin: left 50px; ;">Health Card Number</span>
          </div>
        </label>

        <!-- Saves previous entry in input space/bar-->
        <input type="text" placeholder="Enter Health Card Number" name="healthCardNum" value="<?= htmlspecialchars($healthCardNum ?? "") ?>"
        required>
        <button type="submit" style="text-align: center;">Login</button>

    </form>
  </div>

    <?php if ($invalidHCN): ?>  <!-- Embedded php command which checks if the credentials were invalid-->
      <em>Invalid Health Card: Number Not Found In Database.</em>
    <?php endif; ?>

  </body>
</html>
```

```sql
/* View 1 */
/* Find the names phone numbers and blood types of all people who have made a blood donation before */
/* Could be used to solicit repeat donations */
select s.firstNm, s.phoneNum, s.address, d.bloodType, d.donationAmount, c.clinicNm
from donor s
join donation d
on s.donorNum = d.donorNum
join clinic c
on c.clinicNum = d.clinicNum;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

firstNm	phoneNum	address	bloodType	donationAmount	clinicNm
Shigeo	1234567890	24 Seasoning City Rd	AB+	1L	Tokyo Blood Bank
Tanjiro	NULL	1 Wandering Swordsman Ave	A+	2L	Muzan Blood Services
Tanjiro	NULL	1 Wandering Swordsman Ave	A+	2L	Muzan Blood Services
Nezuko	NULL	2 Wandering Swordsman Ave	B-	0.5L	Muzan Blood Services
Yuji	7777777777	Tokyo Jujutsu High School of Sorcery	AB-	1L	Lugnica Blood Center
Luffy	NULL	1 Going Merry	A-	1L	Grand Line Blood

```sql
/*Find every donor number whose blood type matchesa specific patient's bloodtype
useful to find donated blood that is compatible with  patient who may need it*/
SELECT d.donorNum
FROM donation d, patient p
WHERE D.bloodType=p.bloodType and p.healthCardNum=1234123123;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

donorNum
2
2

```sql
/* View 2 */
/* Look for physicians who have no patients group by  */
/* useful to see if your doctors are slacking */
select *
from physician p
where p.physicianNum != all (
    select s.physician
    from patient s
    group by s.physician);
```

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

physicianNum	lisenceNum	hospitalNum	firstNm	lastNm	phoneNum	address	birthDt
6	CAMD7654321	5	Matthew	NULL	4000000004	223 Wilson Ave	2004-04-04
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

```
Limit to 1000 rows
2    FROM bloodbanksystem.employee
3    LEFT JOIN clinic ON employee.clinicNum=clinic.clinicNum
4    UNION
5    SELECT *
6    FROM bloodbanksystem.employee
7    RIGHT JOIN clinic ON employee.clinicNum=clinic.clinicNum;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

yeeNum	clinicNum	firstNm	lastNm	birthDt	phoneNum	startDt	salary	isManager	clinicNum	clinicNm	phoneNum	address	managerNum
	1	Kris	Biswa	2000-01-01	1001001000	2020-01-01	100000	NULL	1	Tokyo Blood Bank	1111111111	address 1	NULL
	2	Cole	McMullin	0001-01-01	2002002000	2020-01-01	1000000	1	2	Grand Line Blood	2222222222	address 2	NULL
	3	Ononsen	Aziegbe	2000-01-01	3003003000	2021-01-01	2000	NULL	3	Muzan Blood Services	3333333333	address 3	4
	3	Kibutsuji	Muzan	2016-06-03	4004004000	2021-01-01	1000000	1	3	Muzan Blood Services	3333333333	address 3	4
	4	Abdullah	Khan	2000-01-01	5005005000	2022-01-01	20000	1	4	Lugnica Blood Center	4444444444	address 4	NULL
	3	Stanley	Watemi	2000-01-01	6006006000	2022-01-01	20000	NULL	3	Muzan Blood Services	3333333333	address 3	4
	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	5	Spirit Blood Donation Services	5555555555	address 5	NULL
	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	6	Toronto Blood Bank	6666666666	address 6	NULL

```
Limit to 1000 rows
1    /* look for all donors with A+ or A- blood type who have given blood */
2    /* useful for finding people who may give blood again */
3    select s.donorNum, s.firstNm, s.lastNm, s.bloodType
4    from donor s, donation d
5    where s.donorNum = d.donorNum
6    and d.bloodType = any (
7            select s.bloodType
8            from donor s
9            where s.bloodType = 'A+' or s.bloodType = 'A-');
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

donorNum	firstNm	lastNm	bloodType
2	Tanjiro	Kamado	A+
2	Tanjiro	Kamado	A+
1	Luffy	Monkey'D	A-

References

Canadian Blood Services. (n.d.). Canada's Lifeline. https://www.blood.ca/en

Shamkant, E. R. A. N. (n.d.). *Fundamentals Of Database System 7Th Edition*.