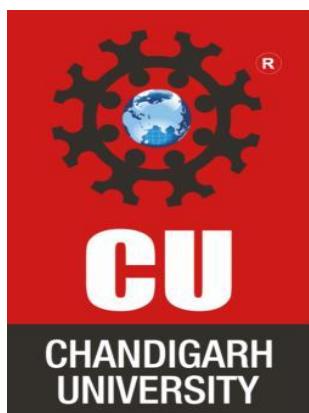




DEPARTMENT OF
UNIVERSITY INSTITUTE OF COMPUTING
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PROJECT FILE

SUBJECT NAME: DATA STRUCTURE

SUBJECT CODE: 24CAP-152

Submitted by:

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Submitted To:

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Signature :



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Name: Ritesh Raj UID:

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Date:



PROJECT FILE

Aim: The Contact List Manager

Aim of the Project

The aim of this project is to **create a simple Contact Manager** using **C programming** that allows users to **add, search, edit, and delete contacts** efficiently.

This project is designed to help users **store and manage contact details** dynamically using a **Doubly Linked List**, ensuring smooth **insertion, deletion, and navigation** of contacts. It provides a **user-friendly menu-driven interface**, making contact management simple and efficient.

This project also enhances **understanding of data structures**, particularly **linked lists, memory allocation, and CRUD operations** in C programming.

Introduction

The **Contact List Manager** is a simple C program that helps users **store, search, update, and delete contacts** easily. It uses a **Doubly Linked List**, allowing contacts to be added and removed without wasting memory.

Unlike an array, which has a fixed size, a **linked list grows dynamically**, making it more efficient for managing contacts. This project is great for **learning data structures** and improving **C programming skills**.

Why Use a Doubly Linked List?

- Allows **bi-directional traversal** (forward & backward).
- Supports **efficient insertion and deletion** without shifting elements (unlike arrays).
- Provides **dynamic memory allocation** to handle contacts dynamically.

Why is it Useful?

- **Efficient Contact Management** – Quickly add, search, update, or delete contacts.
- **Dynamic Storage** – Unlike arrays, linked lists allow unlimited contacts without wasting memory.
- **Easy Navigation** – Move forward and backward through the contact list.
- **Practical Application** – Demonstrates real-world use of **Data Structures in C**.

How Does This Project Work?

1. The program stores contacts using a **Doubly Linked List**.
2. The user can **add contacts** by entering a **name and phone number**.
3. The user can **view all saved contacts** in the list.
4. A **search function** helps find a contact by name.
5. Users can **update** an existing contact's phone number.
6. A **delete function** removes unwanted contacts.
7. The **navigation feature** allows moving forward and backward through contacts.
8. The program runs **through a menu-driven interface**, making it user-friendly.



Objectives

1. **Implement a Contact Management System using Doubly Linked List** – Store and manage contacts efficiently using dynamic memory allocation.
2. **Develop a Menu-Driven Program** – Create an interactive console-based program for managing contacts.
3. **Implement File Handling** – Store contacts permanently in a file to retain data even after exiting the program.
4. **Allow CRUD Operations** – Enable users to **add, search, edit, and delete** contacts efficiently.
5. **Ensure a User-Friendly Interface** – Use a **simple and clear menu-driven system** to make navigation easy for users.

Software & Tools Used

- **Programming Language:** C
- **Compiler:** GCC, Turbo C, or Code::Blocks
- **Operating System:** Windows/Linux

System Requirements

- **Minimum RAM:** 4GB
- **C Compiler Installed:** GCC, Turbo C, or Code::Blocks
- **Free Disk Space:** At least 50MB

Features

Users can efficiently store and manage their contacts.

1. **Add a Contact** – Store a new contact with a name and phone number.
2. **View All Contacts** – Display the complete list of saved contacts.
3. **Search for a Contact** – Find a contact by entering their name.
4. **Update Contact Details** – Modify an existing contact's phone number.
5. **Delete a Contact** – Remove a contact from the list.
6. **Move Forward & Backward** – Navigate through the contact list easily.
7. **Exit the Program** – Close the application safely without losing data (if file storage is added).

Project Scope

The **Contact List Manager** is a **mini-project** designed to help students learn:

1. **Doubly Linked Lists** – Efficiently storing and managing contacts.
2. **Dynamic Memory Allocation** – Managing memory efficiently using malloc() and free().
3. **CRUD Operations** – Performing Create, Read, Update, and Delete operations.
4. **User Interaction** – Developing a menu-driven system for contact management.
5. **Algorithm Development** – Implementing search, insert, and delete functions in C.



Project Implementation

Modules in the Project

1. Main Menu

- Displays options for the user to perform actions such as adding, searching, editing, deleting, moving through contacts, displaying all contacts, and exiting.

2. Add Contact

- Stores a new contact in the **doubly linked list**.
- Takes **name** and **phone number** as input.
- Inserts the contact at the **beginning** of the list.

3. Search Contact

- Finds a contact by **name**.
- If found, displays the contact's details.
- If not found, shows an error message.

4. Edit Contact

- Searches for a contact by **name**.
- If found, allows the user to **update the phone number**.

5. Delete Contact

- Finds a contact by **name** and removes it.
- Ensures correct re-linking of nodes before freeing memory.

6. Display Contacts

- Displays **all saved contacts** in the list.
- If the list is empty, prints a **No contacts available** message.

7. Move Forward

- Traverses the contact list **from head to tail**.
- Displays each contact's details.

8. Move Backward

- Moves to the **last contact** first.
- Traverses backward to display contacts in **reverse order**.

9. Exit

- Terminates the program with a **goodbye message**.

Code Explanation

void addContact()

- Creates a new contact using `malloc()`.
- Takes input for name and phone.
- Inserts the contact at the beginning of the doubly linked list.

void displayContacts()

- Traverses the entire doubly linked list and prints all contacts.
- If the list is empty, it displays a No contacts available message.

void searchContact()

- Takes a name as input.
- Iterates through the linked list to find a match.

- If found, displays the contact details; otherwise, shows a Contact Not Found message.

void editContact()

- Searches for a contact by name.
- If found, allows the user to update the phone number.

void deleteContact()

- Finds a contact by name.
- Adjusts the previous and next pointers to remove the contact.
- Frees the memory allocated for the contact.

void moveForward()

- Starts from the head of the list and moves to the end.
- Displays each contact in order.

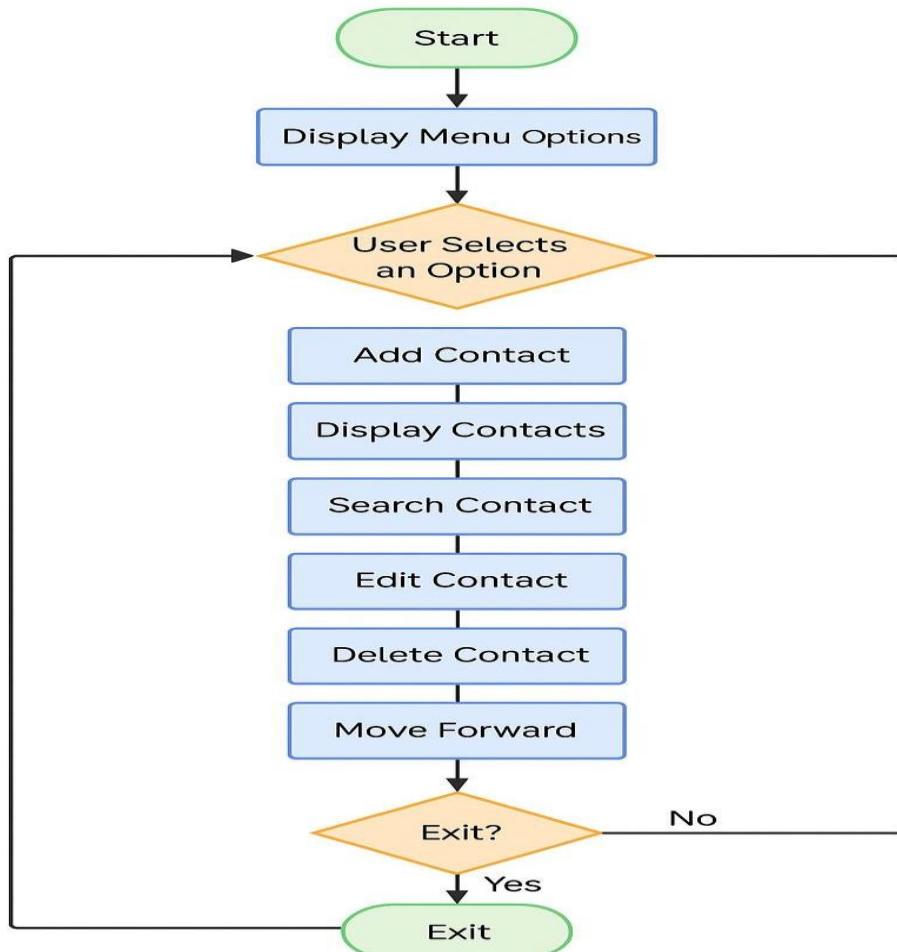
void moveBackward()

- Moves to the last contact first.
- Traverses backward through the doubly linked list to display contacts in reverse order.

Exit

- Terminates the program with a goodbye message.

Flowchart





Code Implementation

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

// Structure for Contact
typedef struct Contact
{
    char name[50];
    char phone[15];
    struct Contact *prev, *next;
} Contact;

Contact *head = NULL; // Head of the doubly linked list

// Function to add a new contact
void addContact()
{
    Contact *newContact = (Contact *)malloc(sizeof(Contact));
    printf("\nEnter Name: ");
    scanf(" %49[^n]", newContact->name);
    printf("Enter Phone Number: ");
    scanf(" %14s", newContact->phone);

    newContact->prev = NULL;
    newContact->next = head;
    if (head != NULL)
    {
        head->prev = newContact;
    }
    head = newContact;
    printf("  Contact Added Successfully!\n");
}

// Function to display all contacts
void displayContacts()
{
    if (head == NULL)
```



```
{  
    printf("\n ✗ No contacts available.\n");  
    return;  
}  
Contact *temp = head;  
printf("\n ☎ Contact List:\n");  
while (temp != NULL)  
{  
    printf("Name: %s, Phone: %s\n", temp->name, temp->phone);  
    temp = temp->next;  
}  
}  
  
// Function to search for a contact  
void searchContact()  
{  
    if (head == NULL)  
    {  
        printf("\n ✗ No contacts available.\n");  
        return;  
    }  
    char searchName[50];  
    printf("\nEnter Name to Search: ");  
    scanf(" %49[^\\n]", searchName);  
  
    Contact *temp = head;  
    while (temp != NULL)  
    {  
        if (strcmp(temp->name, searchName) == 0)  
        {  
            printf(" ✓ Contact Found: Name: %s, Phone: %s\n", temp->name, temp->phone);  
            return;  
        }  
        temp = temp->next;  
    }  
    printf(" ✗ Contact Not Found.\n");  
}
```



```
// Function to delete a contact
void deleteContact()
{
    if (head == NULL)
    {
        printf("\n X No contacts available to delete.\n");
        return;
    }
    char deleteName[50];
    printf("\nEnter Name to Delete: ");
    scanf(" %49[^\\n]", deleteName);

    Contact *temp = head;
    while (temp != NULL)
    {
        if (strcmp(temp->name, deleteName) == 0)
        {
            if (temp->prev != NULL)
            {
                temp->prev->next = temp->next;
            }
            else
            {
                head = temp->next;
            }
            if (temp->next != NULL)
            {
                temp->next->prev = temp->prev;
            }
            free(temp);
            printf(" ✓ Contact Deleted Successfully!\n");
            return;
        }
        temp = temp->next;
    }
    printf(" X Contact Not Found.\n");
}
```



```
// Function to edit a contact
void editContact()
{
    if (head == NULL)
    {
        printf("\n X No contacts available to edit.\n");
        return;
    }
    char searchName[50];
    printf("\nEnter Name to Edit: ");
    scanf(" %49[^\\n]", searchName);

    Contact *temp = head;
    while (temp != NULL)
    {
        if (strcmp(temp->name, searchName) == 0)
        {
            printf("Enter New Phone Number: ");
            scanf(" %14s", temp->phone);
            printf(" ✓ Contact Updated Successfully!\n");
            return;
        }
        temp = temp->next;
    }
    printf(" X Contact Not Found.\n");
}
```

```
// Function to move forward through the contact list
void moveForward()
{
    if (head == NULL)
    {
        printf("\n X No contacts available.\n");
        return;
    }
    Contact *temp = head;
    int count = 1;
    printf("\n→ Moving Forward:\n");
```



```
while (temp != NULL)
{
    printf("[%d] Name: %s, Phone: %s\n", count++, temp->name, temp->phone);
    temp = temp->next;
}

// Function to move backward through the contact list
void moveBackward()
{
    if (head == NULL)
    {
        printf("\n X No contacts available.\n");
        return;
    }
    Contact *temp = head;

    // Move to the last contact
    while (temp->next != NULL)
    {
        temp = temp->next;
    }

    int count = 1;
    printf("\n← Moving Backward:\n");
    while (temp != NULL)
    {
        printf("[%d] Name: %s, Phone: %s\n", count++, temp->name, temp->phone);
        temp = temp->prev;
    }
}

// Function to display menu
void menu()
{
    int choice;
    while (1)
    {
```



```
printf("\n📞 Contact Manager\n");
printf("1. Add Contact\n");
printf("2. Display Contacts\n");
printf("3. Search Contact\n");
printf("4. Edit Contact\n");
printf("5. Delete Contact\n");
printf("6. Move Forward\n");
printf("7. Move Backward\n");
printf("8. Exit\n");
printf("Enter your choice: ");
scanf("%d", &choice);

switch (choice)
{
    case 1: addContact(); break;
    case 2: displayContacts(); break;
    case 3: searchContact(); break;
    case 4: editContact(); break;
    case 5: deleteContact(); break;
    case 6: moveForward(); break;
    case 7: moveBackward(); break;
    case 8: printf("👋 Exiting Contact Manager. Goodbye!\n"); return;
    default: printf("✖ Invalid choice. Please try again.\n");
}

}

int main()
{
    menu();
    return 0;
}
```



Output

Output

Clear

- 📞 Contact Manager
 - 1. Add Contact
 - 2. Display Contacts
 - 3. Search Contact
 - 4. Edit Contact
 - 5. Delete Contact
 - 6. Move Forward
 - 7. Move Backward
 - 8. Exit

Enter your choice: 1

Enter Name: Ritesh

Enter Phone Number: 8709624574

✓ Contact Added Successfully!

Output

Clear

- 📞 Contact Manager
 - 1. Add Contact
 - 2. Display Contacts
 - 3. Search Contact
 - 4. Edit Contact
 - 5. Delete Contact
 - 6. Move Forward
 - 7. Move Backward
 - 8. Exit

Enter your choice: 1

Enter Name: Uday

Enter Phone Number: 9015155535

✓ Contact Added Successfully!



Output

Clear

📞 Contact Manager

1. Add Contact
2. Display Contacts
3. Search Contact
4. Edit Contact
5. Delete Contact
6. Move Forward
7. Move Backward
8. Exit

Enter your choice: 1

Enter Name: Nitin

Enter Phone Number: 7837925739

Contact Added Successfully!

Output

Clear

📞 Contact Manager

1. Add Contact
2. Display Contacts
3. Search Contact
4. Edit Contact
5. Delete Contact
6. Move Forward
7. Move Backward
8. Exit

Enter your choice: 2

📞 Contact List:

Name: Nitin, Phone: 7837925739

Name: Uday, Phone: 9015155535

Name: Ritesh, Phone: 8709624574

Output

Clear

📞 Contact Manager

1. Add Contact
2. Display Contacts
3. Search Contact
4. Edit Contact
5. Delete Contact
6. Move Forward
7. Move Backward
8. Exit

Enter your choice: 3

Enter Name to Search: Ritesh

Contact Found: Name: Ritesh, Phone: 8709624574



Output

Clear

📞 Contact Manager

1. Add Contact
2. Display Contacts
3. Search Contact
4. Edit Contact
5. Delete Contact
6. Move Forward
7. Move Backward
8. Exit

Enter your choice: 4

Enter Name to Edit: Ritesh

Enter New Phone Number: 8709624574

Contact Updated Successfully!

Output

Clear

📞 Contact Manager

1. Add Contact
2. Display Contacts
3. Search Contact
4. Edit Contact
5. Delete Contact
6. Move Forward
7. Move Backward
8. Exit

Enter your choice: 6

→ Moving Forward:

- [1] Name: Nitin, Phone: 7837925739
- [2] Name: Uday, Phone: 9015155535
- [3] Name: Ritesh, Phone: 8709624574

Output

Clear

📞 Contact Manager

1. Add Contact
2. Display Contacts
3. Search Contact
4. Edit Contact
5. Delete Contact
6. Move Forward
7. Move Backward
8. Exit

Enter your choice: 7

← Moving Backward:

- [1] Name: Ritesh, Phone: 8709624574
- [2] Name: Uday, Phone: 9015155535
- [3] Name: Nitin, Phone: 7837925739



Output

Clear

- 📞 Contact Manager
 - 1. Add Contact
 - 2. Display Contacts
 - 3. Search Contact
 - 4. Edit Contact
 - 5. Delete Contact
 - 6. Move Forward
 - 7. Move Backward
 - 8. Exit

Enter your choice: 5

Enter Name to Delete: Nitin

Contact Deleted Successfully!

Output

Clear

- 📞 Contact Manager
 - 1. Add Contact
 - 2. Display Contacts
 - 3. Search Contact
 - 4. Edit Contact
 - 5. Delete Contact
 - 6. Move Forward
 - 7. Move Backward
 - 8. Exit

Enter your choice: 2

📞 Contact List:

Name: Uday, Phone: 9015155535

Name: Ritesh, Phone: 8709624574

- 📞 Contact Manager
 - 1. Add Contact
 - 2. Display Contacts
 - 3. Search Contact
 - 4. Edit Contact
 - 5. Delete Contact
 - 6. Move Forward
 - 7. Move Backward
 - 8. Exit

Enter your choice: 8

👋 Exiting Contact Manager. Goodbye!



Limitations & Future Enhancements

Limitations:

1. **No GUI, Only Console-Based** – The application runs in a terminal, making it less user-friendly.
2. **No Cloud Synchronization** – Contacts are lost after exiting the program since there's no online storage.
3. **Limited Search Functionality** – Users can only search by full name, not partial names or phone numbers.

Future Enhancements:

1. **Convert to a GUI-Based Application** – Develop a user-friendly interface using **Python (Tkinter/PyQt)** or **Java (Swing/JavaFX)**.
2. **Add Import/Export Feature** – Allow users to **save and load contacts** using **CSV or JSON files**.
3. **Sync with Online Services** – Integrate with **Google Contacts or iCloud** for cloud synchronization.

Conclusion

Through this project, I learned how to implement a **doubly linked list** for managing contacts efficiently. It enhanced my understanding of **dynamic memory allocation, file handling, and user interaction** in C programming. Debugging issues like **memory leaks and input handling** improved my problem-solving skills.

This project demonstrates the **practical application of data structures** in real-world scenarios. Although it's a **basic console-based contact manager**, it can be extended with **GUI, cloud integration, and database support** to create a fully functional contact management system.

References

Here are five useful websites for C programming references and resources:

1. GeeksforGeeks:

<https://www.geeksforgeeks.org/c-language-introduction/?ref=shm>

2. W3schools:

https://www.w3schools.com/c/c_intro.php

3. javapoints:

<https://www.javatpoint.com/c-programming-language-tutorial>

4. Learn c:

https://www.learn-c.org/#google_vignette

5. Codecademy:

<https://www.codecademy.com/learn/paths/c>