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CSE2003 DATA STRUCTURES AND ALGORITHMS

SLOT : F1

J COMPONENT

PROJECT REPORT

PERSONAL DATA DIRECTORY

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INTRODUCTION :

The personal data directory contains various information about a person such as phone number , address, emailID, Aadhaar number etc. Person using the directory can easily obtain the information of the person of his/her interest .

The directory supports easy addition and removal of informations . Particular information can be deleted or updated if necessary.

The directory also supports addition of more information on a particular field like storing more than one phone number of a person , more than one address , etc.

The directory performs efficient traversal of information and efficient searching. The directory is linked with files for permanent storage of data.

The search functionality of the directory gives suggestions for searching the name of the person. It takes the input alphabets as argument and filters the names in the directory so that it is convenient for the user to search for a particular name.

After the name of the person has been retrieved , the user is provided with the option of viewing the details of his/her own interest or the complete details of the person . This provides high degree of usability to the user.

Data Structures Used:

The personal data directory makes use of the 'trie' data structure which is basically a complex, and highly branched tree. Even though it is highly complex, it helps in easy navigation through data which can be broken down like arrays. Since names are strings which are basically an array of characters, using a trie data structure would be a highly plausible solution.

This data structure has been used in the following program because it requires easy access to the various amounts of data as per the name suggests. All the names are stored inside the trie data structure and the data of these names is accessed by a private key which is unique to that name alone, thus avoiding confusion between the data accepted by the program from the user.

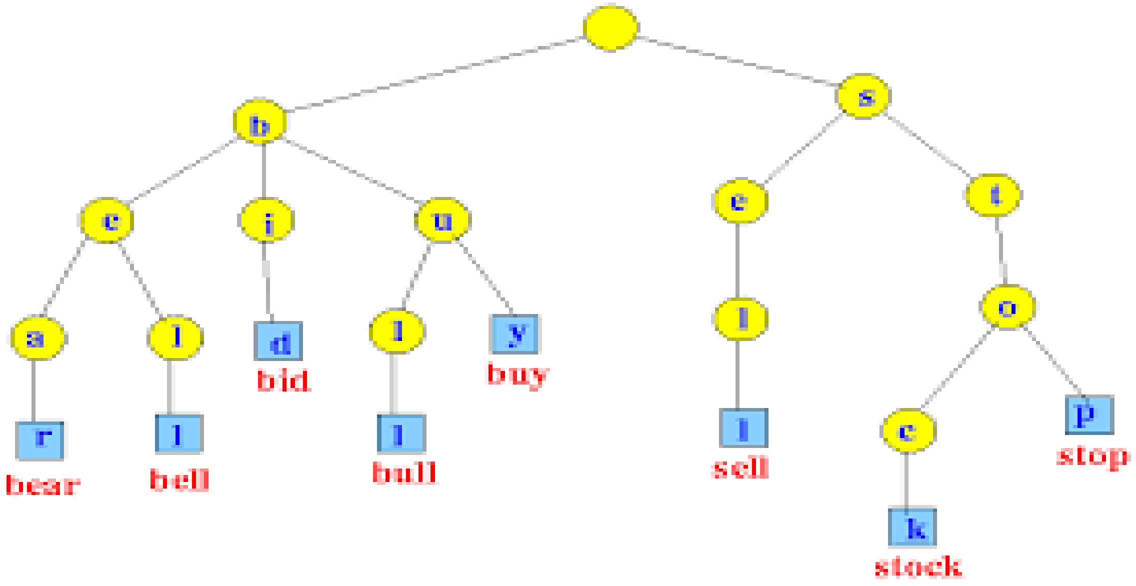
The address of the person is stored in a simple structure for easy access of address while the rest of the data – phone number, Aadhar no. etc. are stored as simple integer arrays. The person can enter the basic data to define his/her identity in the physical and online world. Their phone number(s), Aadhar number, email id(s) and their address(es) can be entered by them, and can be accessed whenever required during the execution of the program.

The trie data structure helps the accessor see the names present in the directory that resemble the name he/she types. For example, if names abc, xdi, abhhu, abyil and xyjfe are present in the directory, and the user types ab – the program shows the names abc, abyil and abhhu

REASON FOR USAGE OF DATA STRUCTURE :

This data structure can help in reduction of memory used by generic 2D character arrays as it uses pointers and is dynamically allocated. Plus, names containing the same initial substrings share the same substrings which help in saving the computer's memory thus enhancing its speed of compilation.

This data structure helps in grouping of the names in the data directory based on its features mentioned previously, and would thus be extremely easy for the user to access the names in the directory based on starting alphabets or substrings.



IMPLEMENTATION :

Each person is assigned a unique ID (PersonID) and this ID information will be stored in the ID field of the trie data structure . Using this ID , we can access the information of the particular person . This ID is randomly generated and assigned.

This ID will be linked to the numsearch linked list . The linked list contains informations such as Address , Aadhaar number , Phone number , EmailID , Date of birth etc .

Thus the search operation takes the name of the person as argument . It traverses the trie and if the required name is found in the trie , the id of the person is returned . This id is given as argument to the numsearch( ) function which will traverse the linked list . If the required ID is matched with the argument ID, the entire details of the person is retrieved .

The modify function also works in the same manner . The contents of the linked list gets overwritten by the new information.

The insert function takes the name as argument and adds the name on the trie it then assigns a ID to the person and calls the insert_numsearch() function by passing ID as the argument . The insert numsearch() function adds details such as Aadhar number , Phone number , Email ID etc . in the linked list with the ID as the argument ID.

The delete function takes the name of the person to be deleted as the argument and traverses the trie data structure . If the required name is found , it assignes the isend Boolean variable as false and returns the ID of the name.

Source Code:

```
#include<iostream>
#include<conio.h>
#include<fstream>
#include<stdlib.h>
#include<conio.h>
#include<string.h>
#include<stdbool.h>
#include<ctype.h>
#include<dos.h>
#include<windows.h>
#define CHAR_TO_INDEX(c) ((int)c - (int)'a')

using namespace std;

int cnt=0;
int flag=0;

/*void find_length(){
fstream f;
f.open("names.txt",ios::in);
string str;
while(std::getline(f,str)){
cnt++;
}
f.close();
}
*/
void gotoxy(short x,short y){
COORD pos={x,y};
SetConsoleCursorPosition(GetStdHandle(STD_OUTPUT_HANDLE
),pos);
}

struct address{
char doorno[90];
char streetname[90];
char area[90];
char state[90];
char country[90];
```

```
};

struct trienode{
struct trienode *children[26];
bool isend;
int id;
};

struct numsearch{
int id;
char num[20];
char snum[20];
struct address ad;
struct address ad1;
char emailid[90];
char semail[90];
char dob[90];
char aadhaar[90];
struct numsearch *next;
};

struct numsearch *start=NULL;

int check_aadhaar(char aadhaart[90]){
int i,j,k,l;
if(strlen(aadhaart)!=16){
return 0;
}
for(i=0;i<strlen(aadhaart);i++){

if(!isdigit(aadhaart[i])){
//cout<<"digit condition violated";
return 0;
}
}
return 1;
}

int check_mail(char email[90]){
int i,j,k,l,flag=0,flag1=0;
int n=strlen(email);
for(i=0;i<strlen(email);i++){
if(email[i]=='@')
flag=1;
}
if(email[n-4]=='.'&&email[n-3]=='c'&&email[n-
2]=='o'&&email[n-1]=='m'){
flag1=1;
}
if(flag==1&&flag1==1){
return 1;
}
return 0;
}




void insert_numsearch(int x,char pno[20]){
char email[90],dobt[90],aadhaart[90];
struct numsearch *t,*temp;
t=(struct numsearch *)malloc(sizeof(struct numsearch));
struct address add;
cout<<"Enter the address details\n";
cout<<"Enter the doorno ";
cin>>add.doorno;
cout<<"Enter the area ";
cin>>add.area;
cout<<"Enter the streetname ";
cin>>add.streetname;
cout<<"Enter the state ";
cin>>add.state;
cout<<"Enter the country ";
cin>>add.country;
cout<<"Enter mail id ";
    cin>>email;
    int checker=check_mail(email);
    while(checker==0){
    cout<<"Enter the valid emailid ";
    cin>>email;
    checker=check_mail(email);
}
cout<<"Enter date of birth in dd/mm/yyyy format";
cin>>dobt;
cout<<"Enter the aadhaar number of the person in
XXXXXXXXXXXXXXXX format ";
cin>>aadhaart;
int check=check_aadhaar(aadhaart);
while(check==0)
{
cout<<"Please type a valid aadhaar number : ";
cin>>aadhaart;
check=check_aadhaar(aadhaart);
}

fstream f;
    f.open("details.txt",ios::app);
    char fl[90];
    if(!f){
    //cout<<"File creation failed!!";
}
else{
//cout<<"New file created!!"<<endl;
f<<x<<" "<<pno<<" "<<add.doorno<<" "<<add.area<<"
"<<add.streetname<<" "<<add.state<<" "<<add.country<<"
"<<email<<" "<<dobt<<" "<<aadhaart<<endl;
f.close();
}
if(start==NULL){
start=t;
start->id=x;
strcpy(start->num,pno);
strcpy(start->ad.doorno,add.doorno);
strcpy(start->ad.area,add.area);
strcpy(start->ad.streetname,add.streetname);
strcpy(start->ad.state,add.state);
strcpy(start->ad.country,add.country);
strcpy(start->emailid,email);
strcpy(start->dob,dobt);
strcpy(start->aadhaar,aadhaart);
strcpy(start->snum,"0");
strcpy(start->semail,"0");
strcpy(start->ad1.doorno,"0");
start->next=NULL;

}
else{
temp=start;
while(temp->next!=NULL){
temp=temp->next;
}
temp->next=t;
t->id=x;
strcpy(t->num,pno);
strcpy(t->ad.doorno,add.doorno);
strcpy(t->ad.area,add.area);
strcpy(t->ad.streetname,add.streetname);
strcpy(t->ad.state,add.state);
strcpy(t->ad.country,add.country);
strcpy(t->emailid,email);
strcpy(t->dob,dobt);
strcpy(t->aadhaar,aadhaart);
strcpy(t->snum,"0");
strcpy(t->semail,"0");
strcpy(t->ad1.doorno,"0");

t->next=NULL;
}
}

bool isLeafNode(struct trienode *root)
{
    return root->isend != false;
}


void display(struct trienode *root, char str[], int
level)
{
    if (isLeafNode(root))
    {
        str[level] = '\0';
        cout<<str<<" "<<root->id<<endl;
    }

    int i;
    for (i = 0; i <26; i++)
    {

        if (root->children[i])
        {
            str[level] = i + 'a';
            display(root->children[i], str, level + 1);
        }
    }
}

void search_numsearch(int x){
int ch=1,choice,option;
struct numsearch *temp;
temp=start;
cout<<"\n1.View details\n2.Modify details\n3.Add more
details\n";
cin>>option;
if(option==1)
{

while(temp->next!=NULL){
if(temp->id==x){
 cout<<"Enter the choice!!!"<<endl;
do{
cout<<"1.View Phone number\n2.View Address\n3.View
Emailid\n4.Date of birth\n5.View Aadhaar number\n6.View
complete info\n";
cin>>choice;

 switch(choice){
case 1:{
if(strcmp(temp->num,"0")!=0)
cout<<"The phone number of the person is "<<temp-
>num<<endl;
else
cout<<"Not provided!!"<<endl;
if(strcmp(temp->snum,"0")!=0)
cout<<"The additional phone number of the person is
"<<temp->snum<<endl;
break;
}
case 2:{
cout<<"The address is :"<<temp->ad.doorno<<" "<<temp-
>ad.streetname<<" "<<temp->ad.area<<" "<<temp-
>ad.state<<" "<<temp->ad.country<<endl;
if(strcmp(temp->ad1.doorno,"0")!=0)
cout<<"The additional address is : "<<temp-
>ad1.doorno<<" "<<temp->ad1.streetname<<" "<<temp-
>ad1.area<<" "<<temp->ad1.state<<temp-
>ad1.country<<endl;
break;
}
case 3:{
if(strcmp(temp->emailid,"0")!=0)
cout<<"Emailid is "<<temp->emailid<<endl;
else
cout<<"Not provided!!"<<endl;
if(strcmp(temp->semail,"0")!=0)
cout<<"Additional email id is "<<temp->semail<<endl;
break;
}
case 4:{
cout<<"Date of birth is "<<temp->dob<<endl;
break;
}
case 5:{
if(strcmp(temp->aadhaar,"0")!=0)
cout<<"Aadhaar number : "<<temp->aadhaar<<endl;
else
cout<<"Not provided!!"<<endl;
break;
}
```

```
case 6:{
if(strcmp(temp->num,"0")!=0)
cout<<"The phone number of the person is "<<temp-
>num<<endl;
if(strcmp(temp->snum,"0")!=0)
cout<<"The additional phone number of the person is
"<<temp->snum<<endl;

cout<<"The address is :"<<temp->ad.doorno<<" "<<temp-
>ad.streetname<<" "<<temp->ad.area<<" "<<temp-
>ad.state<<" "<<temp->ad.country<<endl;
if(strcmp(temp->ad1.doorno,"0")!=0)
cout<<"The additional address is : "<<temp-
>ad1.doorno<<" "<<temp->ad1.streetname<<" "<<temp-
>ad1.area<<" "<<temp->ad1.state<<temp-
>ad1.country<<endl;

if(strcmp(temp->emailid,"0")!=0)
cout<<"Emailid is "<<temp->emailid<<endl;
if(strcmp(temp->semail,"0")!=0)
cout<<"Additional email id is "<<temp->semail<<endl;
cout<<"Date of birth is "<<temp->dob<<endl;
if(strcmp(temp->aadhaar,"0")!=0)
cout<<"Aadhaar number : "<<temp->aadhaar<<endl;

break;
}

}
  cout<<"Do you want to continue?(0/1)"<<endl;
cin>>ch;
}while(ch==1);
}
temp=temp->next;
}
if(temp->id==x){
cout<<"Enter the choice!!!"<<endl;
do{
cout<<"1.View Phone number\n2.View Address\n3.View
Emailid\n4.Date of birth\n5.View Aadhaar number\n6.View
```

```
complete info\n";
cin>>choice;

 switch(choice){
case 1:{
if(strcmp(temp->num,"0")!=0)
cout<<"The phone number of the person is "<<temp-
>num<<endl;
else
cout<<"Not provided!!"<<endl;
if(strcmp(temp->snum,"0")!=0)
cout<<"The additional phone number of the person is
"<<temp->snum<<endl;

break;
}
case 2:{

cout<<"The address is :"<<temp->ad.doorno<<" "<<temp-
>ad.streetname<<" "<<temp->ad.area<<" "<<temp-
>ad.state<<" "<<temp->ad.country<<endl;
if(strcmp(temp->ad1.doorno,"0")!=0)
cout<<"The additional address is : "<<temp-
>ad1.doorno<<" "<<temp->ad1.streetname<<" "<<temp-
>ad1.area<<" "<<temp->ad1.state<<temp-
>ad1.country<<endl;

break;
}
case 3:{
if(strcmp(temp->emailid,"0")!=0)
cout<<"Emailid is "<<temp->emailid<<endl;
else
cout<<"Not provided!!"<<endl;
if(strcmp(temp->semail,"0")!=0)
cout<<"Additional email id is "<<temp->semail<<endl;

break;
}
case 4:{
```

```
if(strcmp(temp->dob,"0")!=0)
cout<<"Date of birth is "<<temp->dob<<endl;
else
cout<<"Not provided!!"<<endl;
break;
}
case 5:{
if(strcmp(temp->aadhaar,"0")!=0)
cout<<"Aadhaar number : "<<temp->aadhaar<<endl;
else
cout<<"Not provided!!"<<endl;
break;
}
case 6:{
if(strcmp(temp->num,"0")!=0)
cout<<"The phone number of the person is "<<temp-
>num<<endl;
if(strcmp(temp->snum,"0")!=0)
cout<<"The additional phone number of the person is
"<<temp->snum<<endl;

cout<<"The address is :"<<temp->ad.doorno<<" "<<temp-
>ad.streetname<<" "<<temp->ad.area<<" "<<temp-
>ad.state<<" "<<temp->ad.country<<endl;
if(strcmp(temp->ad1.doorno,"0")!=0)
cout<<"The additional address is : "<<temp-
>ad1.doorno<<" "<<temp->ad1.streetname<<" "<<temp-
>ad1.area<<" "<<temp->ad1.state<<temp-
>ad1.country<<endl;

if(strcmp(temp->emailid,"0")!=0)
cout<<"Emailid is "<<temp->emailid<<endl;
if(strcmp(temp->semail,"0")!=0)
cout<<"Additional email id is "<<temp->semail<<endl;

cout<<"Date of birth is "<<temp->dob<<endl;
if(strcmp(temp->aadhaar,"0")!=0)
cout<<"Aadhaar number : "<<temp->aadhaar<<endl;

break;
```

```
}

}
  cout<<"Do you want to continue viewing?(0/1)"<<endl;
cin>>ch;
}while(ch==1);
}
}
if(option==2){
int choose;
cout<<"\n1.Modify phone number\n2.Modify
address\n3.Modify emailid\n4.Modify
Dateofbirth\n5.Modify Aadhaar number\n";
    cin>>choose;
    temp=start;
    while(temp->next!=NULL){
    if(temp->id==x){
    switch(choose){
    case 1:{
    char num[90];
cout<<"Enter the phone number";
    cin>>num;
    strcpy(temp->num,num);
    cout<<"Phone number has been updated!!\n";
break;
}
case 3:{
char num[90];
cout<<"Enter the emailid";
cin>>num;
int checker=check_mail(num);
    while(checker==0){
    cout<<"Enter the valid emailid ";
    cin>>num;
    checker=check_mail(num);
}
strcpy(temp->emailid,num);
cout<<"Emailid has been updated!!\n";
break;
}
```

```
case 5:{
char num[90];
cout<<"Enter the aadhaar number in XXXXXXXXXXXXXXXX
format";
cin>>num;
int check=check_aadhaar(num);
while(check==0)
{
cout<<"Please type a valid aadhaar number : ";
cin>>num;
check=check_aadhaar(num);
}
strcpy(temp->aadhaar,num);
cout<<"Aadhaar number has been updated!!\n";
break;
}
case 4:{
char num[90];
cout<<"Enter the date of birth in dd/mm/yyyy format";
cin>>num;
strcpy(temp->dob,num);
cout<<"Date of birth has been updated!!\n";
break;
}
case 2:{
char
doorno[90],street[90],area[90],state[90],country[90];
cout<<"Enter the door no : ";
cin>>doorno;
cout<<"Enter the streetname : ";
cin>>street;
cout<<"Enter the area : ";
cin>>area;
cout<<"Enter the state : ";
cin>>state;
cout<<"Enter the country : ";
cin>>country;
strcpy(temp->ad.doorno,doorno);
strcpy(temp->ad.streetname,street);
strcpy(temp->ad.area,area);
strcpy(temp->ad.state,state);
strcpy(temp->ad.country,country);
break;
}
}
}
temp=temp->next;
}
if(temp->id==x){
    switch(choose){
    case 1:{
    char num[90];
cout<<"Enter the phone number";
    cin>>num;
    strcpy(temp->num,num);
    cout<<"Phone number has been updated!!\n";
break;
}
case 3:{
char num[90];
cout<<"Enter the emailid";
cin>>num;
int checker=check_mail(num);
    while(checker==0){
    cout<<"Enter the valid emailid ";
    cin>>num;
    checker=check_mail(num);
}
strcpy(temp->emailid,num);
cout<<"Emailid has been updated!!\n";

break;
}
case 5:{
char num[90];
cout<<"Enter the aadhaar number in XXXXXXXXXXXXXXXX
format";
cin>>num;
int check=check_aadhaar(num);
while(check==0)
```

```
{
cout<<"Please type a valid aadhaar number : ";
cin>>num;
check=check_aadhaar(num);
}
strcpy(temp->aadhaar,num);
cout<<"Aadhaar number has been updated!!\n";

break;
}
case 4:{
char num[90];
cout<<"Enter the date of birth in dd/mm/yyyy format";
cin>>num;
strcpy(temp->dob,num);
cout<<"Date of birth has been updated!!\n";
break;
}
case 2:{
char
doorno[90],street[90],area[90],state[90],country[90];
cout<<"Enter the door no : ";
cin>>doorno;
cout<<"Enter the streetname : ";
cin>>street;
cout<<"Enter the area : ";
cin>>area;
cout<<"Enter the state : ";
cin>>state;
cout<<"Enter the country : ";
cin>>country;
strcpy(temp->ad.doorno,doorno);
strcpy(temp->ad.streetname,street);
strcpy(temp->ad.area,area);
strcpy(temp->ad.state,state);
strcpy(temp->ad.country,country);

break;
}
}
```

```
}
}
if(option==3){
int choose;
cout<<"\n1.Add new phone number\n2.Add new
address\n3.Add new emailid\n";
cin>>choice;
temp=start;
while(temp->next!=NULL){
if(temp->id==x){
switch(choice){
case 1:{
char num[90];
cout<<"Enter the additional number : ";
cin>>num;
strcpy(temp->snum,num);
cout<<"Details added!!"<<endl;
break;
}
case 2:{
cout<<"Enter the additional address : ";
cout<<"Enter the door no : ";
cin>>temp->ad1.doorno;
cout<<"Enter the area : ";
cin>>temp->ad1.area;
cout<<"Enter the streetname : ";
cin>>temp->ad1.streetname;
cout<<"Enter the state : ";
cin>>temp->ad1.state;
cout<<"Enter the country : ";
cin>>temp->ad1.country;
cout<<"Details added!!"<<endl;
break;
}
case 3:{
char num[90];
cout<<"Enter the additional email address ";

cin>>num;
int checker=check_mail(num);
```

```
    while(checker==0){
    cout<<"Enter the valid emailid ";
    cin>>num;
    checker=check_mail(num);
}
strcpy(temp->semail,num);
cout<<"Details added!!"<<endl;
break;
}

}
}
temp=temp->next;
}
if(temp->id==x){
switch(choice){
case 1:{
char num[90];
cout<<"Enter the additional number : ";
cin>>num;
strcpy(temp->snum,num);
cout<<"Details added!!"<<endl;
break;
}
case 2:{
cout<<"Enter the additional address : ";
cout<<"Enter the door no : ";
cin>>temp->ad1.doorno;
cout<<"Enter the area : ";
cin>>temp->ad1.area;
cout<<"Enter the streetname : ";
cin>>temp->ad1.streetname;
cout<<"Enter the state : ";
cin>>temp->ad1.state;
cout<<"Enter the country : ";
cin>>temp->ad1.country;
cout<<"Details added!!"<<endl;
break;
}
case 3:{
```

```
char num[90];
cout<<"Enter the additional email address ";
cin>>num;
int checker=check_mail(num);
    while(checker==0){
    cout<<"Enter the valid emailid ";
    cin>>num;
    checker=check_mail(num);
}
strcpy(temp->semail,num);

cout<<"Details added!"<<endl;
break;
}
}
}
}
}
void search_existing_numsearch(int x){
struct numsearch *temp;
temp=start;
int flag=0;
while(temp->next!=NULL){
if(temp->id==x){
cout<<"The name already exists in the list\nAdd the new
number\n";
char strtemp[90];
cin>>strtemp;
insert_numsearch(x,strtemp);
cout<<"Phone number added\n";
flag=1;
break;
}
temp=temp->next;
}

if(temp->id==x&&flag==0){
cout<<"The name already exists in the list\nAdd the new
number\n";
char strtemp[90];
```

```
cin>>strtemp;
insert_numsearch(x,strtemp);
cout<<"Phone number added\n";
}
}

int count_numsearch(int x){
struct numsearch *temp;
temp=start;
int count=0;
while(temp->next!=NULL){
if(temp->id==x){
count++;

}
temp=temp->next;
}
if(temp->id==x){
count++;
}
return count;
}


void del_numsearch_number(char str[20]){
struct numsearch *temp;
temp=start;
if(temp==NULL){
cout<<"Empty phone list\n";
}
else{

if(strcmp(temp->num,str)==0){
if(temp->next==NULL){
temp=NULL;
}
        else{
temp=temp->next;
}
}
```

```
else{

while(temp->next!=NULL){
if(strcmp(temp->next->num,str)==0){
temp->next=temp->next->next;
}
else
temp=temp->next;
}
}
cout<<"\nPhone number has been deleted\n";
}
}

void del_numsearch(int x){
struct numsearch *temp;
temp=start;
int ch=1,choice;
if(flag==1){
if(start->id==x){
if(start->next==NULL)
            start=NULL;
                 else{
         start=start->next;
         temp=start;
 }
}
else{

while(temp!=NULL){
if(temp->next->id==x){
temp->next=temp->next->next;
}
temp=temp->next;
}
}
}


else{
```

```
cout<<"Enter the choice !!"<<endl;
cout<<"1.Delete phone number\n2.Delete aadhar
details\n3.Delete mail id\n";
cin>>choice;
if(temp==NULL){
cout<<"Empty phone list\n";
}
else{

if(start->id==x){
switch(choice){
case 1:{
strcpy(start->num,"0");
cout<<"Phone number has been deleted\n";
break;
}
case 2:{
strcpy(start->aadhaar,"0");
cout<<"Aadhaar number has been deleted\n";
break;
}
case 3:{
strcpy(start->emailid,"0");
cout<<"Emailid has been deleted";
break;
}

}

}
else{

while(temp!=NULL){
if(temp->next->id==x){
    switch(choice){
case 1:{
strcpy(temp->num,"0");
cout<<"Phone number has been deleted\n";
break;
}
case 2:{
strcpy(temp->aadhaar,"0");
cout<<"Aadhaar number has been deleted\n";
break;
}
case 3:{
strcpy(temp->emailid,"0");
cout<<"Emailid has been deleted";
break;
}

}

temp->next=temp->next->next;
}
temp=temp->next;
}
}

}
}
}

void display_numsearch(){
struct numsearch *temp;
temp=start;
if(temp==NULL){
cout<<"Empty list\n";}
else{

while(temp->next!=NULL){
cout<<temp->id<<" "<<temp->num<<endl;
temp=temp->next;
}
cout<<temp->id<<" "<<temp->num<<endl;

}
}

struct trienode* newnode(){
```

```
struct trienode *sample=(struct trienode
*)malloc(sizeof(struct trienode));
int i;
for(i=0;i<26;i++){
sample->children[i]=NULL;

}
sample->isend=false;
return sample;
}


bool isemptytrie(struct trienode *root){
int i;
for(i=0;i<26;i++){
if(root->children[i]!=NULL){
return false;
}
}
return true;
}

void deletetrie(struct trienode *root, char str[20]){


int i,flag=0,index;
struct trienode *current=root;
for(i=0;i<strlen(str);i++){
index=str[i]-'a';
if(current->children[index]==NULL){
cout<<"\nGiven name is not found\n";
flag=1;
break;
}
current=current->children[index];
}
current->isend=false;

if(flag==0){
```

```
//del_numsearch(current->id);
current->id=-1;
cout<<"\nName has been deleted\n";
}
}


void insert(struct trienode *root,char str[20]){
int i,index;
char pho[10];
struct trienode *current=root;
for(i=0;i<strlen(str);i++){
index=str[i]-'a';
if(current->children[index]==NULL){
current->children[index]=newnode();
}
current=current->children[index];
}
current->isend=true;
current->id=cnt;
cout<<"Enter the phone number of the person ";
cin>>pho;
insert_numsearch(cnt,pho);
cnt++;
fstream f;
    f.open("names.txt",ios::app);
    char fl[90];
    if(!f){
    //cout<<"File creation failed!!";
}
else{
//cout<<"New file created!!"<<endl;
f<<str<<endl;
f.close();
}


}
```

```
void load_trie(struct trienode *root){
fstream f;
    f.open("names.txt",ios::in);
    string str;
    while(std::getline(f,str)){
    int i,index;
char pho[10];
struct trienode *current=root;
for(i=0;i<str.length();i++){
index=str[i]-'a';
if(current->children[index]==NULL){
current->children[index]=newnode();
}
current=current->children[index];
}
current->isend=true;
current->id=cnt;
cnt++;
}
f.close();
//cout<<"Trie loading done!!"<<endl;
}

void load_numsearch(){
fstream f;
    f.open("details.txt",ios::in);
    char str[90];
    int counter=-1;
    while(f>>str){
    char num[90],email[90],dobt[90],aadhaart[90];
    int id;
counter++;
struct numsearch *t,*temp;
t=(struct numsearch *)malloc(sizeof(struct numsearch));
struct address add;
if(counter==0){
id=atoi(str);

}
if(counter==1){
```

```
strcpy(num,str);

}
if(counter==2){
strcpy(add.doorno,str);

}
if(counter==3){
strcpy(add.area,str);

}
if(counter==4){
strcpy(add.streetname,str);

}
if(counter==5){

strcpy(add.state,str);

}
if(counter==6){

strcpy(add.country,str);

}
if(counter==7){

strcpy(email,str);

}
if(counter==8){

strcpy(dobt,str);

}
if(counter==9){

strcpy(aadhaart,str);
counter=-1;
```

```
struct numsearch *t,*temp;
t=(struct numsearch *)malloc(sizeof(struct numsearch));
if(start==NULL){
start=t;
start->id=id;
strcpy(start->num,num);
strcpy(start->ad.doorno,add.doorno);
strcpy(start->ad.area,add.area);
strcpy(start->ad.streetname,add.streetname);
strcpy(start->ad.state,add.state);
strcpy(start->ad.country,add.country);
strcpy(start->emailid,email);
strcpy(start->dob,dobt);
strcpy(start->aadhaar,aadhaart);
strcpy(start->snum,"0");
strcpy(start->semail,"0");
strcpy(start->ad1.doorno,"0");
start->next=NULL;

}
else{
temp=start;
while(temp->next!=NULL){
temp=temp->next;
}
temp->next=t;
t->id=id;
strcpy(t->num,num);
strcpy(t->ad.doorno,add.doorno);
strcpy(t->ad.area,add.area);
strcpy(t->ad.streetname,add.streetname);
strcpy(t->ad.state,add.state);
strcpy(t->ad.country,add.country);
strcpy(t->emailid,email);
strcpy(t->dob,dobt);
strcpy(t->aadhaar,aadhaart);
strcpy(t->snum,"0");
strcpy(t->semail,"0");
strcpy(t->ad1.doorno,"0");
t->next=NULL;
}

}



}
f.close();
}




bool isLastNode(struct trienode *root)
{
    int i;
for ( i = 0; i < 26; i++)
        if (root->children[i]!=NULL)
            return 0;
    return 1;
}


void suggestionsRec(struct trienode *root, char
currPrefix[20])
{

int t=strlen(currPrefix);
    if (root->isend==true)
    {
        cout<<currPrefix<<endl;
currPrefix[strlen(currPrefix)]='\0';
    }


    if (isLastNode(root))
        return;
     int i;
    for (i = 0; i < 26; i++)
    {
        if (root->children[i])
        {

            currPrefix[t]=(97+i);
currPrefix[t+1]='\0';
            //printf("%s\n",currPrefix);


suggestionsRec(root->children[i], currPrefix);
}




    }
}



int printAutoSuggestions(struct trienode *root, char
query[20])
{
    struct trienode *pCrawl = root;


    int level;
    int n = strlen(query);
    for (level = 0; level < n; level++)
    {
        int index = CHAR_TO_INDEX(query[level]);


        if (!pCrawl->children[index])
            return 0;

        pCrawl = pCrawl->children[index];
    }
    bool isWord = (pCrawl->isend == true);


    bool isLast = isLastNode(pCrawl);


    if (isWord && isLast)
    {
        cout<<query<<endl;
        return -1;
    }


    if (!isLast)
    {
        char prefix[90]="\0";
strcpy(prefix,query);
        suggestionsRec(pCrawl, prefix);
        return 1;
    }
}




int search(struct trienode *root,char str[20]){
int i,index;
struct trienode *current=root;
for(i=0;i<strlen(str);i++){
index=str[i]-'a';
if(current->children[index]==NULL)
return -1;
else{
current=current->children[index];
}
}
if(current!=NULL && current->isend==true)
return current->id;
else
```

```
return -1;
}

int main(){
cout<<"
        USER   DIRECTORY
                          \n\n";

/*fstream f;
    f.open("names.txt",ios::in|ios::out);
    char fl[90];
    f.seekg(0,ios::beg);*/
struct trienode *t=newnode();
struct trienode *sample=(struct trienode
*)malloc(sizeof(struct trienode));
int i,choice,ch=1;
char str[20];
load_trie(t);
load_numsearch();
/*while(!f.eof())
    {
    f>>fl;
    insert(t,fl);
    }
*/
cout<<"Enter an option\n";
do{

cout<<"1.Insert\n2.Search\n3.Delete\n4.display_numsearc
h\n5.Display_all_names\n";
cin>>choice;


switch(choice){
case 1:{
cout<<"Enter the string to be inserted\n";
   cin>>str;
int x=search(t,str);
if(x==-1){
insert(t,str);
```

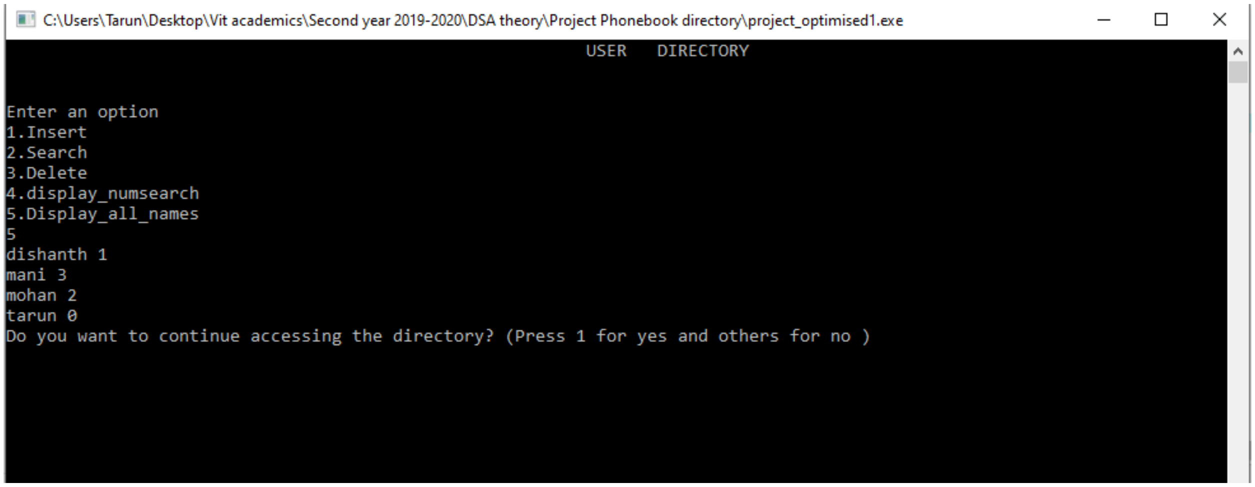
```
cout<<"Word inserted\n";
    }
else{
search_existing_numsearch(x);
}

break;
}
case 2:{
int i=0,x;
int temp=0,comp;
char str[90];
char name[20]={0};
/*printf("Enter the name to be searched\n");

scanf("%s",name);*/
while((int)(name[temp-1])!=13)
    {
    system("cls");
gotoxy(1,1);
cout<<"Enter the name to be searched "<<name<<endl;

comp = printAutoSuggestions(t,name);
    if (comp == -1)
    {
cout<<"No other strings found with this prefix\n";
break;
    }

    else if (comp == 0)
    {
cout<<"No string found with this prefix\n";
break;
    }
    else
    {
     gotoxy(32+temp,1);
    name[temp]=getch();
    if((int)(name[temp])==13){
    name[temp]='\0';
    break;
}
else{
temp++;

    //printf("%c",name[temp-1]);
    name[temp]='\0';}
    }
}
system("cls");
char trial[90]="\0";
strcpy(trial,name);
//printf("\nHi %s\n",trial);
x=search(t,trial);
if(x==-1){
cout<<"\nNo such name in list\n";
break;
}
search_numsearch(x);
break;
}


case 3:{
char name[20];
if(isemptytrie(t)){
cout<<"Empty trie!!\n";
}
else{
int choice;
char strtemp[20];
cout<<"Enter the name to be deleted\n";
cin>>name;
int x=search(t,name);
if(x==-1){
cout<<"No such name in list\n";
}
else{
int y=count_numsearch(x);
if(y==1){
```

```
cout<<"Do you want to delete the entire user profile?(0
for no 1 for yes)";
int ch1;
cin>>ch1;
if(ch1==0){
flag=0;
del_numsearch(x);
}
else{
flag=1;
del_numsearch(x);
deletetrie(t,name);}
}
else{
search_numsearch(x);
cout<<"1.Delete specific number\n2.Delete Entire
contact\n";
cin>>choice;
switch(choice){
case 2:{
deletetrie(t,name);
break;
}
case 1:{
cout<<"ENter the number to be deleted\n";
cin>>strtemp;
del_numsearch_number(strtemp);
break;
}

}
}
}
}
break;
}
case 4:{
display_numsearch();
break;
}
```

```
case 5:{
if(isemptytrie(t))
cout<<"EMpty trie!!\n";
else{
char str[90];
int level=0;
display(t,str,level);
}
break;
}
default:{
cout<<"Wrong choice\n";
break;
}
}
cout<<"Do you want to continue accessing the directory?
(Press 1 for yes and others for no )\n";
cin>>ch;
}while(ch==1);
return 0;
}
```

Sample Outputs:

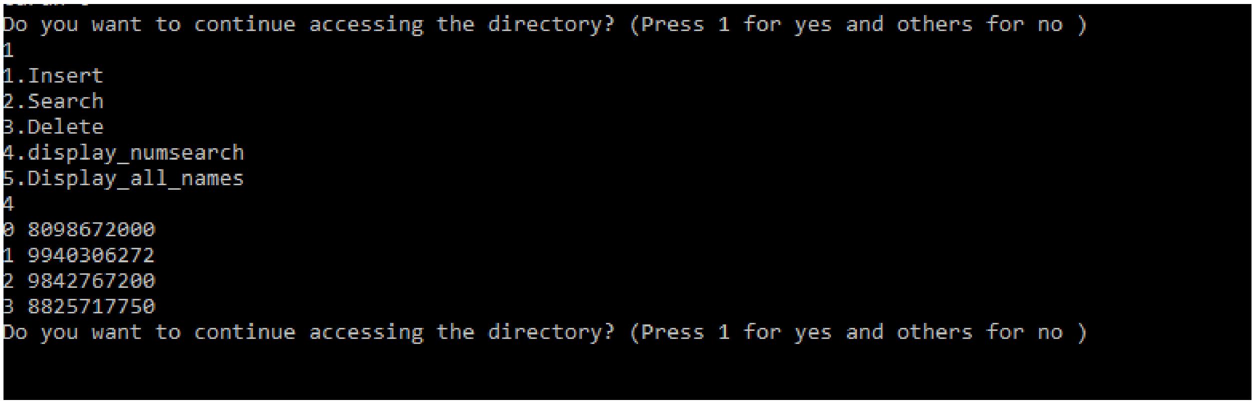
Initially , trie gets loaded with the values from the files



C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

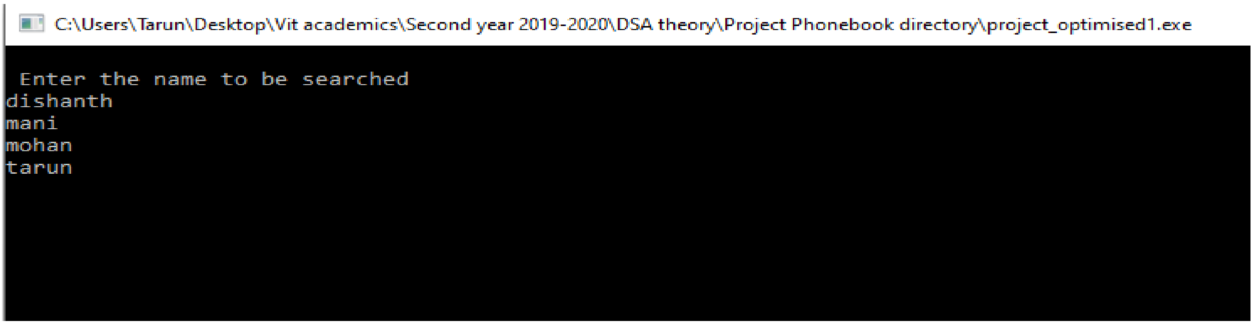
```
                                                          USER    DIRECTORY


Enter an option
1.Insert
2.Search
3.Delete
4.display_numsearch
5.Display_all_names
5
dishanth 1
mani 3
mohan 2
tarun 0
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

The numsearch linkedlist gets loaded with the values from the files



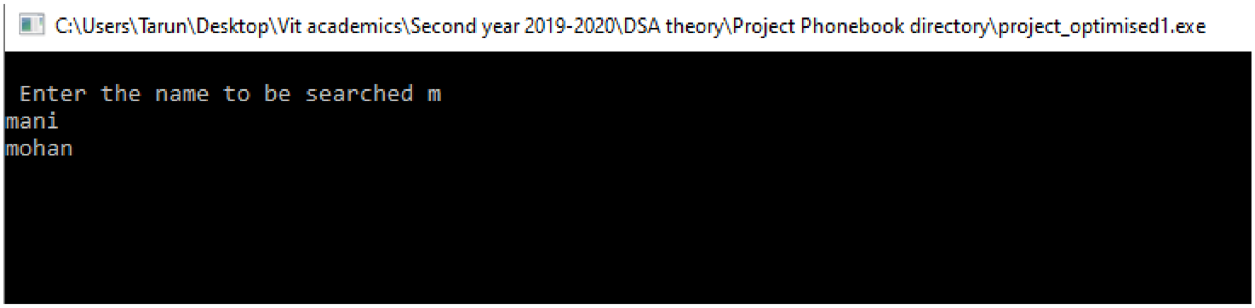
```
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
1
1.Insert
2.Search
3.Delete
4.display_numsearch
5.Display_all_names
4
0 8098672000
1 9940306272
2 9842767200
3 8825717750
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

The search functionlality of the directory initially shows all the names in the trie. Later , Based on the input values the results gets filtered



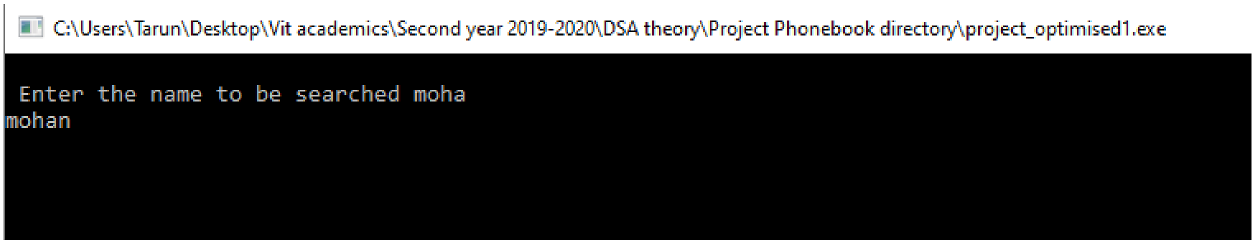
C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

```
 Enter the name to be searched
dishanth
mani
mohan
tarun
```



C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

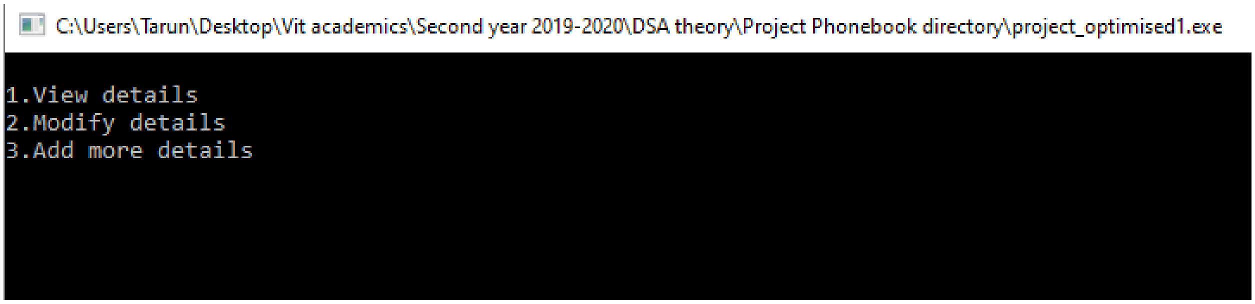
```
 Enter the name to be searched m
mani
mohan
```



C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

```
 Enter the name to be searched moha
mohan
```

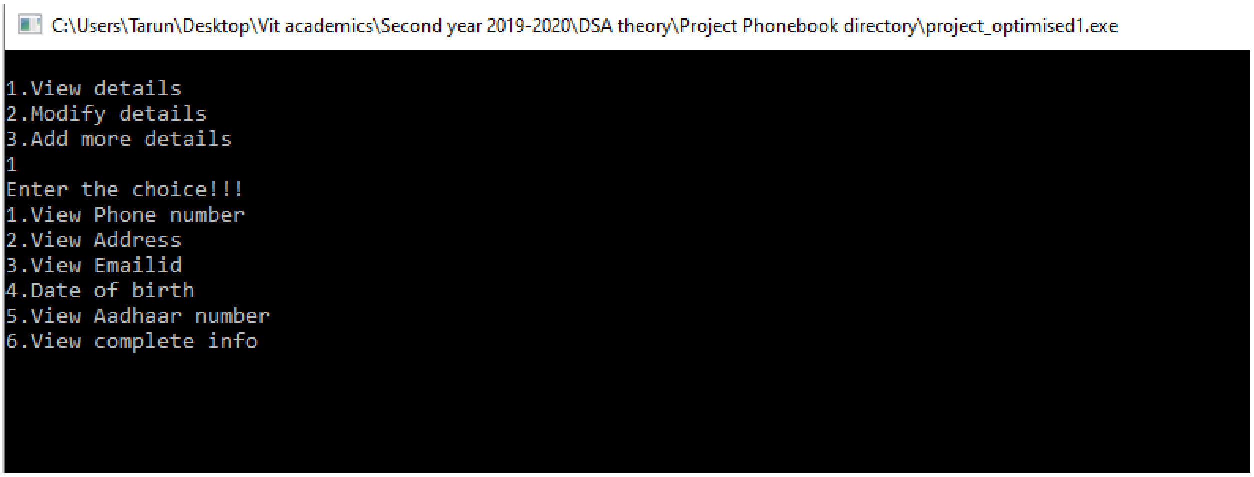
When the user types the name to be searched and hits the ENTER BUTTON



C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

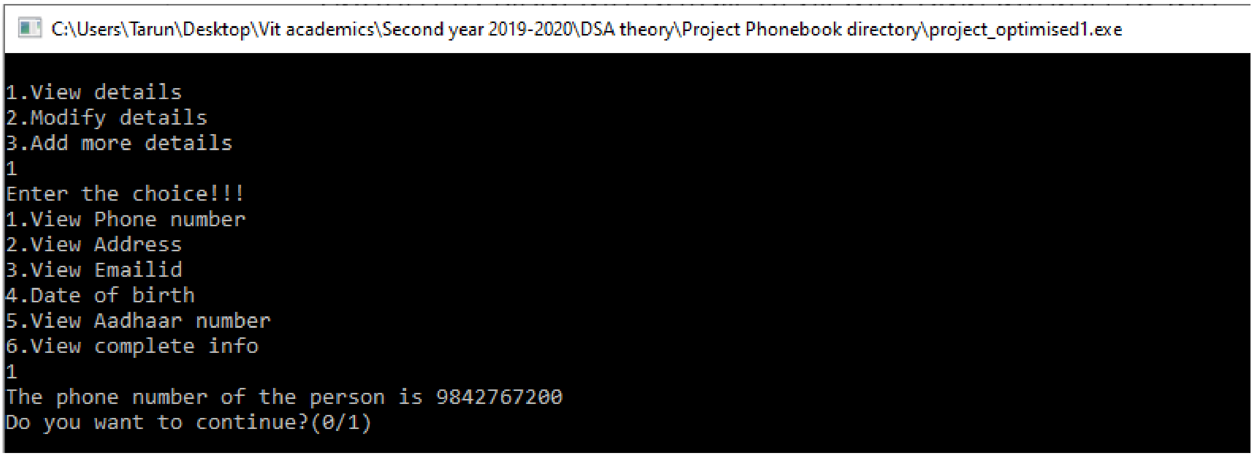
```
1.View details
2.Modify details
3.Add more details
```

When the user selects View details option , the user can choose to view the details of his/her own interest or the complete info the person



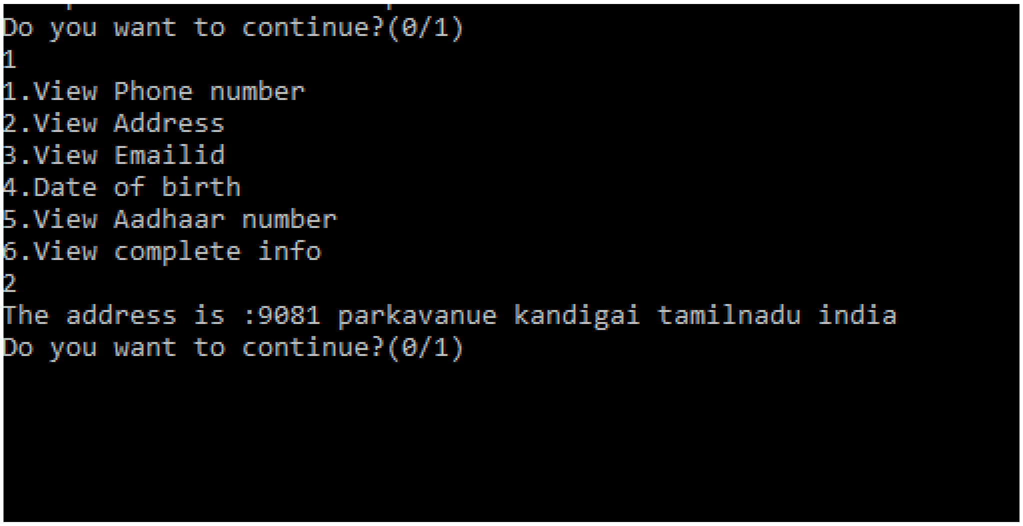
C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

```
1.View details
2.Modify details
3.Add more details
1
Enter the choice!!!
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
```

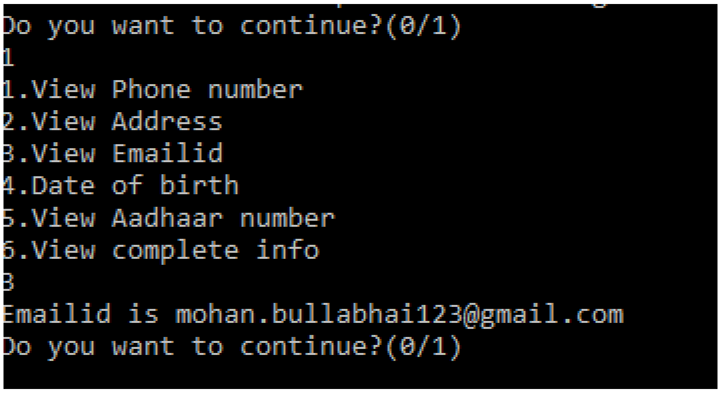


C:\Users\Tarun\Desktop\Vit academics\Second year 2019-2020\DSA theory\Project Phonebook directory\project_optimised1.exe

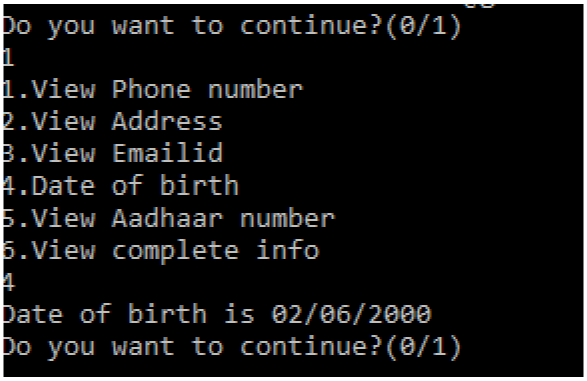
```
1.View details
2.Modify details
3.Add more details
1
Enter the choice!!!
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
1
The phone number of the person is 9842767200
Do you want to continue?(0/1)
```



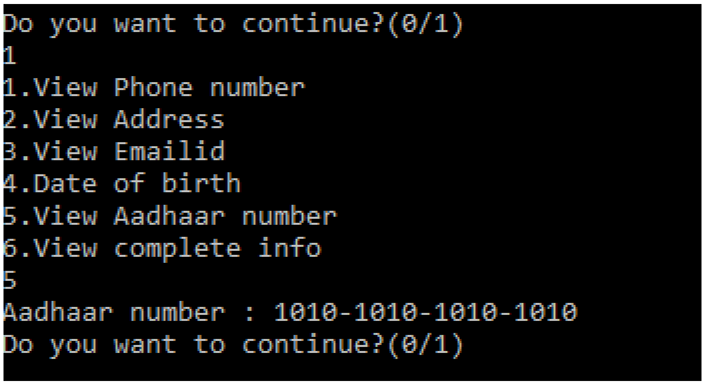
```
Do you want to continue?(0/1)
1
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
2
The address is :9081 parkavanue kandigai tamilnadu india
Do you want to continue?(0/1)
```



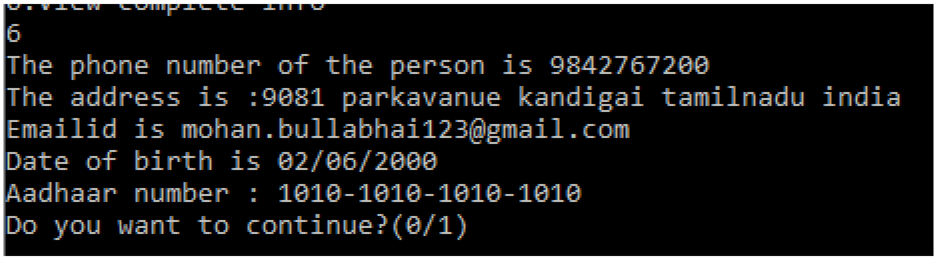
```
Do you want to continue?(0/1)
1
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
3
Emailid is mohan.bullabhai123@gmail.com
Do you want to continue?(0/1)
```



```
Do you want to continue?(0/1)
1
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
4
Date of birth is 02/06/2000
Do you want to continue?(0/1)
```

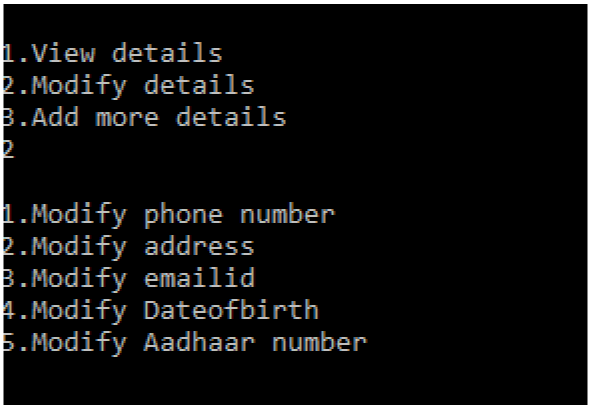


```
Do you want to continue?(0/1)
1
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
5
Aadhaar number : 1010-1010-1010-1010
Do you want to continue?(0/1)
```



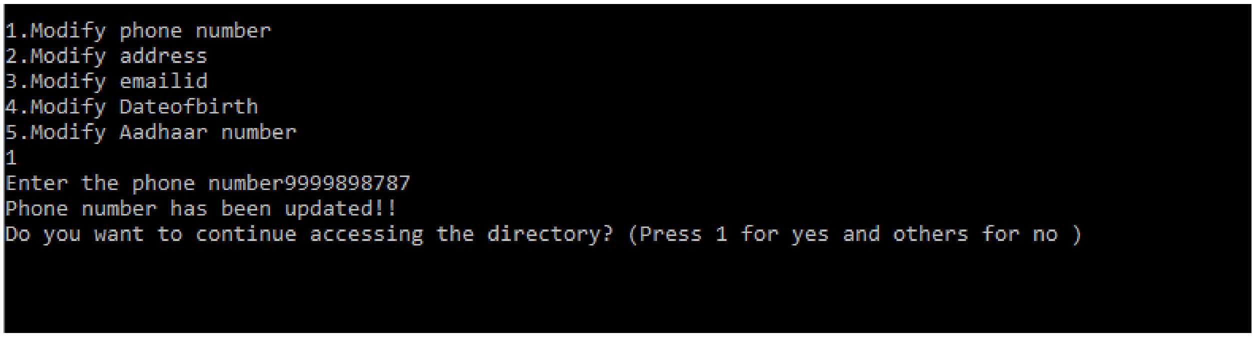
```
6.View complete info
6
The phone number of the person is 9842767200
The address is :9081 parkavanue kandigai tamilnadu india
Emailid is mohan.bullabhai123@gmail.com
Date of birth is 02/06/2000
Aadhaar number : 1010-1010-1010-1010
Do you want to continue?(0/1)
```

When the user selects MODIFY DETAILS option



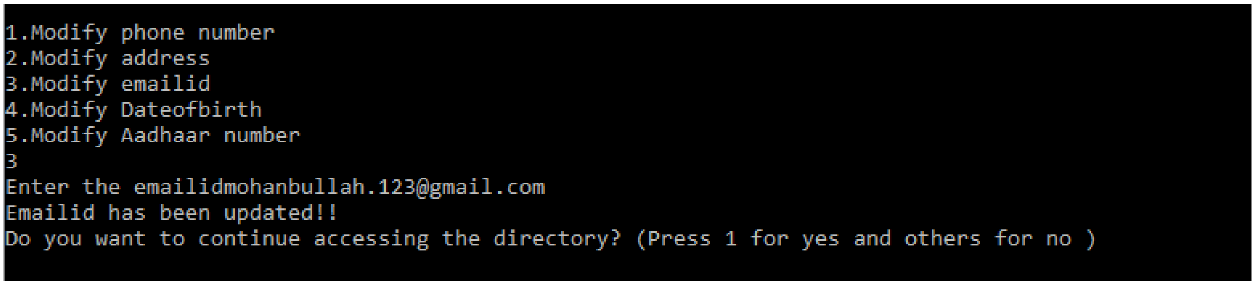
```
1.View details
2.Modify details
3.Add more details
2

1.Modify phone number
2.Modify address
3.Modify emailid
4.Modify Dateofbirth
5.Modify Aadhaar number
```

When the user chooses to modify phone number



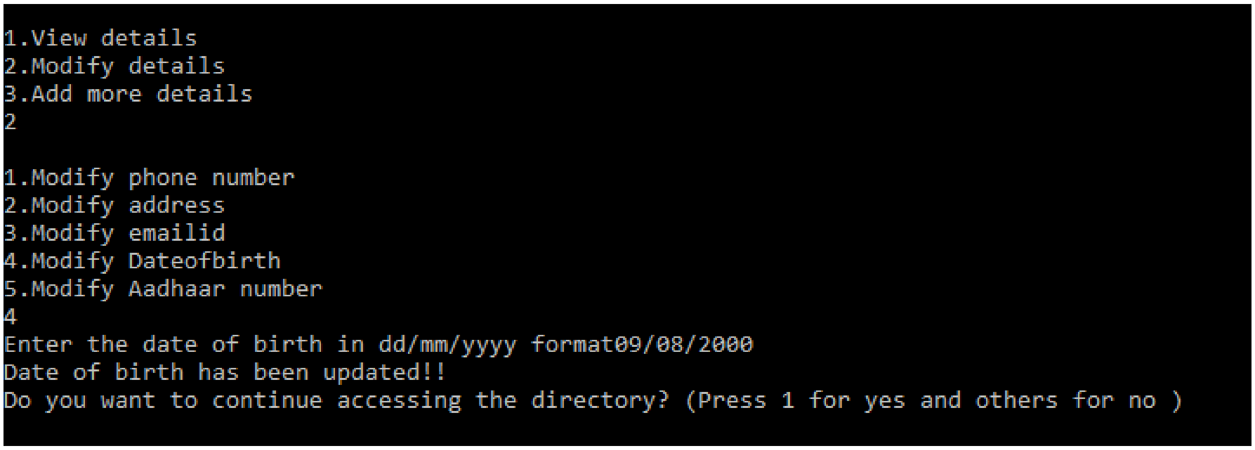
```
1.Modify phone number
2.Modify address
3.Modify emailid
4.Modify Dateofbirth
5.Modify Aadhaar number
1
Enter the phone number9999898787
Phone number has been updated!!
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

When modify emailID is choosen :



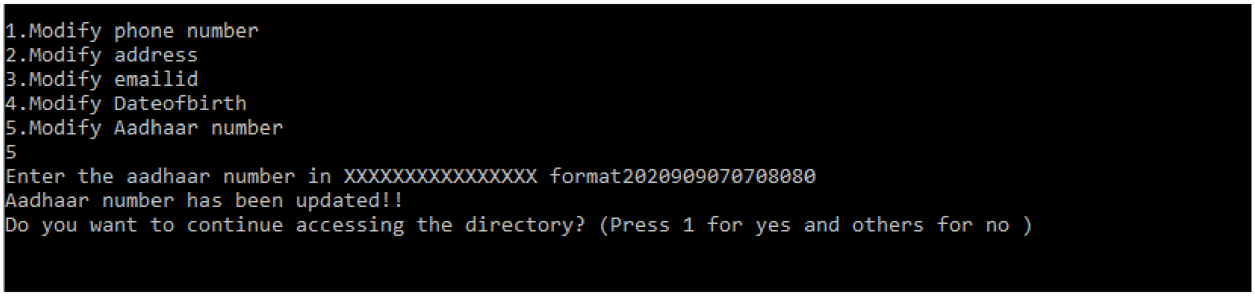
```
1.Modify phone number
2.Modify address
3.Modify emailid
4.Modify Dateofbirth
5.Modify Aadhaar number
3
Enter the emailidmohanbullah.123@gmail.com
Emailid has been updated!!
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

When modify DOB is choosen



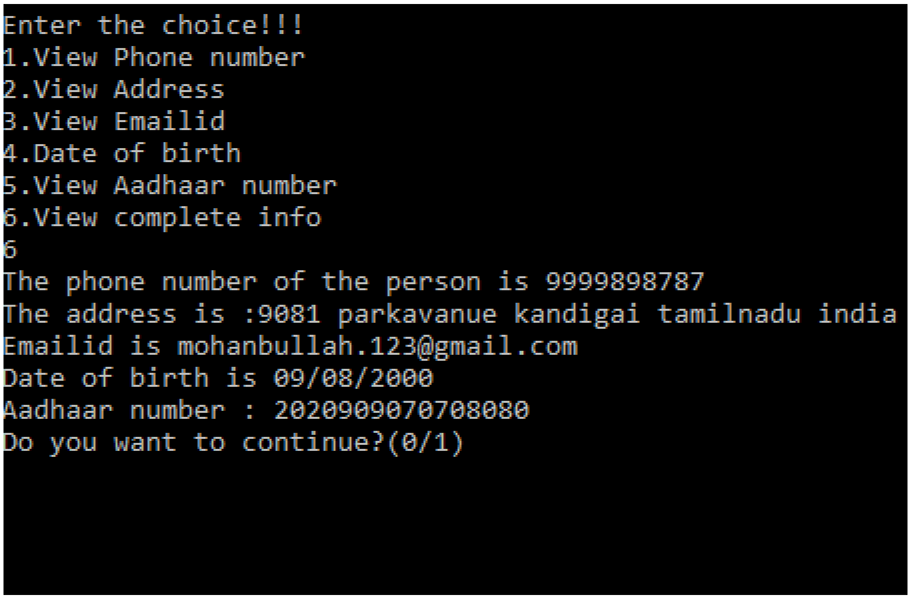
```
1.View details
2.Modify details
3.Add more details
2

1.Modify phone number
2.Modify address
3.Modify emailid
4.Modify Dateofbirth
5.Modify Aadhaar number
4
Enter the date of birth in dd/mm/yyyy format09/08/2000
Date of birth has been updated!!
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

When modify Aadhaar number is choosen



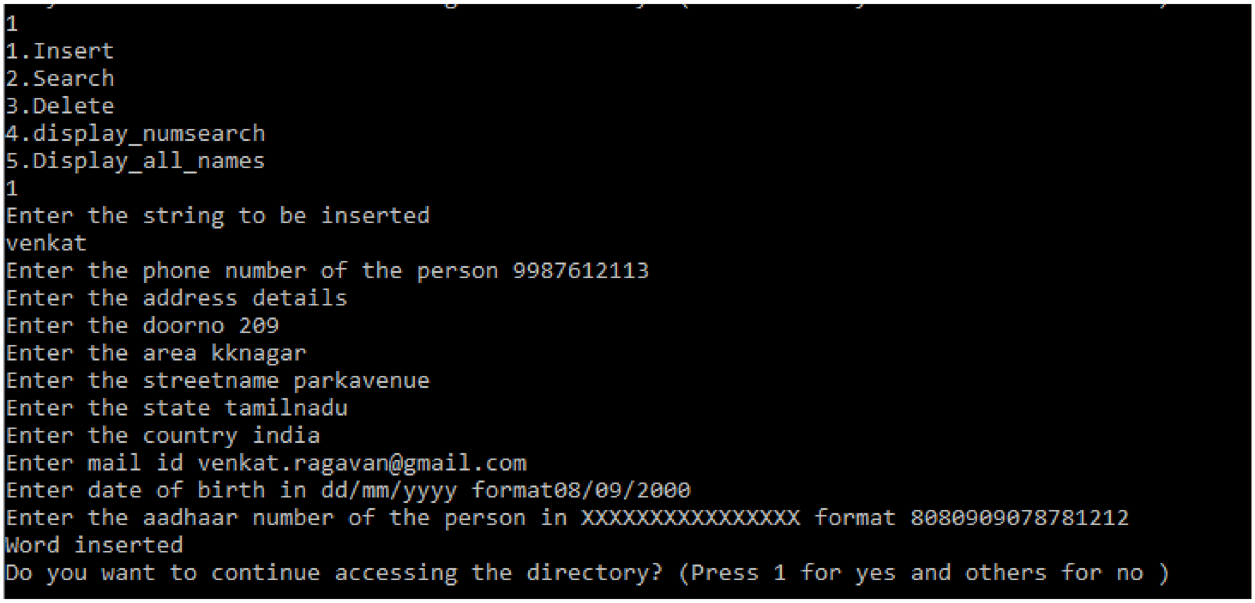
```
1.Modify phone number
2.Modify address
3.Modify emailid
4.Modify Dateofbirth
5.Modify Aadhaar number
5
Enter the aadhaar number in XXXXXXXXXXXXXXXX format2020909070708080
Aadhaar number has been updated!!
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

The updated info



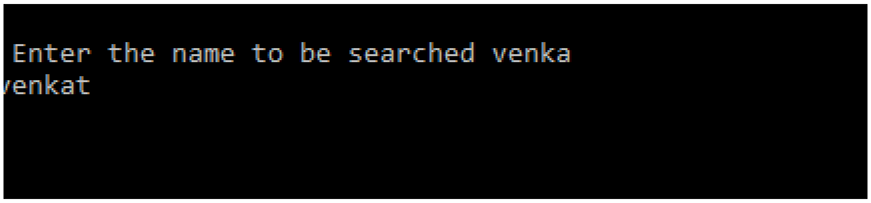
```
Enter the choice!!!
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
6
The phone number of the person is 9999898787
The address is :9081 parkavanue kandigai tamilnadu india
Emailid is mohanbullah.123@gmail.com
Date of birth is 09/08/2000
Aadhaar number : 2020909070708080
Do you want to continue?(0/1)
```

When user wishes to insert a record in the directory



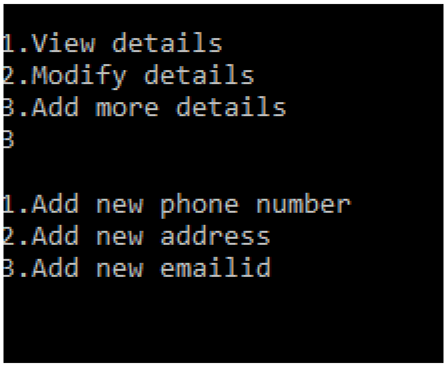
```
1
1.Insert
2.Search
3.Delete
4.display_numsearch
5.Display_all_names
1
Enter the string to be inserted
venkat
Enter the phone number of the person 9987612113
Enter the address details
Enter the doorno 209
Enter the area kknagar
Enter the streetname parkavenue
Enter the state tamilnadu
Enter the country india
Enter mail id venkat.ragavan@gmail.com
Enter date of birth in dd/mm/yyyy format08/09/2000
Enter the aadhaar number of the person in XXXXXXXXXXXXXXXX format 8080909078781212
Word inserted
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

The added record is visible in the search module

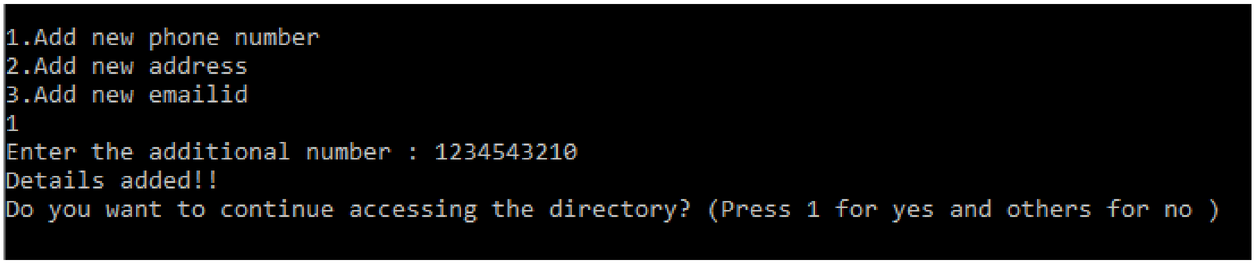


```
 Enter the name to be searched venka
venkat
```

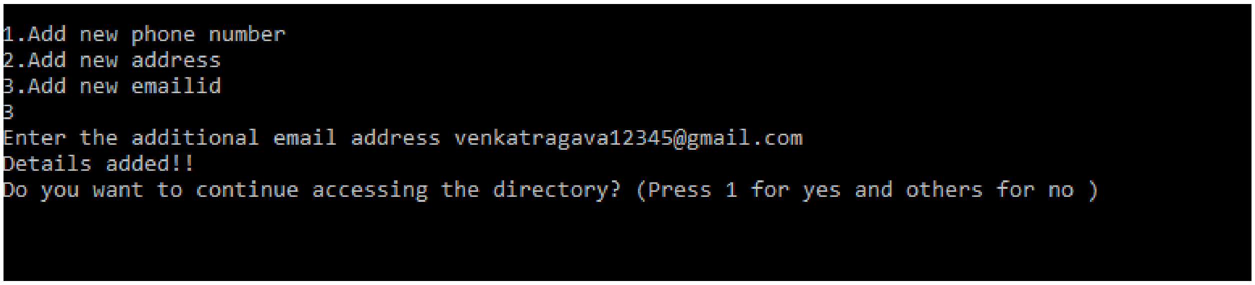
When the user wants to add more details



```
1.View details
2.Modify details
3.Add more details
3

1.Add new phone number
2.Add new address
3.Add new emailid
```

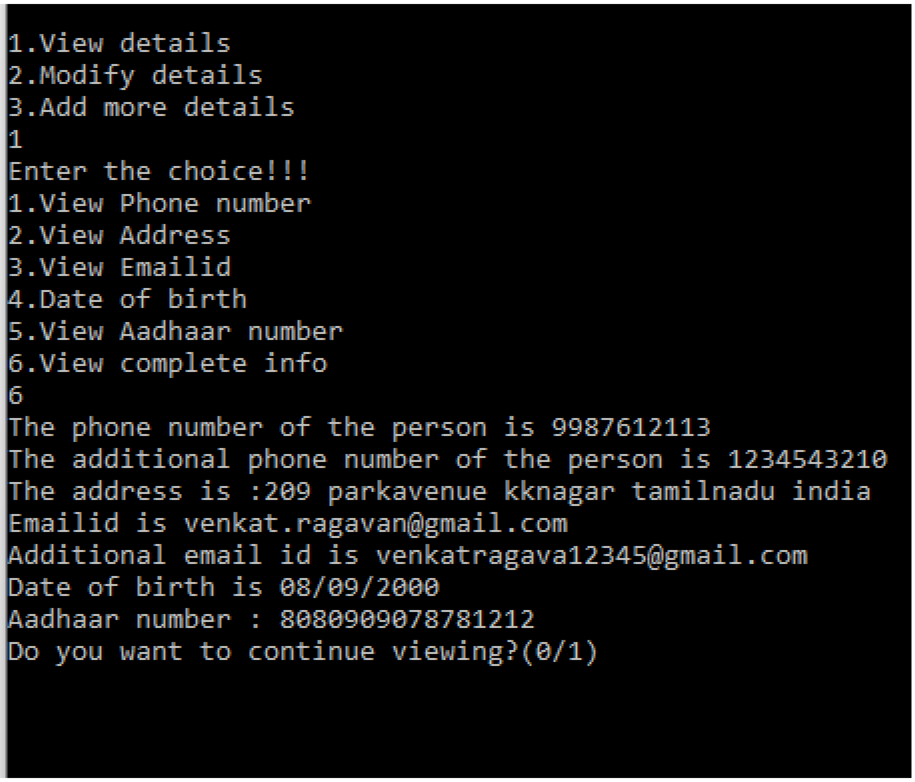


```
1.Add new phone number
2.Add new address
3.Add new emailid
1
Enter the additional number : 1234543210
Details added!!
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```



```
1.Add new phone number
2.Add new address
3.Add new emailid
3
Enter the additional email address venkatragava12345@gmail.com
Details added!!
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

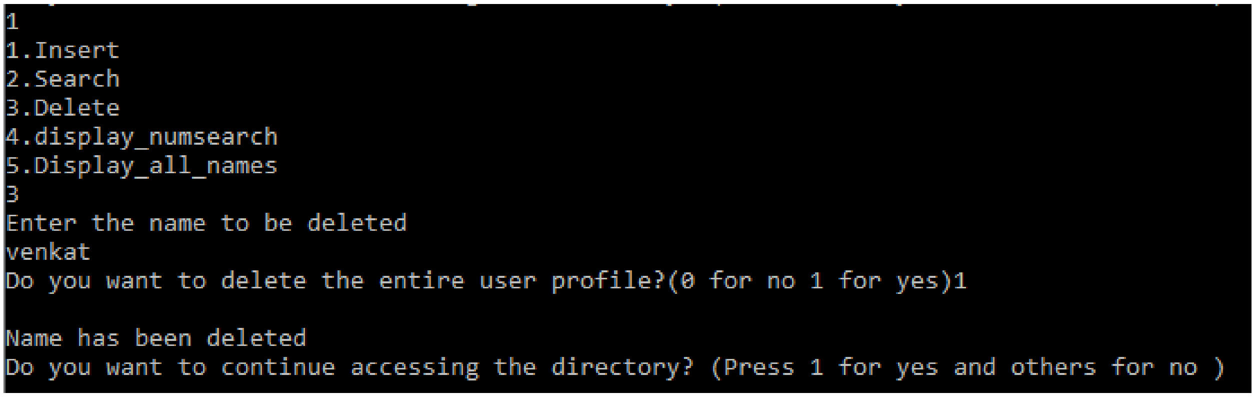
When the details are added in to the linked list



```
1.View details
2.Modify details
3.Add more details
1
Enter the choice!!!
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
6
The phone number of the person is 9987612113
The additional phone number of the person is 1234543210
The address is :209 parkavenue kknagar tamilnadu india
Emailid is venkat.ragavan@gmail.com
Additional email id is venkatragava12345@gmail.com
Date of birth is 08/09/2000
Aadhaar number : 8080909078781212
Do you want to continue viewing?(0/1)
```

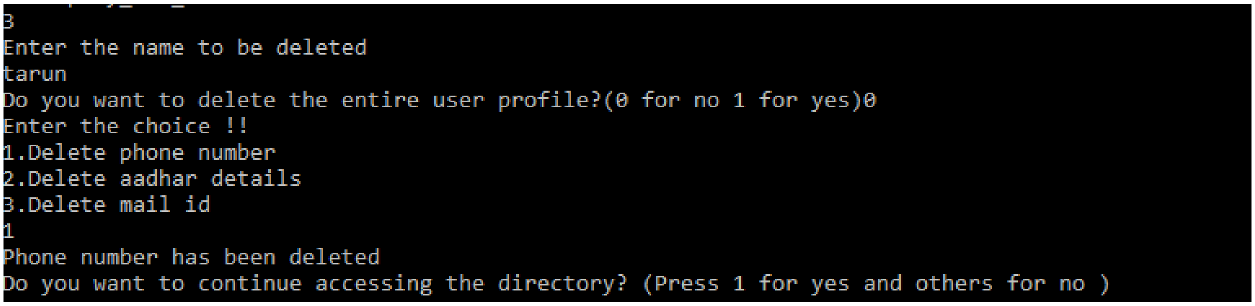
Delete functionality :

When the user wants to delete the entire profile:



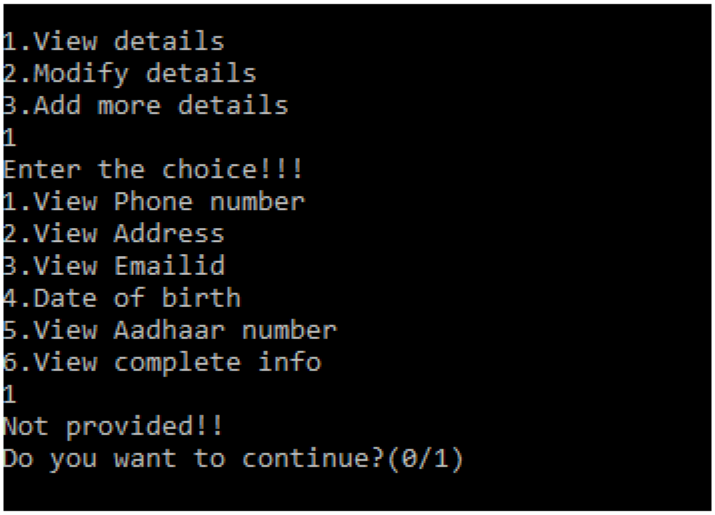
```
1
1.Insert
2.Search
3.Delete
4.display_numsearch
5.Display_all_names
3
Enter the name to be deleted
venkat
Do you want to delete the entire user profile?(0 for no 1 for yes)1

Name has been deleted
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

When the user wants to delete particular information :

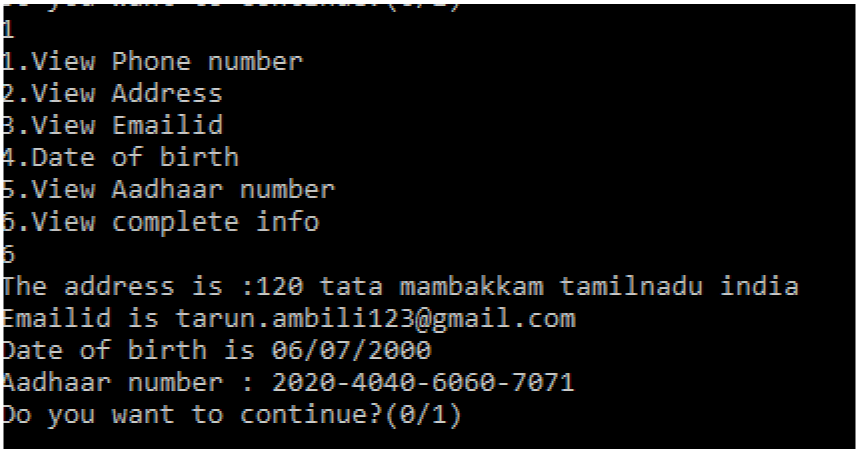


```
3
Enter the name to be deleted
tarun
Do you want to delete the entire user profile?(0 for no 1 for yes)0
Enter the choice !!
1.Delete phone number
2.Delete aadhar details
3.Delete mail id
1
Phone number has been deleted
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

When the person checks for the phone number:

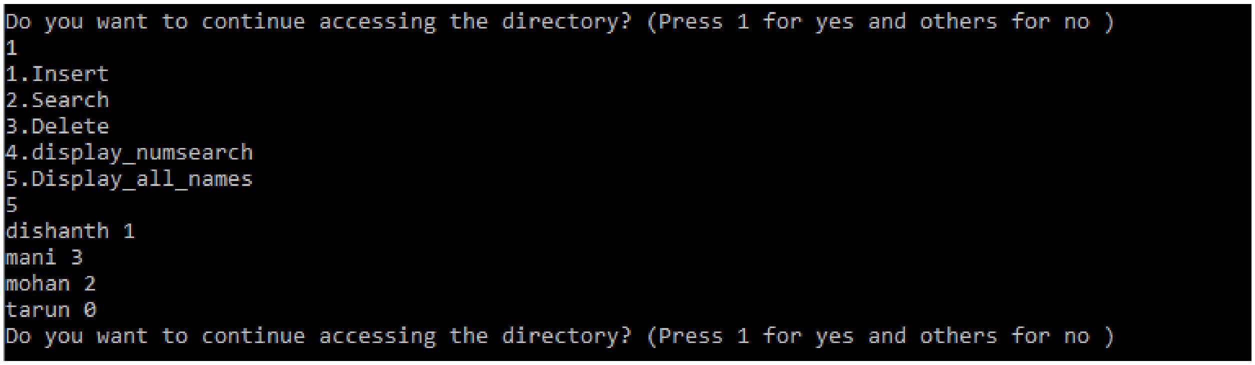


```
1.View details
2.Modify details
3.Add more details
1
Enter the choice!!!
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
1
Not provided!!
Do you want to continue?(0/1)
```



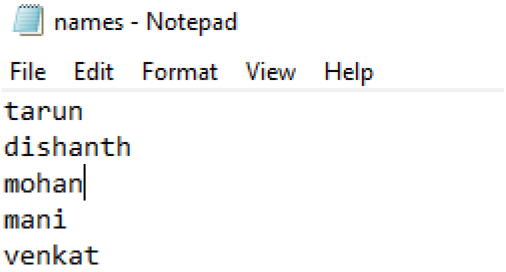
```
Do you want to continue?(0/1)
1
1.View Phone number
2.View Address
3.View Emailid
4.Date of birth
5.View Aadhaar number
6.View complete info
6
The address is :120 tata mambakkam tamilnadu india
Emailid is tarun.ambili123@gmail.com
Date of birth is 06/07/2000
Aadhaar number : 2020-4040-6060-7071
Do you want to continue?(0/1)
```

When the contents of the trie are checked :

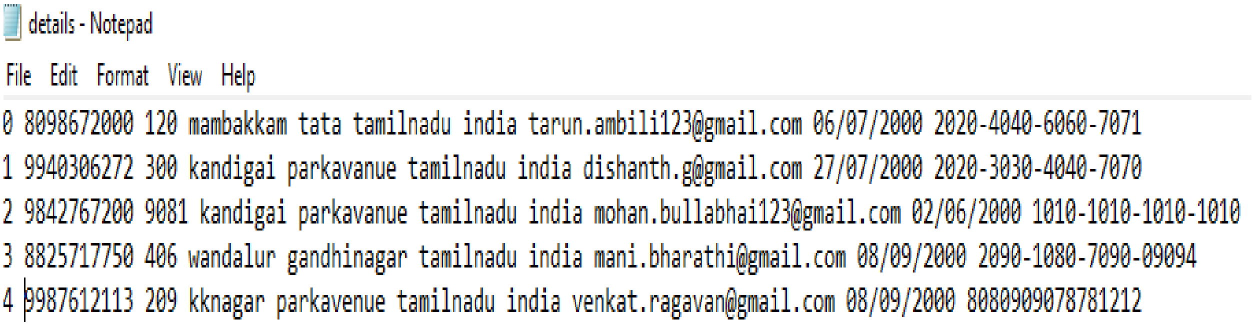


```
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
1
1.Insert
2.Search
3.Delete
4.display_numsearch
5.Display_all_names
5
dishanth 1
mani 3
mohan 2
tarun 0
Do you want to continue accessing the directory? (Press 1 for yes and others for no )
```

Contents of the file :



```
tarun
dishanth
mohan
mani
venkat
```



```
0 8098672000 120 mambakkam tata tamilnadu india tarun.ambili123@gmail.com 06/07/2000 2020-4040-6060-7071
1 9940306272 300 kandigai parkavanue tamilnadu india dishanth.g@gmail.com 27/07/2000 2020-3030-4040-7070
2 9842767200 9081 kandigai parkavanue tamilnadu india mohan.bullabhai123@gmail.com 02/06/2000 1010-1010-1010-1010
3 8825717750 406 wandalur gandhinagar tamilnadu india mani.bharathi@gmail.com 08/09/2000 2090-1080-7090-09094
4 9987612113 209 kknagar parkavenue tamilnadu india venkat.ragavan@gmail.com 08/09/2000 8080909078781212
```

Inference:

We know that such mechanisms already exist and is highly prevalent in search engines and almost 90 percent of the websites that use a search bar. But to implement trie on a lower scale is quite unique, and would also help in compilation as the compiler can access the user's choice of data as and when the user types a character, which would save a lot of memory in the long run. The data structures are selected keeping in mind the space and memory requirement. The directory will provide high level of usability to the user . The project also provides high scope of improvement in the future like addition of new features, etc. The modularity of the project enables to incorporate new features .

The program is thus time and space efficient and has high scope of improvement

BIBILIOGRAPHY:

https://www.geeksforgeeks.org/trie-insert-and-search/

https://www.hackerearth.com/practice/data-structures/advanced-data-structures/trie-keyword-tree/tutorial/