Citizen Database

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Citizen database is having the two linked list in it and queue of data called as data pipeline. The CCID and CBID. Both are also linked to each other. The implementation is as following:

Implementation:

File reading & Data pipeline:

Data pipeline is a queue in which the data is read and is populated. Then another data is read and stored until the file ends. From the both files the data is read and in stored in the pipeline. The **enqueue ()** function is called to add the data in the data pipeline. **MoveIndatapipeline ()** mainly read each string and enqueue in the string.

Dequeue in CCID and CBID:

After this data is Dequeue from the data pipeline. As the database was static so the first 50 elements were of CBID that were added to CBID list and was deleted from the data pipeline. Each data was added by calling the **populateMe ()** and from populateMe the function **addTome ()** is called and added in the CBID list. Similarly, the CCID was populated. Initially crime was single and was added as the node of crime that is the singly linked list. Also the data inserted in CCID nad CBID is in ascending order.

This all is done in the database class. In the constructor of database all of the above mentioned work is done. i.e. all data filling is done in the constructor. Other these databases perform many other functions as:

- ### Search in CBID & Search in CCID:

Searches the CNIC in the record and display the data against in it similarly search in CCID searches the record in CCID.

- ### Update CBID name, father name, address, nationality:

This updates the data against the given CNIC if not found returns false that was not in the data otherwise updates the desired data.

- ### Add crime:

Crime is a singly list. Each CCID node contains this. When addition to crime is done it's check whether it exist in CBID or not. To see the validity of the CNIC. Then it checks if CNIC exist in the CCID then the crime is appended as there was the existence of the crime. If it doesn't there a new node in acid is made that contains the new data and crime contain the first crime and so on.

- **Update crime:**

After validating the entered CNIC then the CNIC's crime the crime is updated. The head entry only.

- **Delete Crime:**

Crime is deleted. If CNIC exist and crime is also found, then the specific of crime list is deleted. If the deleted was the last crime, then the relation pointers are again set to NULL.

Relation developing and breaking:

In CBID a pointer of CCID is made to refer to the CCID and in CCID a pointer of CBID is made to refer the CBID from CCID.

Relation are developed by the function. The iteration is done in CCID if a cnic is found then iteration is done in the CBID and if the cnic matches to the specific node then that nodes are linked by setting the pointers mentioned above.

Relations are breaked by iterating till the desired cnic then the above pointers are set to NULL, as having no relations, do this in both CCID & CBID.

```
//find each of ccid in cbid
            while (tempB)
            {
                //the CBID cnic
                cnicinCBID = stoi(tempB->cnicB);

                //both are same so make the relation
                if (cnicinCBID == cnicinCCID)
                {
                    //making reference;
                    // will add the references
                   //refering to ccid in cbid
                    cb.addReference(temp, cnicinCCID);

                   //referring to cbid in ccid
                    ci.addReference(tempB, cnicinCCID);


                    break; //no need to see more
                }
```

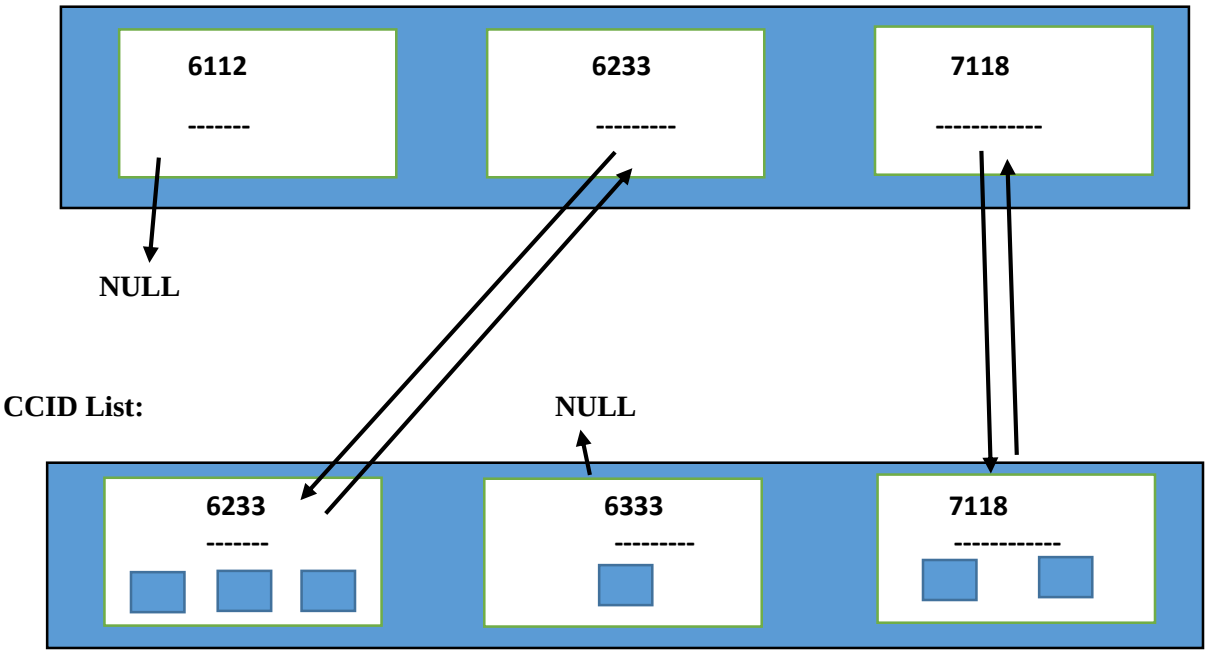
```
            tempB = tempB->next;
        }

        temp = temp->next; //next CCID entery
    }
```

```
//iterate in list
    while (tempCBID)
    {
        cnicAlready = stoi(tempCBID->cnicB);

        if (cnic == cnicAlready)
        {
            //remove the relation
            tempCBID->referencetoCCID = NULL;
            break;
        }

        //going to next
        tempCBID = tempCBID->next;
    }
```

Deleting Reference in CBID for CCID similar in CCID for CBID

Pictorial Presentation:

CBID List:



Crime list is embedded that is singular linked list and CCID is doubly circular linked list and CBID is doubly linked list.

Testing:

Google unit testing(Gtest) were used. The given tests were run and were executed successfully. The test includes the test of updating name, father name, address, nationality and crimes, add crimes and delete crimes. Searching in CBID and CCID. Screenshot is below: