Database Implementation System
Project : 4.1

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Instruction to Compile and Run:

To run a4-1.out:

Please use the below commands to complie the testing code. While running the executable file using the command “./a4-1.out” pass queryNo as an argument which is any number between 0-11. Example: ./a4-1.out 1

```
> make a4-1.out
> ./a4-1.out {queryNo}
```

To run runTestCases.sh:

Pleae use the below commands to run the bash file. This will generate an output41.txt file.

```
> make a4-1.out
> ./runTestCases.sh
```

To run gtest:

```
> make clean
> make gtest
> ./gtest
```

Project Flow and Structure:

Classes

RelStats:

```
class RelStats{

    long noOfTuples;
    string groupName;
    int groupSize;
    map<string,int> attributeMap;
public:
    //constructor,copyconstructor and destructor function

    RelStats(int numTuples, string relName;
    ~RelStats();
    RelStats(RelStats &copyMe);

    //getter function

    string GetGroupName();
    int GetGroupSize();
    map<string,int> * GetRelationAttributes();
    long GetNofTuples();

    //setter function
    void UpdateNoOfTuples(int numTuples);
    void UpdateAttributes(string attName,int numDistincts);
    void UpdateGroup(string groupName,int groupCount);
};
```

Statistics:

```
class Statistics
{
private:
    map<string,RelStats*> statsMap;
public:
    Statistics();
    ~Statistics();
    map<string,RelStats*>* GetStatsMap();
    Statistics(Statistics &copyMe);      // Performs deep copy
    void AddRel(char *relName, int numTuples);
    void AddAtt(char *relName, char *attName, int numDistincts);
    void CopyRel(char *oldName, char *newName);
    void Read(char *fromWhere);
    void Write(char *fromWhere);
    bool checkParseTreeAndPartition(struct AndList *parseTree, char *relNames[], int numToJoin,map<string,long>
&uniqvallist);
    bool CheckForAttribute(char *value,char *relNames[], int numToJoin,map<string,long> &uniqvallist);
    void Apply(struct AndList *parseTree, char *relNames[], int numToJoin);
    double Estimate(struct AndList *parseTree, char **relNames, int numToJoin);
    double EstimateTuples(struct OrList *orList, map<string,long> &uniqvallist);
    void printRelsAtts();
};
```

Statistics.txt:

All the information recorded by the statistics class is stored in a text file named “Statistics.txt”. If the file exist the statistics data can be loaded into the program using read command and the statistics data can be written out using write command. The following is the format used for the file. Please consider the below sample

Before Join:
The begin denotes the start of the new relation. The next line consist of the relation name , no of tuples, group-name and group count. Initially the relation name and groupname are the same. But after join the group name becomes comma separated name of the tables used by join and the count of the tables. This is followed by lines contain attribute followed by the distinct count till the END tag is encountered.

```
BEGIN
lineitem 21433 ,lineitem 1
l_partkey 200000
l_shipinstruct 4
l_shipmode 7
END
BEGIN
part 21433 ,part 1
p_container 40
p_partkey 200000
END
```

After Join:
After join the individual tuples count of all the relations are updated and the groupname and the group count for all the relation involved in the join are updated. The relations are not combined into one entry and are stored separately with groupName and groupCount being the common identifying factor.

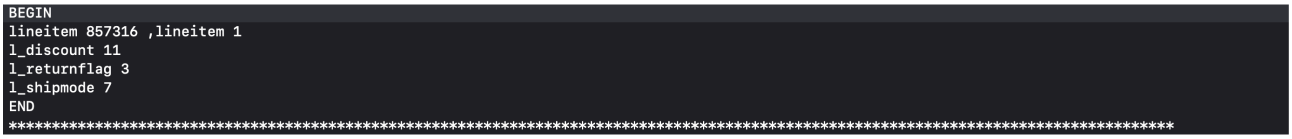
```
BEGIN
lineitem 21433 ,part,lineitem 2
l_partkey 200000
l_shipinstruct 4
l_shipmode 7
END
BEGIN
part 21433 ,part,lineitem 2
```

p_container 40
p_partkey 200000
END

Results:

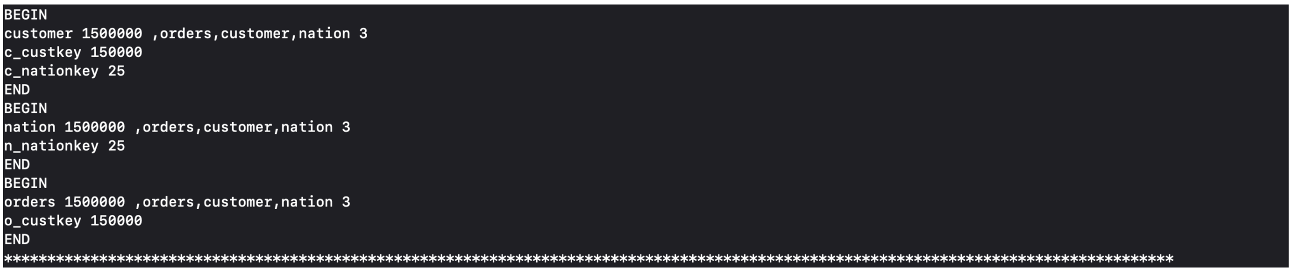
Screenshots from output41.txt

Query 1



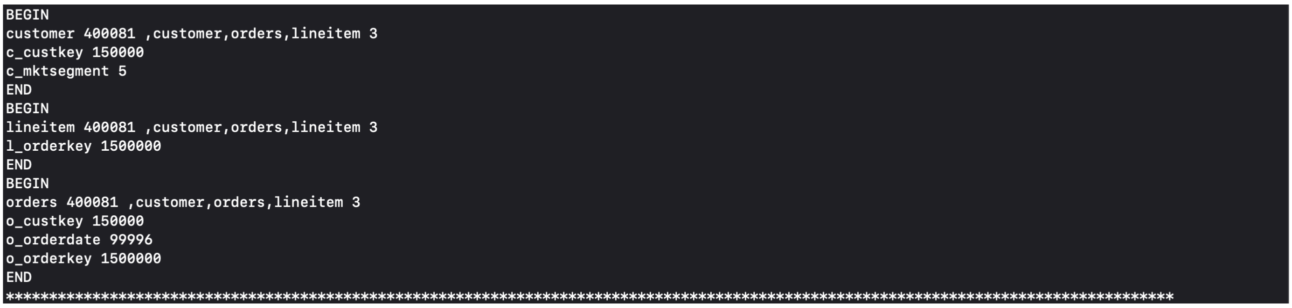
```
BEGIN
lineitem 857316 ,lineitem 1
l_discount 11
l_returnflag 3
l_shipmode 7
END
***************************************************************************************************************************************
```

Query 2



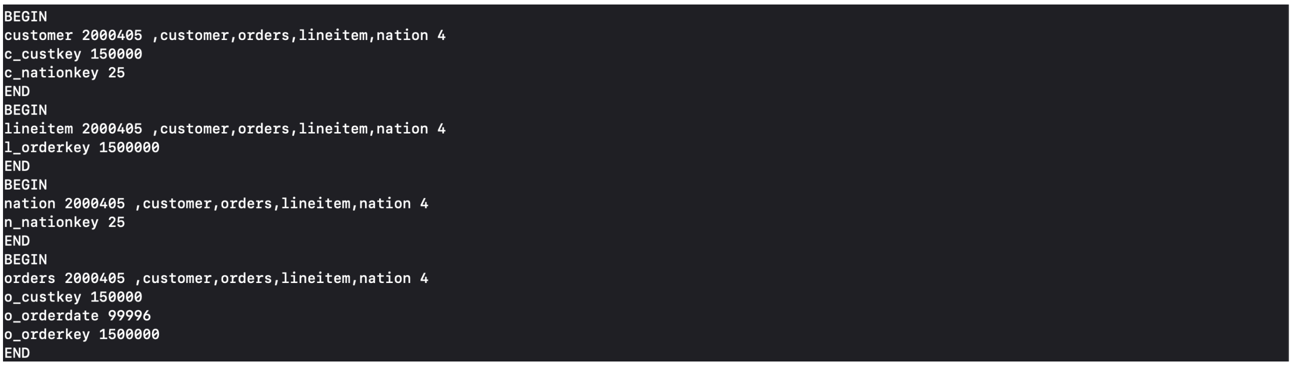
```
BEGIN
customer 1500000 ,orders,customer,nation 3
c_custkey 150000
c_nationkey 25
END
BEGIN
nation 1500000 ,orders,customer,nation 3
n_nationkey 25
END
BEGIN
orders 1500000 ,orders,customer,nation 3
o_custkey 150000
END
***************************************************************************************************************************************
```

Query 5



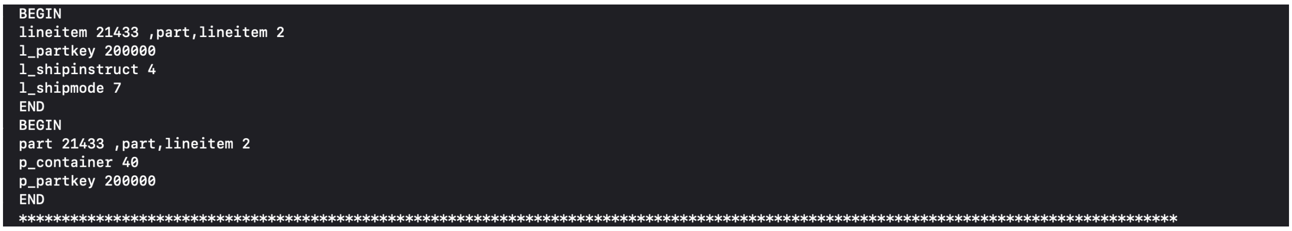
```
BEGIN
customer 400081 ,customer,orders,lineitem 3
c_custkey 150000
c_mktsegment 5
END
BEGIN
lineitem 400081 ,customer,orders,lineitem 3
l_orderkey 1500000
END
BEGIN
orders 400081 ,customer,orders,lineitem 3
o_custkey 150000
o_orderdate 99996
o_orderkey 1500000
END
***************************************************************************************************************************************
```

Query 10



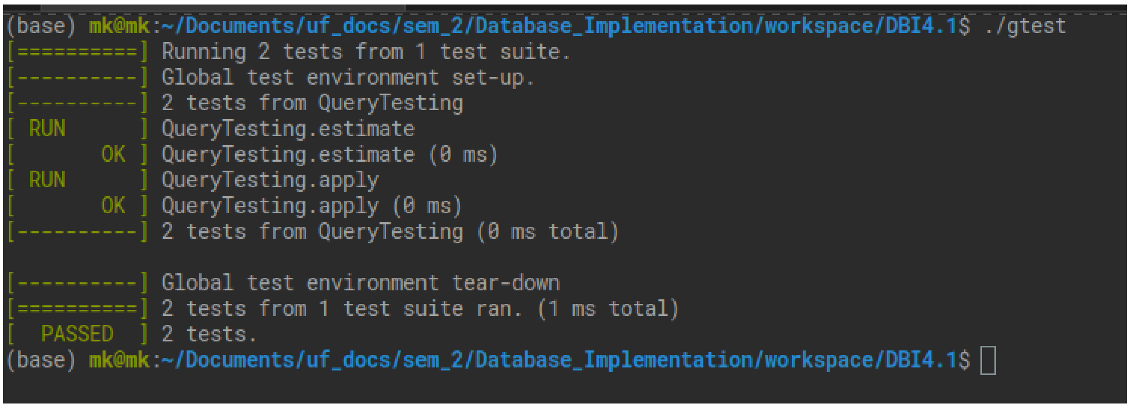
```
BEGIN
customer 2000405 ,customer,orders,lineitem,nation 4
c_custkey 150000
c_nationkey 25
END
BEGIN
lineitem 2000405 ,customer,orders,lineitem,nation 4
l_orderkey 1500000
END
BEGIN
nation 2000405 ,customer,orders,lineitem,nation 4
n_nationkey 25
END
BEGIN
orders 2000405 ,customer,orders,lineitem,nation 4
o_custkey 150000
o_orderdate 99996
o_orderkey 1500000
END
```

Query 11



```
BEGIN
lineitem 21433 ,part,lineitem 2
l_partkey 200000
l_shipinstruct 4
l_shipmode 7
END
BEGIN
part 21433 ,part,lineitem 2
p_container 40
p_partkey 200000
END
***************************************************************************************************************************************
```

GTest Results



```
(base) mk@mk:~/Documents/uf_docs/sem_2/Database_Implementation/workspace/DBI4.1$ ./gtest
[==========] Running 2 tests from 1 test suite.
[----------] Global test environment set-up.
[----------] 2 tests from QueryTesting
[ RUN      ] QueryTesting.estimate
[       OK ] QueryTesting.estimate (0 ms)
[ RUN      ] QueryTesting.apply
[       OK ] QueryTesting.apply (0 ms)
[----------] 2 tests from QueryTesting (0 ms total)

[----------] Global test environment tear-down
[==========] 2 tests from 1 test suite ran. (1 ms total)
[  PASSED  ] 2 tests.
(base) mk@mk:~/Documents/uf_docs/sem_2/Database_Implementation/workspace/DBI4.1$ 
```