Database System Implementation

Project 1 Report

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Table of Contents

Build Process

- unzip the compressed file using `unzip filename.zip`
- `cd src` to change to source directory
- `make test.out` to compile test.out
- `./test.out` to run the compiled binary
- `make gtest` to compile google test cases
- `./gtest` to run test cases
- `make clean` to clean the compiled binaries

DBFile.cc

Following are the states used in this program

- `file`: It's an instance of class `File` implementing heap
- `read_page`: It's an instance of class `Page` that is used to read records
- `write_page`: It's an instance of class `Page` that is used to write records
- `head`: It's an instance of class `Record` pointing to the current record
- `read_index`: Maintains a count of number of records it has read
- `write_index`: Maintains a count of number of records it has written
- `comparisonEngine`: It's an instance of class `ComparisonEngine` used to filter records using a CNF

- `has_record_to_write`: It's a boolean that would be set to true if there's any record in Page buffer that is yet to be written to the file; false otherwise.
- `is_end_of_file`: It's a boolean that denotes that we have reached at the end of a file.

DBFile::Create

In order to create a file, we make use of exiting `File::Open()` method with argument `0`(Since we want to create a file). Once a file is created we initialize other parameters such as `read_index`, `write_index`, `has_record_to_write` & `is_end_of_file` to their default values.

DBFile::Open

To open a file, `File::Open()` is used with argument `1`(Since we want to open a file) & f_path.

DBFile::Close

Before closing a file, we check if there's any record left to be written. If there is we write it out to file before closing it

DBFile::Load

In order to load, all the records from schema, we've used `SuckNextRecord` method that reads the next record from a pointer to a text file and then add it to page buffer.

DBFile::Add

Check if the size doesn't exceed the current page size. If it exceeds then write it to file before and then add record. Else add the record to the page buffer.

DBFile::WriteToFile

Write the current page records to file and empties the page buffer.

DBFile::MoveFirst

Get the first page and move to the first record of that page.

DBFile::GetNext(Record)

Gets the first record from the current read page by using `File::GetFirst()` and puts it into the record passed as an argument. This also increments the pointer into the file, so a subsequent call to `GetNext()` won't return the same record twice. In case, the record is not found in current page, we increment the `read_index` and then load the record from the corresponding page.

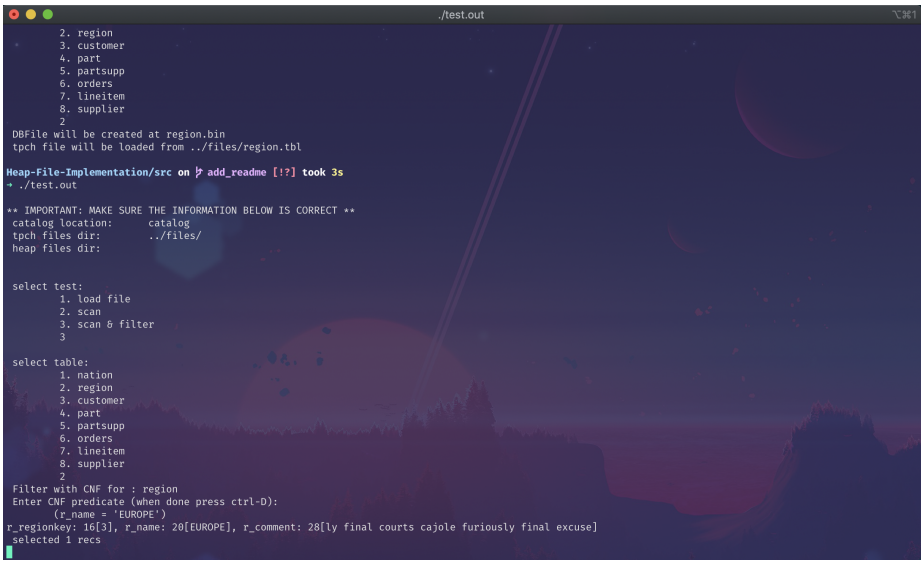
DBFile::GetNext(Record &record_to_fetch, CNF &cnf, Record &literal)

This method internally calls `DBFile::GetNext(record_to_fetch)` and calls the `Compare` method of the comparison check to the satisfiability of the `cnf`

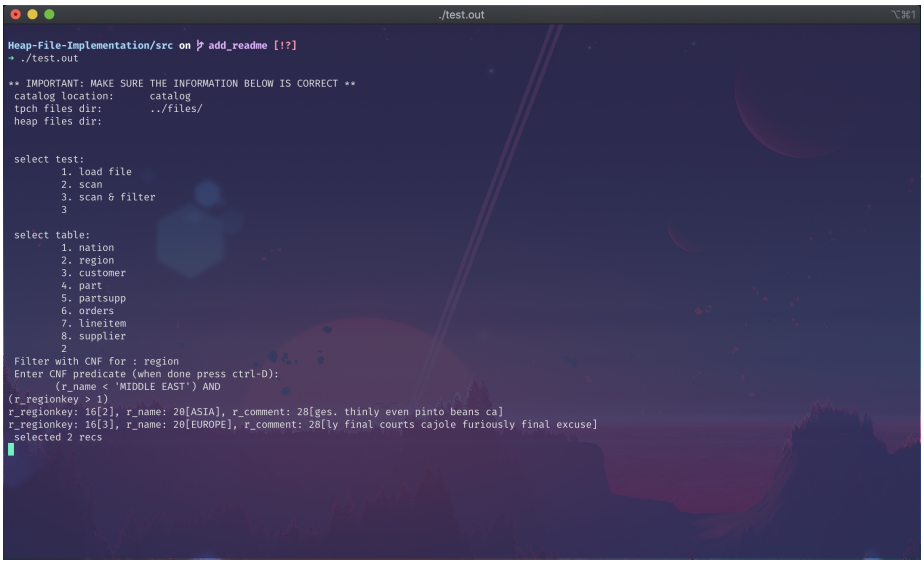
Test Results

test.cc

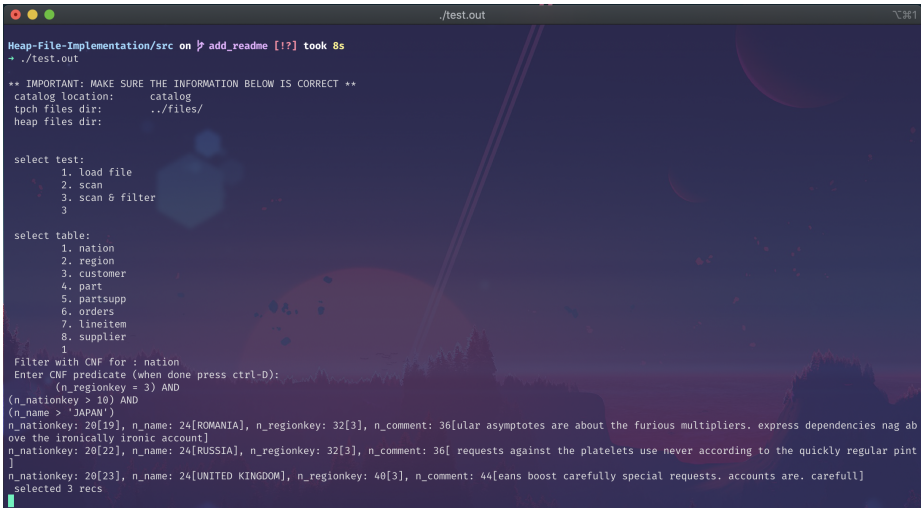
q1



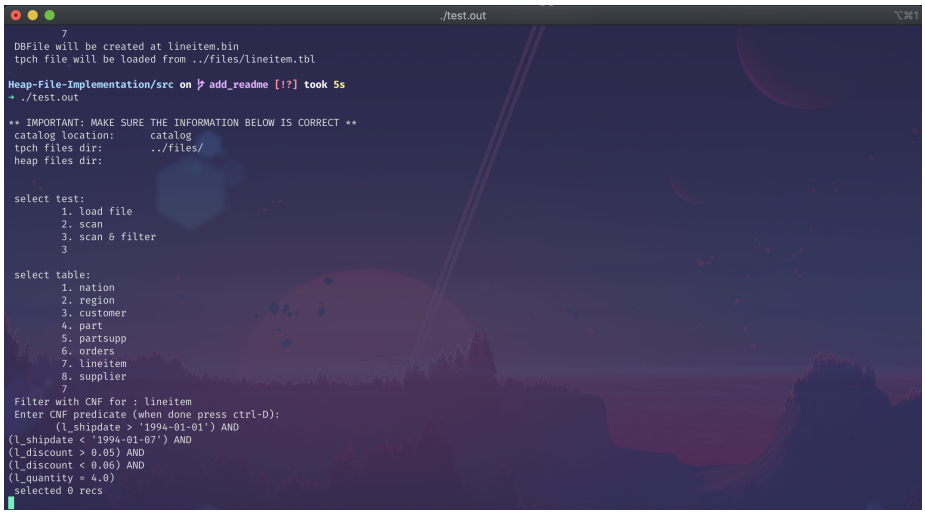
q2


./test.out
Heap-File-Implementation/src on add_readme [!?]
➜ ./test.out
** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location: catalog
tpch files dir: ../files/
heap files dir:
select test:
1. load file
2. scan
3. scan & filter
3
select table:
1. nation
2. region
3. customer
4. part
5. partsupp
6. orders
7. lineitem
8. supplier
2
Filter with CNF for : region
Enter CNF predicate (when done press ctrl-D):
(r_name < 'MIDDLE EAST') AND
(r_regionkey > 1)
r_regionkey: 16[2], r_name: 20[ASIA], r_comment: 28[ges. thinly even pinto beans ca]
r_regionkey: 16[3], r_name: 20[EUROPE], r_comment: 28[ly final courts cajole furiously final excuse]
selected 2 recs

q3


./test.out
Heap-File-Implementation/src on add_readme [!?] took 8s
➜ ./test.out
** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location: catalog
tpch files dir: ../files/
heap files dir:
select test:
1. load file
2. scan
3. scan & filter
3
select table:
1. nation
2. region
3. customer
4. part
5. partsupp
6. orders
7. lineitem
8. supplier
1
Filter with CNF for : nation
Enter CNF predicate (when done press ctrl-D):
(n_regionkey = 3) AND
(n_nationkey > 10) AND
(n_name > 'JAPAN')
n_nationkey: 20[19], n_name: 24[ROMANIA], n_regionkey: 32[3], n_comment: 36[ular asymptotes are about the furious multipliers. express dependencies nag ab
ove the ironically ironic account]
n_nationkey: 20[22], n_name: 24[RUSSIA], n_regionkey: 32[3], n_comment: 36[requests against the platelets use never according to the quickly regular pint
]
n_nationkey: 20[23], n_name: 24[UNITED KINGDOM], n_regionkey: 40[3], n_comment: 44[eans boost carefully special requests. accounts are. carefull]
selected 3 recs

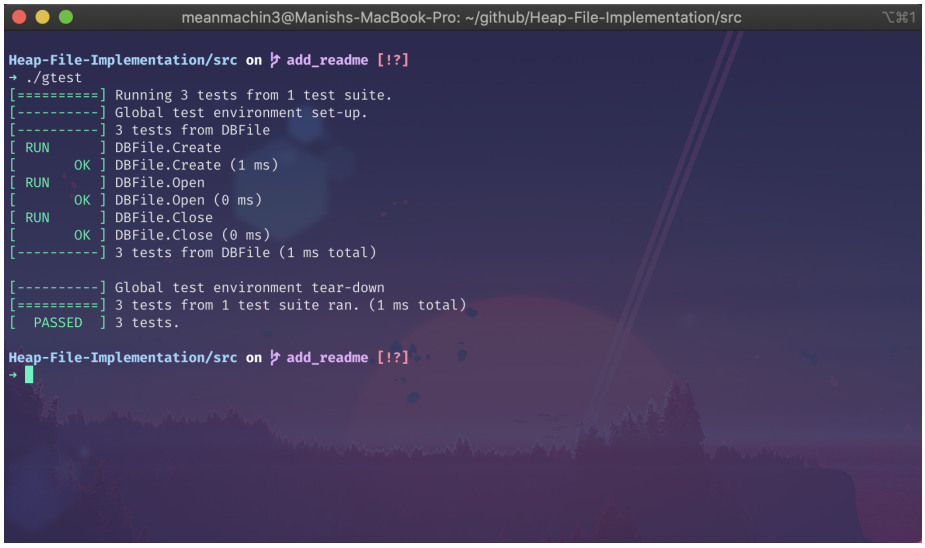
q11


./test.out
7
DBFile will be created at lineitem.bin
tpch file will be loaded from ../files/lineitem.tbl
Heap-File-Implementation/src on add_readme [!?] took 5s
→ ./test.out
** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location: catalog
tpch files dir: ../files/
heap files dir:
select test:
1. load file
2. scan
3. scan & filter
3
select table:
1. nation
2. region
3. customer
4. part
5. partsupp
6. orders
7. lineitem
8. supplier
7
Filter with CNF for : lineitem
Enter CNF predicate (when done press ctrl-D):
(l_shipdate > '1994-01-01') AND
(l_shipdate < '1994-01-07') AND
(l_discount > 0.05) AND
(l_discount < 0.06) AND
(l_quantity = 4.0)
selected 0 recs

q12


./test.out
: 112[0.01], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1995-04-09], l_commitdate: 140[1995-02-20], l_receiptdate: 152[1995-05-09], l_shipinstruct: 164[TAKE BACK RETURN], l_shipmode: 184[AIR], l_comment: 188[ve slyly of the frets. careful]
l_orderkey: 68[677], l_partkey: 72[1497], l_suppkey: 76[15], l_linenumber: 80[5], l_quantity: 88[25], l_extendedprice: 96[34962.2], l_discount: 104[0], l_tax: 112[0.05], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1994-03-12], l_commitdate: 140[1994-02-02], l_receiptdate: 152[1994-03-28], l_shipinstruct: 164[DELIVER IN PERSON], l_shipmode: 184[AIR], l_comment: 188[packages integrate blithely]
l_orderkey: 68[678], l_partkey: 72[975], l_suppkey: 76[76], l_linenumber: 80[5], l_quantity: 88[16], l_extendedprice: 96[30015.5], l_discount: 104[0.06], l_tax: 112[0.04], l_returnflag: 120[R], l_linestatus: 124[F], l_shipdate: 128[1993-03-09], l_commitdate: 140[1993-04-18], l_receiptdate: 152[1993-04-07], l_shipinstruct: 164[NONE], l_shipmode: 172[AIR], l_comment: 176[about the]
l_orderkey: 68[738], l_partkey: 72[1871], l_suppkey: 76[72], l_linenumber: 80[2], l_quantity: 88[4], l_extendedprice: 96[7091.48], l_discount: 104[0], l_tax: 112[0.03], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1993-06-20], l_commitdate: 140[1993-04-08], l_receiptdate: 152[1993-07-09], l_shipinstruct: 164[NONE], l_shipmode: 172[AIR], l_comment: 176[ar packages. fluffily bo]
l_orderkey: 68[738], l_partkey: 72[1749], l_suppkey: 76[34], l_linenumber: 80[5], l_quantity: 88[30], l_extendedprice: 96[49522.2], l_discount: 104[0.02], l_tax: 112[0], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1993-06-12], l_commitdate: 140[1993-05-29], l_receiptdate: 152[1993-06-25], l_shipinstruct: 164[NONE], l_shipmode: 172[AIR], l_comment: 176[ecial instructions haggle blithely regula]
l_orderkey: 68[742], l_partkey: 72[1919], l_suppkey: 76[64], l_linenumber: 80[4], l_quantity: 88[16], l_extendedprice: 96[29134.6], l_discount: 104[0.01], l_tax: 112[0.05], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1995-01-15], l_commitdate: 140[1995-02-25], l_receiptdate: 152[1995-01-24], l_shipinstruct: 164[COLLECT COD], l_shipmode: 176[AIR], l_comment: 180[eodolites haggle carefully regul]
l_orderkey: 68[769], l_partkey: 72[1751], l_suppkey: 76[94], l_linenumber: 80[1], l_quantity: 88[36], l_extendedprice: 96[59499], l_discount: 104[0.02], l_tax: 112[0.02], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1993-10-01], l_commitdate: 140[1993-08-07], l_receiptdate: 152[1993-10-15], l_shipinstruct: 164[NONE], l_shipmode: 172[AIR], l_comment: 176[es. furiously iro]
l_orderkey: 68[772], l_partkey: 72[1799], l_suppkey: 76[26], l_linenumber: 80[4], l_quantity: 88[10], l_extendedprice: 96[17007.9], l_discount: 104[0.08], l_tax: 112[0.02], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1993-05-17], l_commitdate: 140[1993-06-09], l_receiptdate: 152[1993-05-29], l_shipinstruct: 164[COLLECT COD], l_shipmode: 176[AIR], l_comment: 180[o the furiously final deposits. furi]
l_orderkey: 68[801], l_partkey: 72[947], l_suppkey: 76[36], l_linenumber: 80[2], l_quantity: 88[21], l_extendedprice: 96[38806.7], l_discount: 104[0.05], l_tax: 112[0.02], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1992-03-14], l_commitdate: 140[1992-04-01], l_receiptdate: 152[1992-04-05], l_shipinstruct: 164[COLLECT COD], l_shipmode: 176[AIR], l_comment: 180[wake silently furiously idle deposits.]
l_orderkey: 68[802], l_partkey: 72[1328], l_suppkey: 76[29], l_linenumber: 80[2], l_quantity: 88[34], l_extendedprice: 96[41796.9], l_discount: 104[0.08], l_tax: 112[0.06], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1995-03-01], l_commitdate: 140[1995-03-15], l_receiptdate: 152[1995-03-12], l_shipinstruct: 164[COLLECT COD], l_shipmode: 176[AIR], l_comment: 180[instructions cajole carefully. quietl]
l_orderkey: 68[866], l_partkey: 72[1358], l_suppkey: 76[59], l_linenumber: 80[1], l_quantity: 88[5], l_extendedprice: 96[6296.75], l_discount: 104[0.08], l_tax: 112[0], l_returnflag: 120[R], l_linestatus: 124[F], l_shipdate: 128[1993-01-22], l_commitdate: 140[1993-01-14], l_receiptdate: 152[1993-02-07], l_shipinstruct: 164[TAKE BACK RETURN], l_shipmode: 184[AIR], l_comment: 188[tegrate fluffily. carefully f]
l_orderkey: 68[928], l_partkey: 72[104], l_suppkey: 76[31], l_linenumber: 80[7], l_quantity: 88[11], l_extendedprice: 96[11045.1], l_discount: 104[0], l_tax: 112[0.01], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1995-04-29], l_commitdate: 140[1995-04-16], l_receiptdate: 152[1995-04-30], l_shipinstruct: 164[NONE], l_shipmode: 172[AIR], l_comment: 176[longside of]
l_orderkey: 68[930], l_partkey: 72[173], l_suppkey: 76[52], l_linenumber: 80[2], l_quantity: 88[47], l_extendedprice: 96[50439], l_discount: 104[0.08], l_tax: 112[0], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1995-03-20], l_commitdate: 140[1995-02-04], l_receiptdate: 152[1995-04-04], l_shipinstruct: 164[DELIVER IN PERSON], l_shipmode: 184[AIR], l_comment: 188[ackages. fluffily e]
l_orderkey: 68[933], l_partkey: 72[992], l_suppkey: 76[27], l_linenumber: 80[3], l_quantity: 88[26], l_extendedprice: 96[49217.7], l_discount: 104[0.05], l_tax: 112[0], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1992-11-09], l_commitdate: 140[1992-11-03], l_receiptdate: 152[1992-11-16], l_shipinstruct: 164[DELIVER IN PERSON], l_shipmode: 184[AIR], l_comment: 188[the deposits affix slyly after t]
l_orderkey: 68[960], l_partkey: 72[1070], l_suppkey: 76[6], l_linenumber: 80[1], l_quantity: 88[1], l_extendedprice: 96[971.07], l_discount: 104[0.07], l_tax: 112[0], l_returnflag: 120[A], l_linestatus: 124[F], l_shipdate: 128[1994-12-24], l_commitdate: 140[1994-10-26], l_receiptdate: 152[1995-01-20], l_shipinstruct: 164[DELIVER IN PERSON], l_shipmode: 184[AIR], l_comment: 188[y ironic packages. quickly even]
selected 35 recs

Gtest


meanmachin3@Manishs-MacBook-Pro: ~/github/Heap-File-Implementation/src
⌥⌘1
Heap-File-Implementation/src on add_readme [!?]
→ ./gtest
[==========] Running 3 tests from 1 test suite.
[----------] Global test environment set-up.
[----------] 3 tests from DBFile
[RUN   ] DBFile.Create
[OK] DBFile.Create (1 ms)
[RUN   ] DBFile.Open
[OK] DBFile.Open (0 ms)
[RUN   ] DBFile.Close
[OK] DBFile.Close (0 ms)
[----------] 3 tests from DBFile (1 ms total)
[----------] Global test environment tear-down
[==========] 3 tests from 1 test suite ran. (1 ms total)
[PASSED] 3 tests.
Heap-File-Implementation/src on add_readme [!?]
→