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CSC 331 – DataBoss Proposal

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08

**Fall**

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Table of Contents

Topic 3

Goals 3

Description 3

Design 5

Time Table 8

Sample Screens 8

Models 12

# Topic

DataBoss, file management solution.

Databoss provides support for basic record manipulation operations, including: record addition, deletion, modification, and searching.

The system provides support for these operations through the use of two key index lists. The primary key index list uses the primary key associated with the record to create an index key list for facilitating operations. The secondary key index list uses the “code” field associated with the record to provide an additional option for manipulating and searching for records.

Both of the key index lists are loaded into memory for use and allow for reading/writing records from the record file without loading the file into memory. Instead, an offset associated with each record is stored in the primary key index list and used to read/write records to/from the record file by seeking to the appropriate offset. This approach reduces the overhead associated with reading the contents of an entire file into memory to alter or read its contents.

# Goals

Indicate how you classify this database and its application area.

The classification for this database is a single user database system. The system supports one user at a time for the viewing, searching, and modification of records.

The application area for the database is likely small-scale, like a store or small business inventory. There are a few key factors leading to this conclusion:

1. The database is a single user system.
2. There is no record hierarchy supported for organization of items.
3. The system only works for one type of record.

# Description

DataBoss provides support for: Addition of new records, Deletion of existing records, Modification of existing records, and searching for a record.

Addition -  **add KEY NAME CODE COST**

The addition of a new record for a program including a secondary key list can be achieved by:

1. Read new record from input.
2. Insert record in data file.
3. Place the record at the end of the record file.
4. Adjust the size of the new record’s RRN (to match its position in the file).
5. Save the data file.
6. Get the key & location (RRN) from the record.
7. Insert the key & RRN into the primary key list.
8. Insert the secondary key (code) & primary key into the secondary key list.

Deletion - **del KEY**

The deletion of a record for a program including a secondary key list can be achieved by:

1. Delete the data record from the file.
   1. Change the value of the “key” field in the record being deleted to -1 in the record file.
2. Delete the entry for the record from the primary key list.
3. Delete the entry for the record from the secondary key entry.

Modification -  **mod KEY DATA\_LABEL NEW\_DATA**

The modification of a record for a program including a secondary key list can be achieved by:

1. If primary key is changed: -- ***key field***
   1. Search key table for key being changed.
   2. Read the record from the record file (using the RRN from the key list)
   3. Update the key field in the record.
   4. Update the data file - Write the altered record to the record file.
   5. Update primary key list.
      1. Remove the old key entry from the list
      2. Insert the new key entry into the list.
   6. Update secondary key list.
      1. Remove the old key entry from the inverted list.
      2. Insert the new key entry into the inverted list.
2. If the secondary key is changed: -- ***key field***
   1. Search key table for key being changed.
   2. Read the record from the record file (using the RRN from the key list)
   3. Update the secondary key field (code) in the record.
   4. Update the data file - Write the altered record to the record file.
   5. Update the secondary key list.
      1. Remove the old key entry from the inverted list
      2. Insert the new key entry into the inverted list.
3. If data other than a key is changed: -- ***non-key field***
   1. Locate the key in the key list.
   2. Read the record from the record file (using the RRN from the key list).
   3. Change the appropriate field in the record.
   4. Update the data file with the changed value.

Updates can be handled through in-place modifications or a deletion followed by an insertion.

Search -  **search KEY**

1. Search for primary key:
   1. Perform a binary search on the primary key list for the key passed.
   2. Read the record with the matching key from the record file (using the RRN from the key list).
   3. Return the found record.
2. Search for secondary key:
   1. Perform a binary search on the secondary key list for the secondary key (code) passed.
   2. Return all elements in the secondary list entry rather than just a single value (like with the primary key search).
      1. It seems like this could operate by returning all of the primary keys associated with the code being searched for **or** getting all of the records from the record file matching the code being searched for and returning all of these records. Each record with a code matching the search key could be read from the file using the RRN for the primary key in the primary key table. Essentially perform a binary search on the primary key table for each element in the inverted list matching the code search key.

Display -  **display**

1. Display each record in the record file.
2. Display the contents of the primary index list.
3. Display the contents of the secondary index list.

# Design

# Time Table

Outline your proposed design, implementation, and testing effort by date and indicate an estimated number of hours to complete each part.

Design - 10/28/14 – (Estimated time: 15 man hours)

* Design system.
* Outline operations.
* Design system UML.
* Design activity flows.

Implementation

Alpha - 11/6/14 - (Estimated time: 12 man hours)

* + Implement all operations for primary key list.
  + Testing: test operations for primary key list.
* Beta - 11/13/14 - (Estimated time: 14 man hours)
  + Implement all operations for secondary key list.
  + Testing: test operations for secondary key list.
* 1.0 - 11/20/14 - (Estimated time: 10 man hours)
  + Finalize all operations for both lists.
  + Testing: test all operations.

Testing - 11/20/14 - (Estimated time: 6 man hours)

* Test entire system with prepared data with known results to test validity of record system.

# Sample Screens

Operations performed on prog5.dat and its associated index files primary.idx and secondary.idx

**Text in bold is displayed on screen to the user.**

Contents of prog5.dat:

8 blank 0 0.0

12345 Item06 45 14.2

12434 Item04 21 17.3

12382 Item09 62 41.37

34186 Item25 18 17.75

12165 Item16 30 7.69

16541 Item12 21 9.99

21212 Itme31 19 8.35

41742 Item14 55 12.36

Contents of primary.idx, after creating the list from prog5.dat:

8     0

12165 5

12345 1

12382 3

12434 2

16541 6

21212 7

34186 4

41742 8

Contents of secondary.idx, after creating the list from prog5.dat:

18   34186

19   21212

21   12434

21   16541

30   12165

45   12345

55   41742

62   12382

Addition:

**add 10110 Item03 19 10.23**

**Record 10110 added to DataBoss.**

Contents of prog5.dat after the addition:

   9 blank 0 0.0

12345 Item06 45 14.2

12434 Item04 21 17.3

12382 Item09 62 41.37

34186 Item25 18 17.75

12165 Item16 30 7.69

16541 Item12 21 9.99

21212 Itme31 19 8.35

41742 Item14 55 12.36

10110 Item03 19 10.23

Contents of primary.idx after the addition:

9     0

10110 9

12165 5

12345 1

12382 3

12434 2

16541 6

21212 7

34186 4

41742 8

Contents of secondary.idx after the addition:

18   34186

19   10110

19   21212

21   12434

21   16541

30   12165

45   12345

55   41742

62   12382

Deletion:

**del 12165**

**Record 12165 removed from DataBoss**

Contents of prog5.dat after the deletion:

8 blank 0 0.0

12345 Item06 45 14.2

12434 Item04 21 17.3

12382 Item09 62 41.37

34186 Item25 18 17.75

  -1 Item16 30 7.69

16541 Item12 21 9.99

21212 Itme31 19 8.35

41742 Item14 55 12.36

10110 Item03 19 10.23

Contents of primary.idx after the deletion:

8     0

10110 8

12345 1

12382 3

12434 2

16541 5

21212 6

34186 4

41742 7

Contents of secondary.idx after the deletion:

18   34186

19   10110

19   21212

21   12434

21   16541

45   12345

55   41742

62   12382

Modification:

(Primary key field)

**mod 16541 key 12433**

**Record 16541 is now key 12433.**

Contents of prog5.dat after the modification:

8 blank 0 0.0

12345 Item06 45 14.2

12434 Item04 21 17.3

12382 Item09 62 41.37

34186 Item25 18 17.75

  -1 Item16 30 7.69

12433 Item12 21 9.99

21212 Itme31 19 8.35

41742 Item14 55 12.36

10110 Item03 19 10.23

Contents of primary.idx after the modification:

8     0

10110 8

12345 1

12382 3

12433 5

12434 2

21212 6

34186 4

41742 7

Contents of secondary.idx after the deletion:

18   34186

19   10110

19   21212

21   12433

21   12434

45   12345

55   41742

62   12382

(Secondary key field)

**mod 12433 code 19**

**Record 12433 has been modified.**

Contents of prog5.dat after the modification:

8 blank 0 0.0

12345 Item06 45 14.2

12434 Item04 21 17.3

12382 Item09 62 41.37

34186 Item25 18 17.75

  -1 Item16 30 7.69

12433 Item12 19 9.99

21212 Itme31 19 8.35

41742 Item14 55 12.36

10110 Item03 19 10.23

Contents of primary.idx after the modification:

8     0

10110 8

12345 1

12382 3

12433 5

12434 2

21212 6

34186 4

41742 7

Contents of secondary.idx list after modification:

18  34186

19  10110

19  12433

19  21212

21  12434

45  12345

55  41742

62  12382

(non-key field)

**mod 12433 name Item11**

**Record 12433 has been modified.**

Contents of prog5.dat after the modification:

8 blank 0 0.0

12345 Item06 45 14.2

12434 Item04 21 17.3

12382 Item09 62 41.37

34186 Item25 18 17.75

  -1 Item16 30 7.69

12433 Item11 19 9.99

21212 Itme31 19 8.35

41742 Item14 55 12.36

10110 Item03 19 10.23

Contents of primary.idx after the modification:

8     0

10110 8

12345 1

12382 3

12433 5

12434 2

21212 6

34186 4

41742 7

Contents of secondary.idx list after modification:

18  34186

19  10110

19  12433

19  21212

21  12434

45  12345

55  41742

62  12382

Search:

**search 12433**

**12433 Item11 21 9.99**

Contents of prog5.dat after the modification: Unchanged

Contents of primary.idx after the modification: Unchanged

Contents of secondary.idx list after modification: Unchanged

**search 19**

**10110 Item03 19 10.23**

**12433 Item11 19 9.99**

**21212 Itme31 19 8.35**

Contents of prog5.dat after the modification: Unchanged

Contents of primary.idx after the modification: Unchanged

Contents of secondary.idx list after modification: Unchanged

# Models

Models for design were included in the Design section.