COSEQUENTIAL PROCESSING

Contents of today's lecture:

- Cosequential processing (Section 8.1),
- Application: a general ledger program (Section 8.2)

Reference: Folk, Zoellick and Riccardi, File Structures, 1998. Section 8.1-8.2.

Cosequential Processing

Cosequential processing involves the **coordinated processing** of **two or more sequential lists** to produce a single output list.

The two main types of resulting output lists are :

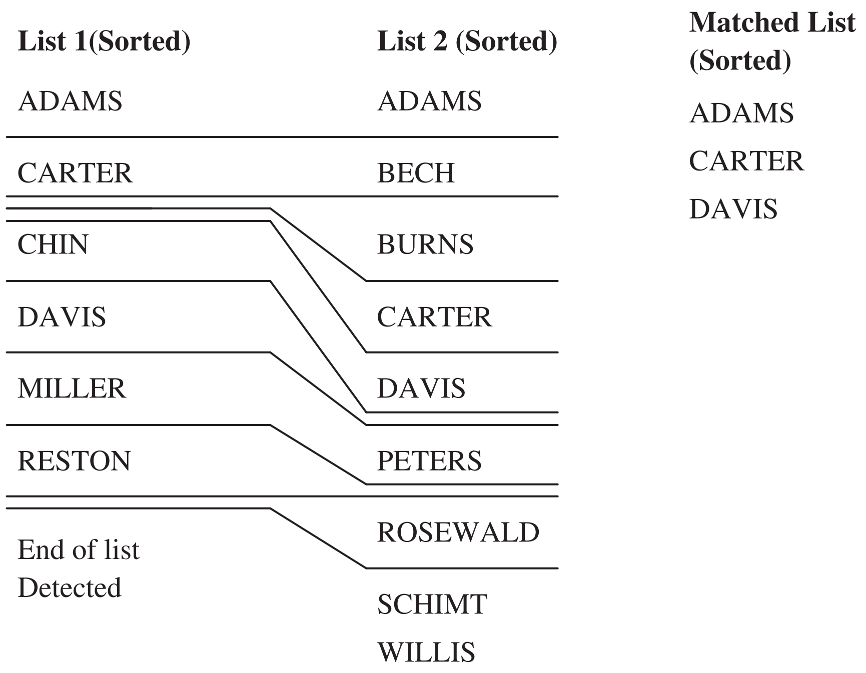
- Matching (intersection) of the items of the lists.
- Merging (union) of the items of the lists.

Examples of applications :

1. Matching :
   Master file - bank account info (account number, person name, account balance) - sorted by account number
   Transaction file - updates on accounts (account number, credit/debit info).

2. Merging :
   Merging two class lists keeping alphabetic order.
   Sorting large files (break into small pieces, sort each piece and then merge them).

Matching the Names in Two Lists



Synchronization :

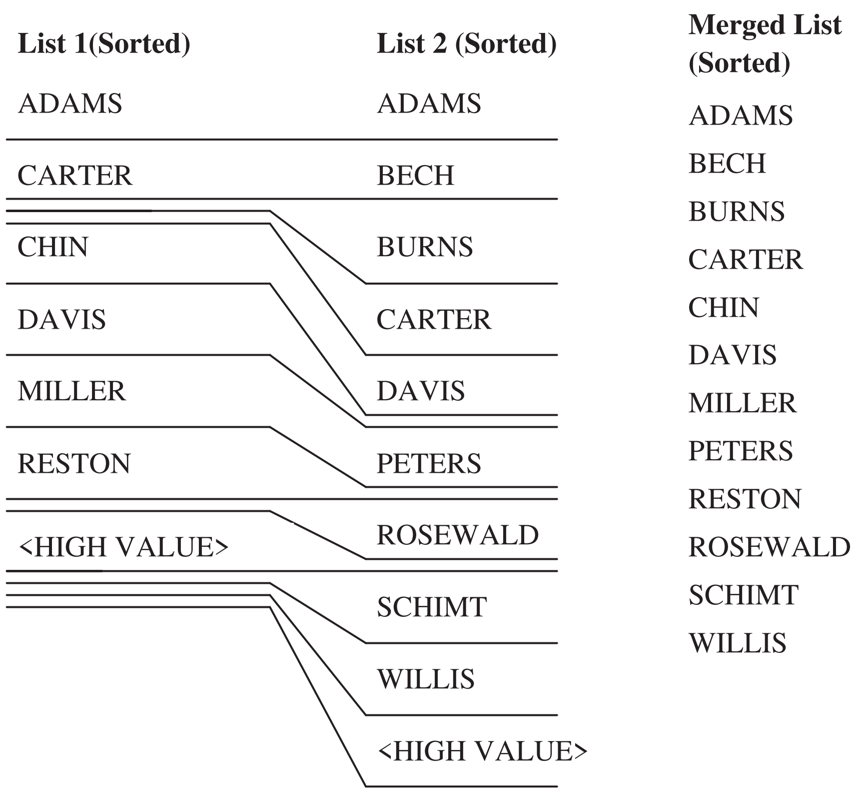
`item(i)` = current item from list i

```
if item(1) < item(2) then
     get next item from list 1
if item(1) > item(2) then
     get next item from list 2
if item(1) = item(2) then
     output the item to output list
     get next item from list 1 and list 2
```

Handling End-of-File/End-of-List Condition

Halt when we get to the end of **either** list 1 **or** list 2.

Merging the Names from Two Lists (Elimin. Repetit.)



Modify the synchronization slightly :

```
if item(1) < item(2) then
     output item(1) to output list
     get next item from list 1
if item(1) > item(2) then
     output item(2) to output list
     get next item from list 2
if item(1) = item(2) then
     output the item to output list
     get next item from list 1 and list 2
```

Handling End-of-File/End-of-List Condition

1. Using a <HIGH VALE> as in the previous example:

   By storing <HIGH VALUE> in the current item for the list that finished, we make sure the contents of the other list is flushed to the output list.
   The **stopping criteria** is changed to :

   Halt when we get to the end of **either** list 1 **and** list 2.

2. Reducing the number of comparisons:

   We can perform a similar algorithm with less comparisons **without** using a <HIGH VALUE> as described above.
   The **stopping criteria** becomes:
   When we get to the end of **either** list 1 **or** list 2, we halt the program.

   Finalization: flush the unfinished list to the output list.

```
while (list 1 did not finish)
   output item(1) to output list
   get next item from list 1

while (list 2 did not finish)
   output item(2) to output list
   get next item from list 2
```

Cosequential Processing: A General Ledger Program

Ledger = A book containing accounts to which debits and credits are posted from books of original entry.

Problem: design a general ledger posting program as part of an accounting system.

Two files are involved in this process:

Master File: ledger file
- monthly summary of account balance for each of the book-keeping accounts.

Transaction File: journal file
- contains the monthly transactions to be posted to the ledger.

Once the journal file is complete for a given month, the journal must be **posted** to the ledger.

Posting involves associating each transaction with its account in the ledger.

Sample Ledger Fragment

Account Number	Account Title	Jan	Feb	Mar	Apr
101	checking account #1	1032.00	2114.00	5219.00	
102	checking account #2	543.00	3094.17	1321.20	
510	auto expense	195.00	307.00	501.00	
540	office expense	57.00	105.25	138.37	
550	rent	500.00	1000.00	1500.00	
⋮	⋮	⋮	⋮	⋮	⋮

Sample Journal Entry

Account Number	Check Number	Date	Description	Debit/Credit
101	1271	April 2, 01	Auto expense	- 79.00
510	1271	April 2, 01	Tune-up	79.00
101	1272	April 3, 01	Rent	- 500.00
550	1272	April 3, 01	Rent for April	500.00
102	670	April 4, 01	Office expense	- 32.78
540	670	April 4, 01	Printer cartridge	32.00
101	1273	April 5, 01	Auto expense	- 31.00
510	1273	April 5, 01	Oil change	31.83
⋮	⋮	⋮	⋮	⋮

Sample Ledger Printout

```
101 Checking account #1
    1271    | April 2, 01 | Auto expense     -  79.00
    1272    | April 3, 01 | Rent             - 500.00
    1273    | April 5, 01 | Auto expense     -  31.00
   Prev. Bal.:    5,219.00       New Bal.:   4,609.00

102 Checking account #2
      ⋮
510 Auto expense
      ⋮
540 Office expense
      ⋮
550 Rent
      ⋮
```

How to implement the Posting Process?

- Use account number as a **key** to relate journal transactions to ledger records.
- Sort the journal file.
- Process ledger and sorted journal **co-sequentially**.

Tasks to be performed:

- Update ledger file with the current balance for each account.
- Produce printout as in the example.

From the point of view of ledger account :
Merging (unmatched accounts go to printout)

From the point of view of journal account:
Matching (unmatched accounts in journal constitute an error)

The posting method is a combined merging/matching.

Ledger Algorithm

```
Item(1): always stores the current master record
Item(2): always stores the current transactions record

- Read first master record
- Print title line for first account
- Read first transactions record
While (there are more masters
       or there are more transactions) {
   if item(1) < item(2) then {
     Finish this master record:
     - Print account balances, update master record
     - Read next master record
     - If read successful, then print title line for
       new account           }
   if item(1) = item(2) {
     Transaction matches master:
     - Add transaction amount to the account balance
       for new month
     - Print description of transaction
     - Read next transaction record  }
   if item(1) > item(2) {
     Transaction with no master:
     - Print error message
     - Read next transaction record  }
}
```