Introduction of General Text Parser

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Reference:

Latent Semantic Indexing Web Site http://www.cs.utk.edu/~lsi/

What is General Text Parser (GTP)?

- Object-oriented (C++, Java) integrated software package.
- Designed for Text Mining.
- Developed by S. Howard *et al.* at the University of Tennessee (Department of Computer Science).

Model Facilitated by GTP

- Tag filter to perform text parsing.
  - ASCII text, HTML, PostScript, PDF.
- Create sparse term-by-document matrices.
- Latent Semantic Indexing (LSI).
  - Singular Value Decomposition (SVD).
  - Semi Discrete Decomposition (SDD).

GTP Requirement

- Solaris 5.7 using **gcc** version 2.95.3.
- RedHat Linux 2.2.16-22 using **gcc** version 2.96.
- Javac, **JVM 1.4**.

Testing Environment

- Mandrake 9.1
- Microsoft Windows XP
- Java(TM) 2 Standard Edition 1.4.2

How to Get GTP?

- Fill out the request form.
  - http://www.cs.utk.edu/~lsi/gtp-request.html
- Wait for the instruction email.
- Download the encrypted file.
- Decrypt and decompress.
  - crypt *key* < *input file* > *output file*
  - tar zxfv gtp.v4.0.tar.gz

How to Run GTP? (Java Version)

- Install Java VM.
  - http://java.sun.com
- Modify shell profile to set CLASSPATH.
  - CLASSPATH=.:/usr/local/GTP
  - export CLASSPATH
- Two ways to run GTP
  - ../GTP/gtp/run/java gtp *parameter*
  - ../GTP/gui/java GTPgui

How to Run GTP? (cont.)

- java GTP *../sample -c ../etc/common_words -t ./tmp -h -z svd1 sample -d 0 -g 0 -O -w log entropy*
  - *../sample*: text file or directory.
  - *-c*: assign a common_words (stop words) list.
  - *-t*: assign a temporary directory.

How to Run GTP? (cont.)

- java GTP *../sample -c ../etc/common_words -t ./tmp -h -z svd1 sample -d 0 -g 0 -O -w log entropy*
  - *-h*: the Harwell-Boeing compressed matrix.
  - *-z svd*: semi-discrete decomposition. (require -h)
  - *-z svd1*: singular value decomposition. (require -h)
  - *sample*: a svd(1) name for description.

How to Run GTP? (cont.)

- java GTP ../sample -c ../etc/common_words -t ./tmp -h -z svd1 sample -d 0 -g 0 -O -w log entropy
  - *-d*: threshold for local frequency of any term.
    - *-d* 2: a term must occur more than twice in the document.
  - *-g*: threshold for global frequency of any term.
    - *-g* 2: a term must occur more than twice in an entire document collection.

How to Run GTP? (cont.)

- java GTP ../sample -c ../etc/common_words -t ./tmp -h -z svd1 sample -d 0 -g 0 -O -w log entropy
  - *-O*: output file is to be in one binary file for SVD. (if need to use GTPQUERY).
  - -w: specify a custom weighting scheme.

Weighting Scheme

- -w *local global*
  - local weighting: *tf*, *log*, *binary*.
    - *tf*: the collection spans general topics.
    - *log*: $1 \div \sqrt{\log(1+tf)^2}$
    - *binary*: Only the presence (1) or absence (0) of a term is included in the vector.
      - the collection is small with few terms in the vocabulary.

Weighting Scheme (cont.)

- global weighting: none, normal, idf, idf2, entropy.
  - idf: the collection is static.
  - idf2: $\log(ndocs)/\log 2 - \log(df+1)/\log 2$
  - entropy: consider to take out noises.

Generation of GTP

- output
  - A binary file contains all the vector (term and document) and singular value information produced by the SVD.
  - Transfer to ASCII file.
    - java gtp.ReadOutput output > output.ascii

Content of output.ascii

Header

terms = 10
docs = 3
factors = 3
commentSize = 20
updatedTerms = 0 * not activated *
updatedDocs = 0 * not activated *
comment = Creating output file

Output file continued ...

Term Vectors

Term 0 (conference)
0 0.3908561766
1 -0.3573666215
2 -0.1973721683

Term 9 (text)
0 0.3908561766
1 0.3573666215
2 0.1973721683

Content of output.ascii (cont.)

Document Vectors

Document 0 (Numerical Libraries and the Grid)

0	0.0000000000
1	-0.4834610820
2	0.8753658533

...

Document 2 (GTP: Software for Text Mining)

0	0.7071067691
1	0.6189771295
2	0.3418586254

Singular Values

0	1.2537220716
1	1.2003111839
2	1.2003111839

Generation of keys

- keys
  - a database of all the terms that were parsed in the GTP run.

Key	ID	Global Weight
Conference	1	1.000000
Grid	2	1.000000
Gtp	3	1.000000
Libraries	4	1.000000
Mining	5	1.000000
Numerical	6	1.000000
Organizer	7	1.000000
Semantic	8	1.000000
Software	9	0.369070
Text	10	1.000000

Content of rawmatrix

- the term-by-document matrix.

```
7 161
doc 1:
123 1.0000 80 3.0000 10 1.0000 30 1.0000 150 1.0000 144 1.0000 83 2.0000 89
1.0000 24 1.0000 53 1.0000 62 1.0000 9 1.0000 25 1.0000 60 2.0000 64 2.0000
51 1.0000 142 1.0000 110 1.0000 34 1.0000 140 1.0000 54 1.0000 159 1.0000
147 2.0000 66 1.0000 118 1.0000 155 1.0000 161 1.0000 129 1.0000 49 1.0000
153 1.0000 47 1.0000
doc2:
```

Query Processing

- Cosine similarity measure between a query vector and document vectors.
- java GTPQUERY *queryfile -c ../etc/common_words –S*
- Require output, keys, LAST_RUN.
- -S: Scale the query vector by the singular values before calculating cosine similarity.

Query Processing (cont.)

- Each query is separated by a blank line.

Numerical Software

Text Mining Software

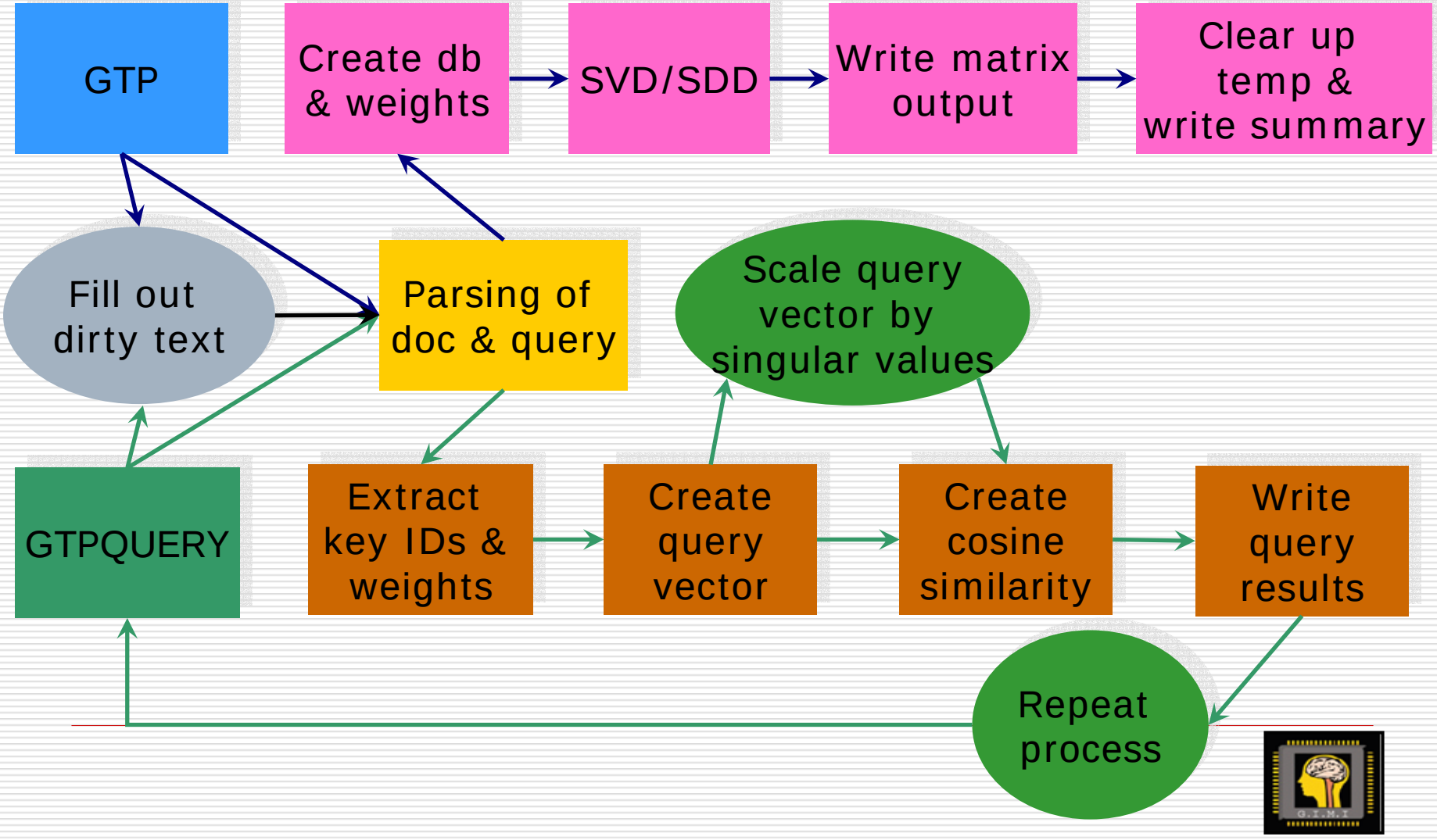
- Each result file has a prefix of q_result.#

Content of A Result File

- A list of document IDs and cosine similarity measures.

Doc ID	Cos. Similarity
50	0.975631
2	0.756432
14	0.500123
...	...

Flowchart of GTP & GTPQUERY



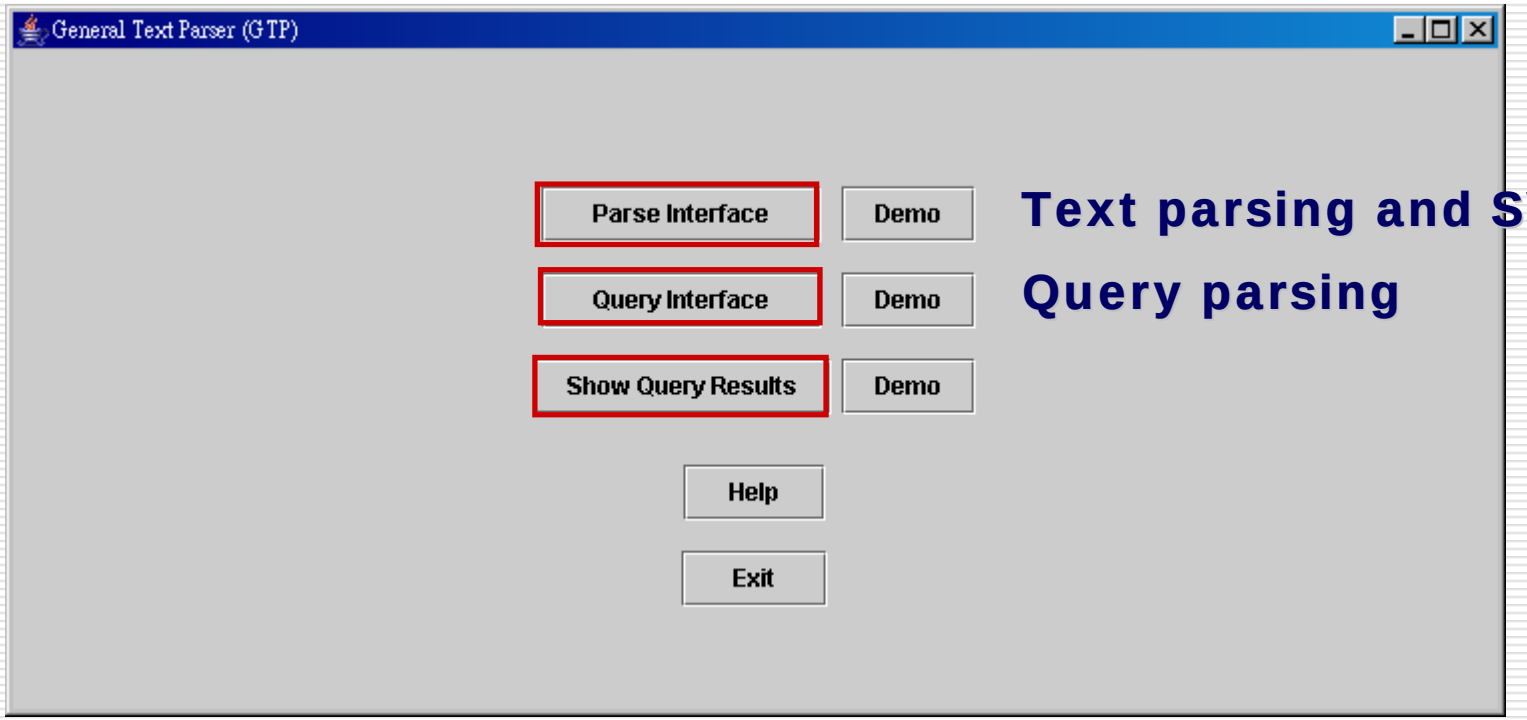
How to Run GTP in MS Windows?

- Set Classpath
  - Set classpath=c:\gtp\
- Run GTP
  - C:\gtp\run\
  - java GTP C:\gtp\sample -c C:\gtp\etc\common_words -t C:\gtp\tmp\ -h -z svd1 sample -d 0 -g 0 -O -w log entropy

How to Run GTP with GUI?

- Copy ./GTP/gtp/GTP.class
  & ./GTP/query/GTPQUERY.class
  to ./GTP/gui
- ./GTP/gui/java GTPgui

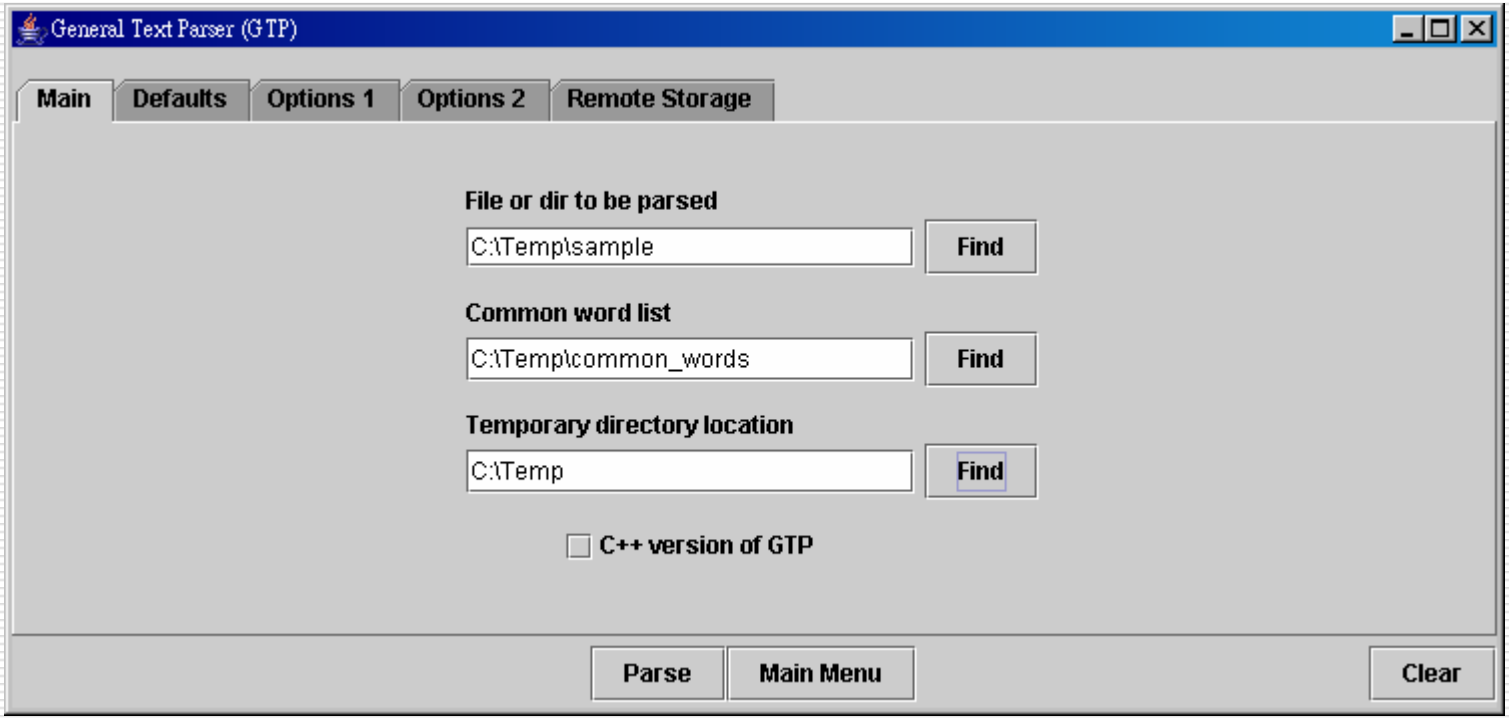
3 Parts of GTP GUI



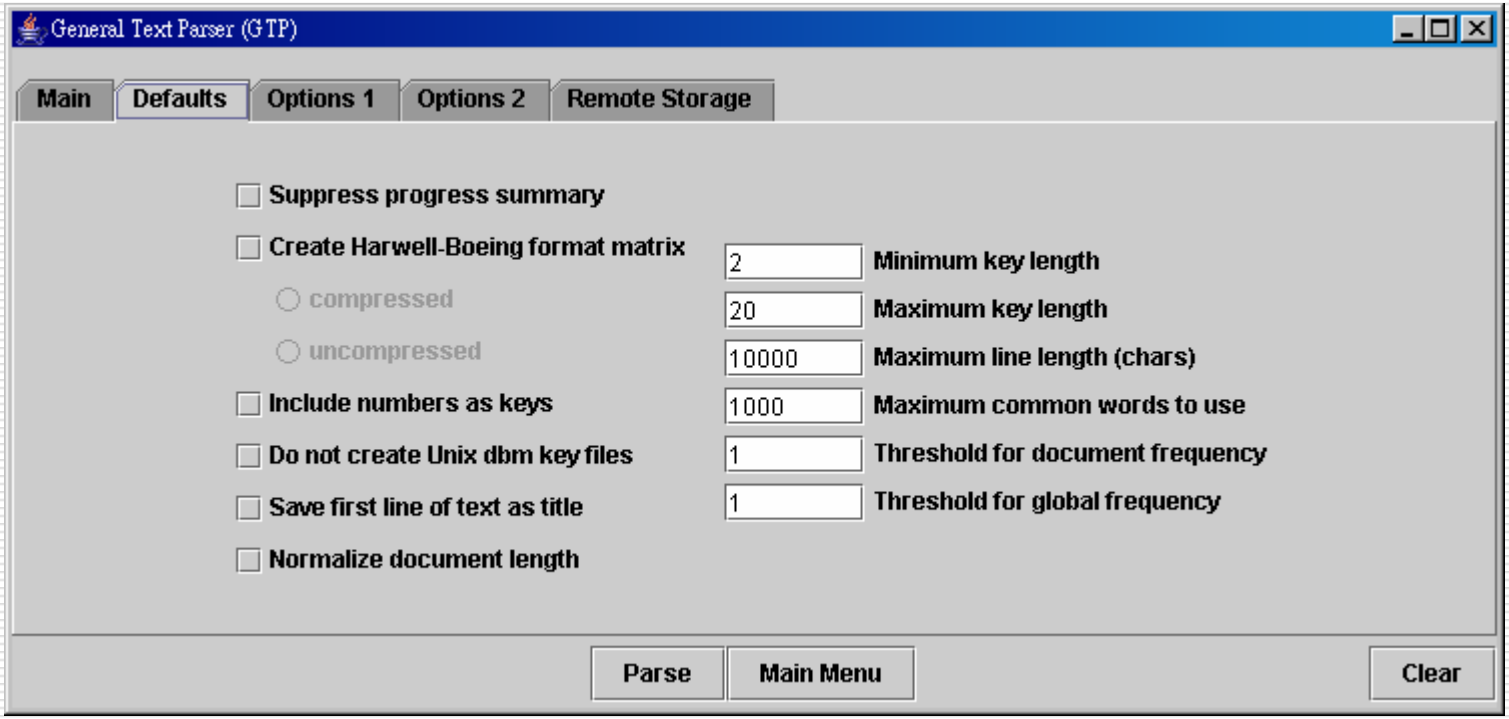
Text parsing and SVD/SDD

Query parsing

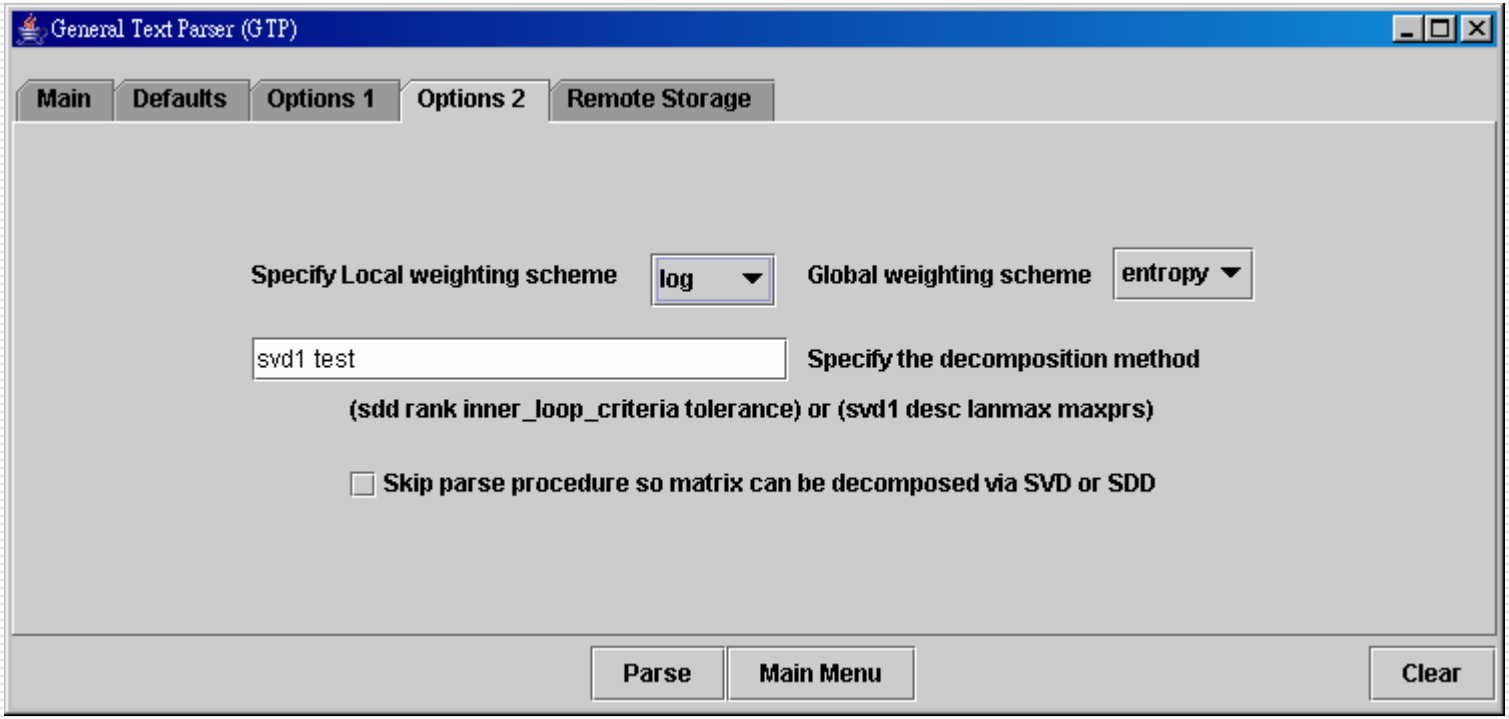
Parser Interface



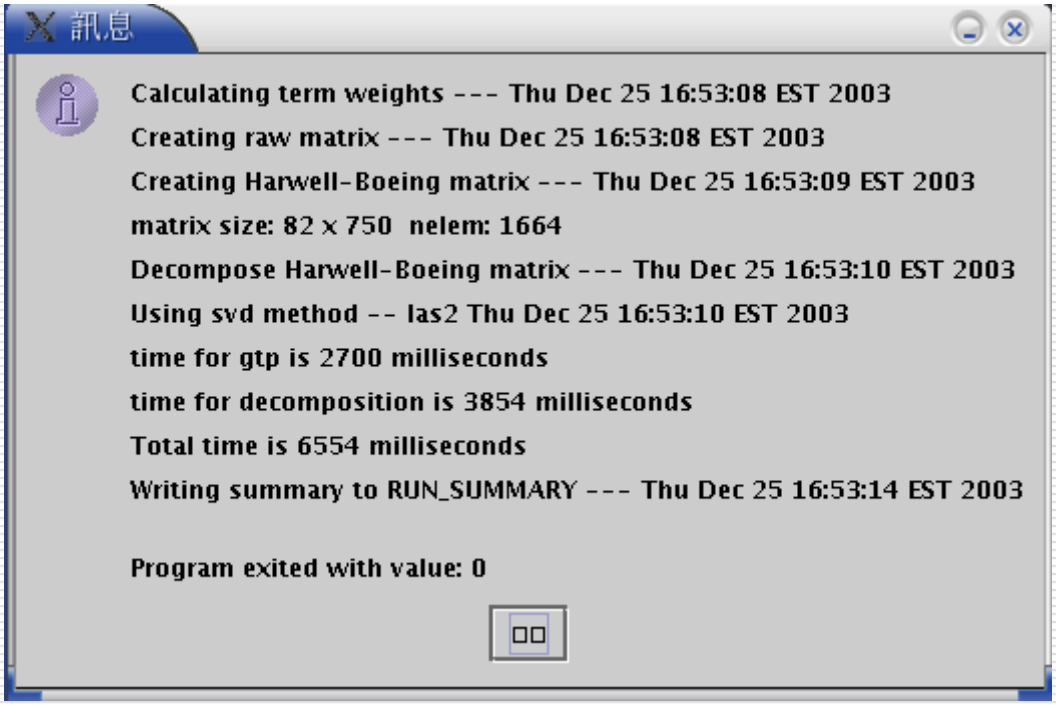
Parser Interface (cont.)



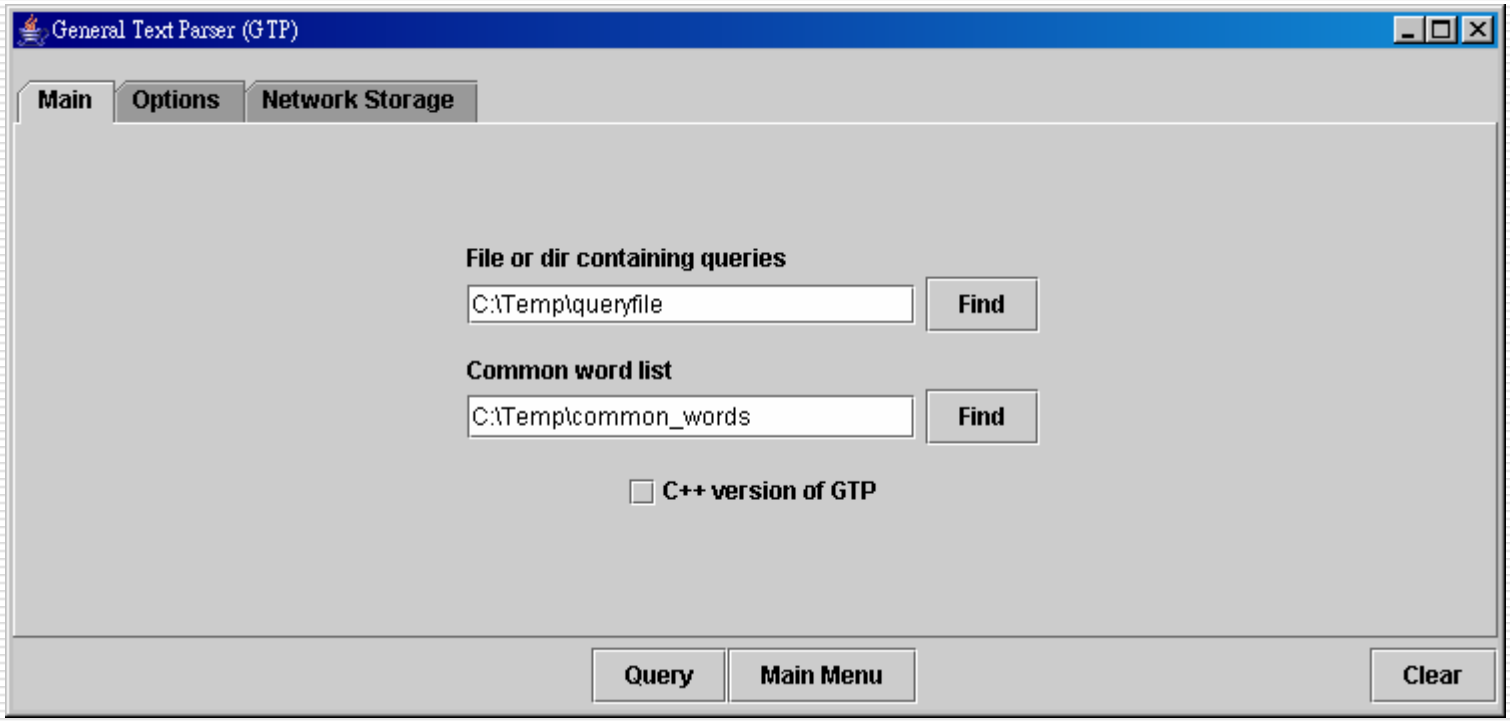
Parser Interface (cont.)



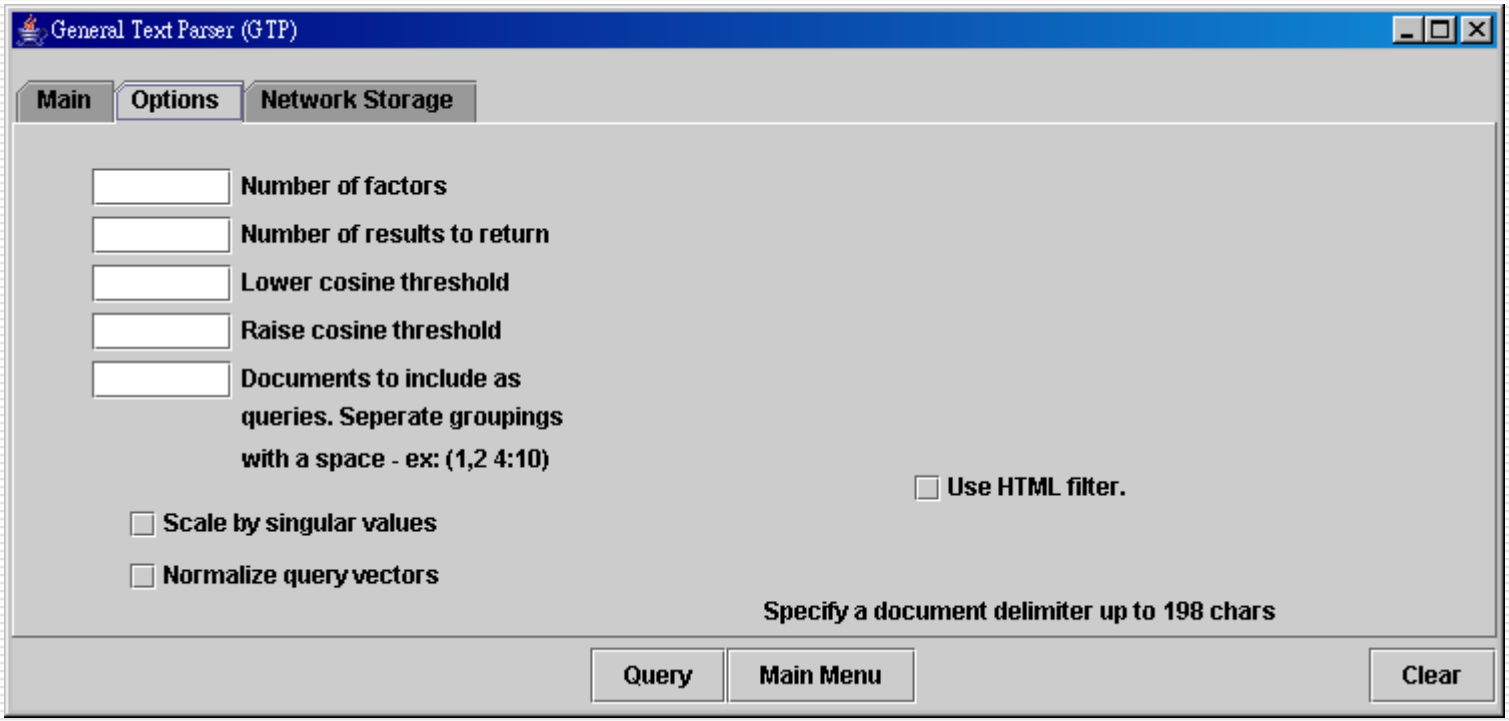
Parser Interface (cont.)



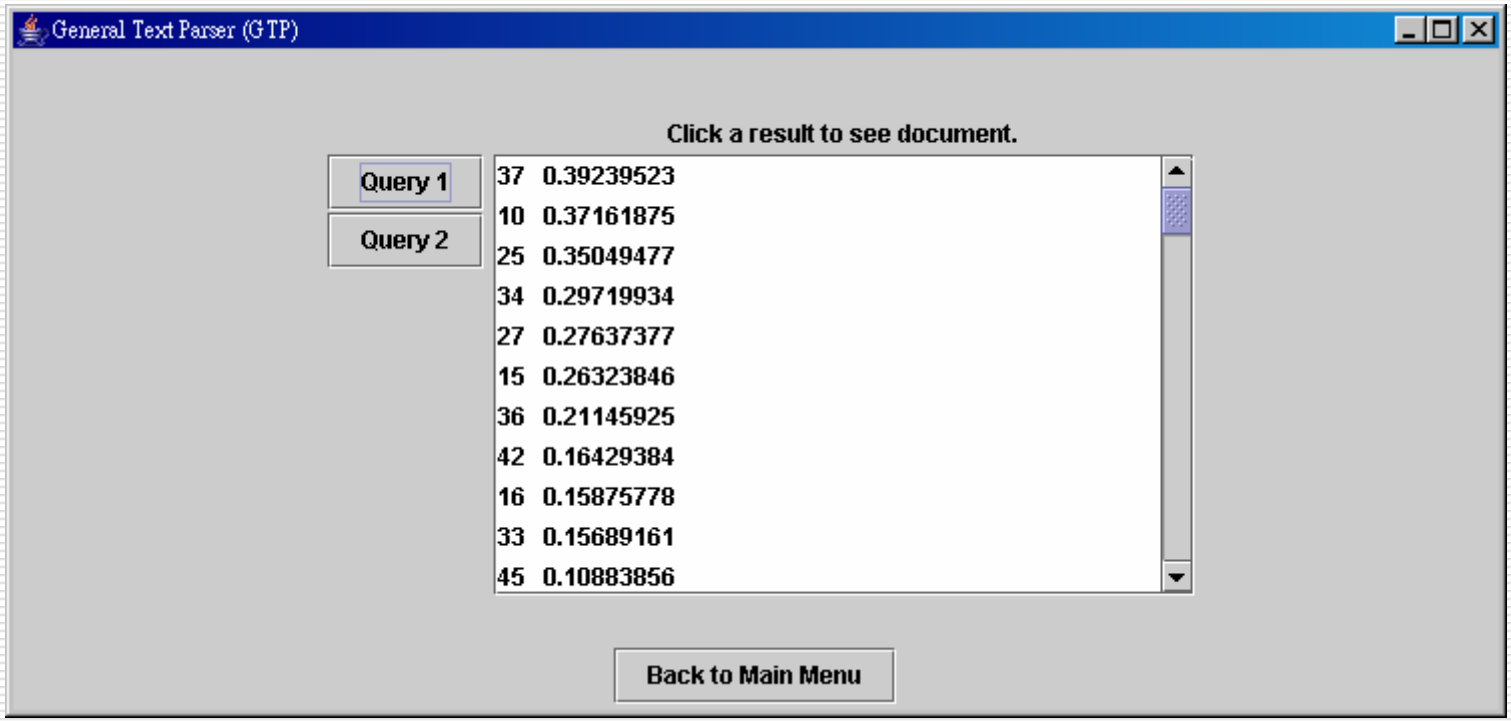
Query Interface



Query Interface (cont.)



Show Query Results



Tips

- Modify compress tool (Cleaner.java)
  - in line 301 & 335: “child = Runtime.getRuntime().exec(“compress)”
  - gzip –f (Linux).
  - C:\\Program Files\\WinRAR\\rar a file1 file2 (Windows).
    - file1: ……
    - file2: rawmatrix, matrix.hb

Tips (cont.)

- For Windows
  - Comment line 230 & 265 in Cleaner.java
  - Runtime.getRuntime().exec("date >> RUN_SUMMARY");
- Recomplie class
  - javac Cleaner.java
  - javac GTP.java

Tips (cont.)

- Avoid Java OutOfMemory Exception
  - Larger document collection needs more memory.
  - Set maximum Java heap size:
    - java –Xmx1024M classname .....