Algorithmics and C Programming, Project
Autumn 2012
LO27 and LO21

Bibtex file parser and management of a book library using a Bibtex-inspired structure

Nicolas Gaud and Abder Koukam

23 octobre 2012

1 Implementation and evaluation of the project

- Group of 1 or 2 persons of the same UV (LO27 or LO21) at most.
- Implementation in C language.
- **The project will be presented during a TP session in January 2012 : Wednesday, January the 9^{th}, Friday and January the 11^{th}. Whatever your original TP group, you must register to present your project during one of these TP sessions (registrations will open soon on Moodle).**
- The project will be documented in a written report that outlines (15 to 20 pages) used data structures, the selected algorithms and optimizations and possibly the encountered difficulties. No copy-paste of entire pages of source code.
- The source codes will be commented and the names of various authors of the project have to be precised at the beginning of the source file as well as a textual description specifying its purpose.
- The program will have a minimal GUI console. The GUI is not the core of the project, it should nevertheless be simple and user friendly.
- the report in **PDF** format and the source code have to be delivered later **January the 6^{rd} 2012 at 18h** by mail adressed to `nicolas.gaud@utbm.fr` for LO27, (Object entitled : LO[27/21] Project - Group : STUDENTNAME1UPPERCASE and STUDENTNAME2UPPERCASE) in a ZIP or TAR.GZ archive named in the following way :

LO[27/21]_STUDENTNAME1UPPERCASE_STUDENTNAME2UPPERCASE.zip

Any delay or failure to comply with these guidelines will be penalized.

A special attention should be paid on the following points when writing the program : the program runs smoothly without bugs (it's better to not provide a feature rather than to provide it if it does not work, negative points), readability and clarity of the code (comments and indentation), complexity and efficiency of proposed algorithms, choice of data structures, modularity of the code (development of small functions, distribution in various files comprising functions consistently and appropriately named).

2 Project goal

The objective of this project is to provide a library of functions for managing a library of scientific books and articles. This library will be structured and initialized using a Bibtex file. Bibtex is a tool specialized for the management of bibliographic references for publishing electronic documents. You must provide a program that allows a user to interactively test this library.

3 Bibtex Introduction

Some websites to introduce you Bibtex and its underlying concepts :

- `http://fr.wikipedia.org/wiki/BibTeX`
- `http://en.wikipedia.org/wiki/BibTeX`
- `http://www.economics.utoronto.ca/osborne/latex/BIBTEX.HTM`
- `http://artis.imag.fr/~Xavier.Decoret/resources/xdkbibtex/bibtex_summary.html`
- `http://amath.colorado.edu/documentation/LaTeX/reference/faq/bibstyles.html`
- `http://arakhne.org/bib2ml/doc/index.html`

Warning, symbols like '_', '&' and '%' are protected by a '\' in a Bibtex file. A Bibtex sample file is provided with the project (see bibtexexample.bib).

4 Work to achieve

4.1 Library

A library written in C containing the types and functions described below.

The library will be implemented using at least two C files (header and source). The final archive will at least contain in a dedicated directory the following files :

bibtexmanager.h the header file that contains the prototype of the functions, types, constants and variables provided by the library ;

bibtexmanager.c the associated source file that contains the body of the various proposed functions.

Makefile makefile to compile the sources, generate libraries and executable. At least, 3 targets in this Makefile :

- **all** compiles everything, generates the libraries and executable.
- **lib** generates the binary code of the library libBibtexManager.so.
- **clean** cleans the tmp files generated during the compilation process and the various binary files

bibtexmain.c the main program.

A dynamic library may be compiled using the following command line :
$gcc -Wall -Werror -ansi -pedantic -shared -fpic <source files> -o libBibtexManager.so

Provided Types

- the type *Library* representing a list of all the available bibliographic entries using a doubly linked list ;
- the type *Entry* representing a Bibtex entry and its various fields.

```
@entrytype{entry_key,
  fieldname1 = "Contents",
  fieldname2 = {Contents},
  fieldname3 = contents,
  ...
}
```

- the type *EntryField* representing a field of a Bibtex's entry.
- the type *Author* representing an author of a given publication, this type is the Cartesian product of the author's name and first name (Rq : name and first name can be composed and thus contain multiple words).
- the type *AuthorList* representing a list of authors using a doubly linked list ;
- the type *AuthorsPublications* representing a list of authors using a doubly linked list, and for each author the list of his associated entries.
- the type *DatePublications* represent a list of publications' group using a doubly linked list, per year, and for each year the list of entries published in this year.

Provided Functions

1. $parseBibtexFile : char* \rightarrow Library$, builds a *Library* from a Bibtex file located in the path specified in parameter ;

2. $sortLibraryAuthorDate : Library \rightarrow AuthorsPublications$, sorting a *Library* by author and date using the quicksort [1] algorithm, this function returns an *AuthorsPublications* that contains all authors alphabetically sorted on the name, and for each author the list of publications sorted by descending year ;

3. $sortLibraryDateAuthor : Library \rightarrow DatePublications$, sorting a *Library* by date and author using the quicksort algorithm, this function returns a *DatePublications* which contains all years of publication sorted in descending order, and for each year, the list of entries published in that year and alphabetically sorted on the first author's name ;

4. $getAuthorReferences : Library \times Author \rightarrow AuthorsPublications$, returns a *AuthorsPublications* which contains a list of publications of the specified author sorted by descending year ;
5. $getYearReferences : Library \times long \rightarrow DatePublications$, return a *DatePublications* which contains the list of entries published in the specified year and alphabetically sorted on the first author's name ;

6. $insertEntry : Library \times Entry \rightarrow Library$, adds an entry to the library ensuring that the new entry is not a duplicate of an existing entry. Two

1. see `http://en.wikipedia.org/wiki/Quicksort`

entries are considered as duplicates if and only if they have the same title and the same list of authors.

7. $removeEntry : Library \times EntryKey \rightarrow Library$, deletes the entry with the specified key from the specified library.
8. $printLibrary : Library \rightarrow \varnothing$, displays in the console the contents of the specified *Library*.
9. $printDatePublications : DatePublications \rightarrow \varnothing$, displays in the console the contents of the specified *DatePublications*.
10. $printAuthorsPublications : AuthorsPublications \rightarrow \varnothing$, displays in the console the contents of the specified *AuthorsPublications*.
11. $exportDatePublications : DatePublications \times char* \rightarrow \varnothing$, exports the contents of a *DatePublications* in the specified text file respecting the following structure :

```
YEAR 1
  ENTRY 1
  ENTRY N
YEAR 2
  ENTRY 1
  ENTRY N
```

For each entry and respecting the following order, a line for the title, a line for the authors, the other fields are then concatenated and separated by commas, the last field being the year.
Example :

```
2012

   From The Tsp To The Dynamic Vrp: An Application Of Elastic Net In Population Based Metaheuristic
   Amir HAJJAM EL HASSANI, Jean-Charles CREPUT, and Abderrafiaa KOUKAM.
   Chapter in Metaheuristics for Dynamic Optimization, chapter From the TSP to the dynamic VRP:
   an application of elastic net in population based metaheuristic, Springer, 2012.
   ISBN: 978-3-642-30664-8.

   Virtual Intelligent Vehicle Urban Simulator: Application To Vehicle Platoon Evaluation
   Franck GECHTER, Jean-Michel CONTET, Olivier LAMOTTE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
   In Simulation Modelling Practice and Theory (SIMPAT), vol. 24, pp. 103-114, 2012.
   DOI: http://dx.doi.org/10.1016/j.simpat.2012.02.001.

   A Metamodeling And Transformation Approach For Knowledge Extraction
   Inaya LAHOUD, Davy MONTICOLO, Vincent HILAIRE, and Samuel GOMES.
   In Proc. of Fourth International Conference on Networked Digital Technologies (NDT'2012), 2012.

   A Multi-Sources Knowledge Management System Via Semantic Web Services
   Inaya LAHOUD, Davy MONTICOLO, and Vincent HILAIRE.
   In Proc. of 14th IFAC Symposium on Information Control Problems in Manufacturing (INCOM 2012), 2012.


2011

   Segmentation D'Orthophotoplans Et Invariants Colorimétriques Pour La Détection De Toitures
   Youssef EL MERABET, Cyril MEURIE, Yassine RUICHEK, Abderrahmane SBIHI, Raja TOUAHNI, and Olivier LAMOTTE.
   In Proc. of Colloque International TELECOM'2011 & 7èmes JFMMA, Tanger, Maroc, 2011.

   Holonic Multi-Agent Systems
   Sebastian RODRIGUEZ, Vincent HILAIRE, Nicolas GAUD, Stéphane GALLAND, and Abderrafiaa KOUKAM.
   Chapter in Self-organizing Software: From Natural to Artificial Adaptation, (first edition),
   Self-Organising Software From Natural to Artificial Adaptation - Natural Computing series,
   chapter 11, pp. 238-263, Springer, 2011.
   ISBN: 978-3642173479.

   Immune Systems
   Vincent HILAIRE, Abderrafiaa KOUKAM, and Sebastian RODRIGUEZ.
   Chapter in Self-organizing Software: From Natural to Artificial Adaptation, (1 edition),
   Natural Computing Series series, chapter 10, pp. 216-236, Springer, 2011.
   ISBN: 978-3642173479.


2010

   ASPECS: An Agent-Oriented Software Process For Engineering Complex Systems -
   How To Design Agent Societies Under A Holonic Perspective
```

Massimo COSSENTINO, Nicolas GAUD, Vincent HILAIRE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
In Autonomous Agents and Multi-Agent Systems, vol. 2(2), pp. 260-304, Springer, 2010.
DOI: 10.1007/s10458-009-9099-4.

Analysis And Design Of Multi-Level Virtual Indoor Environment
Jonathan DEMANGE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
In Int. Journal Systemics and Informatics World Network, vol. 10, pp. 145-152,
Foresight Academy of Technology, 2010.
ISSN: 2044-7272.

Analysis And Design Of Multi-Level Virtual Indoor Environment
Jonathan DEMANGE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
In Proc. of 4th International Conference on Complex Distributed Systems (CODS10),
Chongqing, China, Foresight Academy of Technology, 2010.
ISBN: 2044-7280.

12. $exportAuthorsPublications : AuthorsPublications \times char* \rightarrow \varnothing$ exports the contents of a *AuthorsPublications* in the specified text file respecting the following structure :

```
AUTHOR 1
  YEAR 1
    ENTRY 1
    ENTRY N

  YEAR 2
    ENTRY 1
    ENTRY N

AUTHOR 2
  YEAR 1
    ENTRY 1
    ENTRY N

  YEAR 2
    ENTRY 1
    ENTRY N
```

For each entry and respecting the following order, a line for the title, a line for the authors, the other fields are then concatenated and separated by commas, the last field being the year.
Example :

Nicolas GAUD

2012

A Genetic Programming Based Learning System To Derive Multipole And
Local Expansions For The Fast Multipole Method
Seyed Naser RAZAVI, Nicolas GAUD, Abderrafiaa KOUKAM, and Nasser MOZAYANI.
In AI Communications, vol. 25(4), pp. 305-319, IOS Press, 2012.
DOI: 10.3233/AIC-2012-0538.
ISSN: 0921-7126.

Automatic Dynamics Simplification In Fast Multipole Method: Application To Large Flocking Systems
Seyed Naser RAZAVI, Nicolas GAUD, Abderrafiaa KOUKAM, and Nasser MOZAYANI.
In The Journal of Supercomputing, Springer US, 2012.
DOI: 10.1007/s11227-012-0816-4.
ISSN: 0920-8542.

An Automatic Learning System To Derive Multipole And Local Expansions
For The Fast Multipole Method
Seyed Naser RAZAVI, Nicolas GAUD, Abderrafiaa KOUKAM, and Nasser MOZAYANI.
In Proc. of Third International Conference on Swarm Intelligence (ICSI), pp. 1-10, LNCS 7332, Shenzhen, China, Springer, 2012.
DOI: 10.1007/978-3-642-31020-1_1.
ISBN: 978-3-642-31019-5.

2011

```
    A Conceptualization Of Organizations Involved In Product Design:
    A First Step Towards Reasoning And Knowledge Management
    Yishuai LIN, Vincent HILAIRE, Nicolas GAUD, and Abderrafiaa KOUKAM.
    In International Journal of Digital Information and Wireless Communications, vol. 1(1),
    pp. 141-153, The Society of Digital Information and Wireless Communications (SDIWC), 2011.
    ISSN: 2225-658X.

    Using Motion Levels Of Detail In The Fast Multipole Method
    For Simulation Of Large Particle Systems
    Seyed Naser RAZAVI, Nicolas GAUD, Abderrafiaa KOUKAM, and Nasser MOZAYANI.
    In Proc. of the 15th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI),
    Orlando, Florida, USA, International Institute of Informatics and Cybernetics, 2011.


2010

    Janus: Another Yet General-Purpose Multiagent Platform
    Stéphane GALLAND, Nicolas GAUD, Sebastian RODRIGUEZ, and Vincent HILAIRE.
    In Proc. of the 7th Agent-Oriented Software Engineering Technical Forum (TFGAOSE-10),
    Agent Technical Fora, Paris, France, Agent Technical Fora, 2010.

    An Organisational Approach To Engineer Emergence Within Holarchies
    Massimo COSSENTINO, Stéphane GALLAND, Nicolas GAUD, Vincent HILAIRE, and Abderrafiaa KOUKAM.
    In International Journal of Agent Oriented Software Engineering, vol. 4(3), pp. 304-329, 2010.

Stéphane GALLAND

 2012

    Ontology-Based Multiagent Systems Using Inductive Recommendations -
    A New Approach To Qualify Buildings Use During The Design Phase
    Florian BEHE, Christophe NICOLLE, Thomas DURIF, Stéphane GALLAND, Nicolas GAUD,
    and Abderrafiaa KOUKAM.
    In Proc. of International Conference of Design & Decision Support Systems (DDSS),
    Eindhoven, Netherlands, 2012.

    Virtual Intelligent Vehicle Urban Simulator: Application To Vehicle Platoon Evaluation
    Franck GECHTER, Jean-Michel CONTET, Olivier LAMOTTE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
    In Simulation Modelling Practice and Theory (SIMPAT), vol. 24, pp. 103-114, 2012.
    DOI: http://dx.doi.org/10.1016/j.simpat.2012.02.001.


2011

    Modèle D'environnement Pour Des Simulations Microscopiques Dans Des Bâtiments En 3d
    Florian BEHE, Christophe NICOLLE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
    In Proc. of 1ères Journées des Jeunes Chercheurs de l'UTBM (IngéDoc 2011), UTBM,
    UTBM Press, 2011.

    Semantic Management Of Intelligent Multi-Agents Systems In A 3d Environment
    Florian BEHE, Stéphane GALLAND, Christophe NICOLLE, and Abderrafiaa KOUKAM.
    In Proc. of International Conference on Knowledge Engineering and Ontology Development (KEOD11),
    Paris, France, Paper 89, 2011.
    DOI: 10.1007/978-3-642-24013-3_33.

    Qualifying Building Information Models With Multi-Agent System
    Florian BEHE, Christophe NICOLLE, Stéphane GALLAND, and Abderrafiaa KOUKAM.
    In Proc. of the 3rd International Workshop on Multi-Agent Systems Technology and Semantics
    (MASTS 2011), John Jules MEYER, Amal El Fallah SEGHROUCHNI, Adina Magda FLOREA (eds.),
    pp. 309-314, AI-MAS Laboratory, Department of Computer Science, University Politehnica of
    Bucharest, ERRIC FP7 project, Delft, The Netherlands, Springer, 2011.
    ISBN: 978-3-642-24012-6.
    ISSN: 1860-949X.


2010

    Janus: Another Yet General-Purpose Multiagent Platform
    Stéphane GALLAND, Nicolas GAUD, Sebastian RODRIGUEZ, and Vincent HILAIRE.
    In Proc. of the 7th Agent-Oriented Software Engineering Technical Forum (TFGAOSE-10),
    Agent Technical Fora, Paris, France, Agent Technical Fora, 2010.

    An Organisational Approach To Engineer Emergence Within Holarchies
    Massimo COSSENTINO, Stéphane GALLAND, Nicolas GAUD, Vincent HILAIRE, and Abderrafiaa KOUKAM.
    In International Journal of Agent Oriented Software Engineering, vol. 4(3), pp. 304-329, 2010.

    Submicroscopic And Physics Simulation Of Autonomous And Intelligent Vehicles In Virtual Reality
    Olivier LAMOTTE, Stéphane GALLAND, Jean-Michel CONTET, and Franck GECHTER.
    In Proc. of 2nd International Conference on Advances in System Simulation (SIMUL10), Nice, France, IEEE CPS, 2010.
```

4.2 Main program and graphical user interface

To provide a main program using the previous library (libBibtexManager.so.so) and enabling a user to test all of its provided functionnalities in a simple and friendly way.

This main program, named *bibtexmain.c*, will be compile using the following command line :

$ gcc -Wall -Werror -ansi -pedantic -L<repertoire librairie> bibtexmain.c -o bibtexmain.exe -lBibtexManager

In running the program, the variable LD_LIBRARY_PATH have to specify the directory containing the library *libBibtexManager.so*.

5 The project deliverables

A ZIP archive or TAR.GZ
- the report in pdf format
- Makefile to build the library and get the executable associated to the file bibtexmain.c
- source files of the libraries : bibtexmanager.c and bibtexmanager.h and all other files containing the definition of the other required types (e.g. doubly linked list of something).
- the binary of the library libBibtexManager.so
- the main program bibtexmain.c