

Data and File Structures

Subject Code: DFS-232

Algorithm

- Algorithm representation, complexity and development.
- Simple recursion
- Pointers, strings, arrays (1-D and n-D)

Programming Tools

- Structures and classes
- Templates (Lab 1)
- STL (vectors, maps, lists, iterators) (Lab 1)
- Elapsed time (Lab 1)
- Documentation generation using doxygen

Recursion

- Towers of Hanoi (Lab 2)
- Fibonacci numbers

Sorting

- Mergesort (Lab 2)
- Binary search (Lab 3)
- Selection sort
- Insertion sort
- Quicksort (Lab 3) and Quickselect
- Radix sort

Stacks

- Prefix, infix, postfix notations and conversions
- Evaluations of expressions (Lab 4)
- Simulation of recursion

Lists and Queues

- Linked lists
- Simple queues
- Circular queues (Lab 5)

Trees

- Graphs
- Simple trees
- Heaps, heapsort (Lab 5) and priority queues (Lab 6)
- Traversals
- Binary trees, binary search trees (Lab 7)
- Threaded trees
- Tries (Lab 8)

- B- and B⁺-trees
- Set union and find operations
- Minimum spanning trees (Lab 9)
- Dijkstra's and Floyd-Warshall's algorithms (Lab 10)
- AVL trees

Tables and Information

- Breadth-first and Depth-first searches (Lab 11)
- Backtracking search: 8-queen problem (12)
- Memoization (Lab 13)
- Hashing (Lab 13)

String algorithms

- Simple string manipulations (Lab 14)
- Pattern search (Lab 14)

Lab details

List of labs is included in the syllabus given above. The following is the list of other details of relevance to labs.

Databases/datasets to work on:

- Astronomy: Hipparcos catalogue
- Bioinformatics: SwissProt
- Dictionary: /usr/share/dict/words
- Economics: NASDAQ stock index (2007)

Tools:

- Operating system: GNU/Linux
- Languages: ANSI C (C88) and C++ (GCC and Intel compilers)
- graphviz: graph visualization
- doxygen: documentation generator
- gnuplot: interactive and command-line driven data and function plotter
- GUI programs: Qt (ver 4)

Books

1. **Algorithm Design : Foundations, Analysis, and Internet Examples** by Michael T. Goodrich and Roberto Tamassia (Text)
2. **Data Structures and Algorithms in C++** by Michael T. Goodrich and Roberto Tamassia (Ref)
3. **Data Structures Using C and C++** by Yedidyah Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum (Ref)
4. **Introduction to Algorithms** by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein (Ref)
5. **The C Programming Language (2nd Edition)** by Brian W. Kernighan and Dennis Ritchie (Ref)
6. **Thinking in C++ (Vol. 1 and 2)** by Bruce Eckel (Ref)
7. **Accelerated C++** by Andrew Koenig and Barbara E. Moo (Ref)