Automi, Linguaggi e Traduttori. Corso frontale e Corso on-line. 2007-08.
Docente: Alberto Pettorossi.

Programmi Java o C++ da sviluppare e documentare:

1. Parsing of type 2 languages generated by grammars with ε-productions.
2. Membership of type 1 languages.

Programma dettagliato del corso e domande d'esame (Tra parentesi quadrate sono indicati i riferimenti bibliografici).

1. Mathematical Preliminaries [P: Chapter 1]. Chomsky Hierarchy and Kuroda Theorem. [ATFL: Chapter 1]

2. Regular languages, Regular Expressions, Finite Automata. Kleene's Theorem: NFA=FA. Left-linear and right-linear finite automata. Arden rule. Pumping Lemma for regular languages. Moore Theorem. Myhill-Nerode Theorem (senza prova). Decidability results for regular languages. Closure properties of regular languages. [ATFL: Chapter 2]

3. Context-free languages, Chomsky normal form, and Greibach normal form. Pushdown automata. Deterministic context-free languages and deterministic pushdown automata. Decidability results for context-free languages and deterministic context-free languages. [ATFL: Chapter 3]

4. Avoiding useless symbols ('From Below' and 'From Above'), ε-productions, unit-productions, and left-recursion. Pumping Lemma for context-free languages. Closure properties of context-free languages, ambiguity, and inherent ambiguity. Self-embedding property. [ATFL: Chapter 3]

5. Recursiveness of context-sensitive languages [ATFL: Chapter 4]. Turing Machines: basic notions. Decidability and semidecidability. Halting Problem and Post Correspondence Problem [ATFL: Chapter 5 and 6. No sections: 6.2, 6.3, 6.4].

6. Backtracking and parsing of regular languages [D and ATFL: Chapter 2].

7. Parsing for context free languages: Cocke-Younger-Kasami parser, Chop-Expand parser [ATFL: Chapter 3]. Earley parser (facoltativo) [ATFL: Chapter 3].

8. LL(1), LR(0), SRL(1), LR(1), LALR(1) parsing. Use of parser generators, Bison. [D and DB: Sections 4.4, 4.5, and 4.7]. Operator precedence parsing [D and DB: Sections 4.6].

9. String matching with finite automata and Knuth-Morris-Pratt algorithm [D].

10. Basic notions of program correctness; Hoare's triples. [P: Chapter 8. Section 3].

Riferimenti bibliografici.

[ATFL] Pettorossi, A.: Automata Theory and Formal Languages, Aracne, 2007.
[DB] A.V. Aho, R. Sethi, J.D. Ullman: Compilers: Principles, Techniques and Tools, Addison-Wesley 1986. (The Dragon Book)

Per il backtracking, il parsing e il pattern matching:
[D] Dispense scaricabili dal sito del corso.

Per i preliminari matematici e le triple di Hoare:
[P] Pettorossi, A.: Quaderni di Informatica. Parte I, 2nd Edition, Aracne, 2004.

Altri libri del docente ove approfondire alcune tecniche di programmazione (quali il backtracking e il parsing) e gli argomenti di decidibilità, di computabilità e di complessità sono:

[C] Pettorossi, A.: Programming in C++. Aracne, 2001.
[J] Pettorossi, A.: Sequential and Concurrent Programming in Java. Aracne, 2005.
[CDC] Pettorossi, A.: Elements of Computability, Decidability and Complexity, Second Edition, Aracne, 2007.