

Regulated Grammars and Automata

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Area

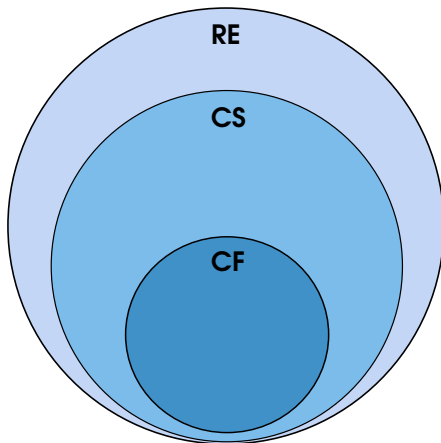
- Theoretical computer science, formal language theory

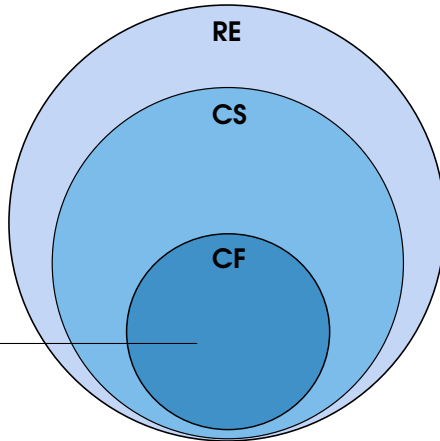
Topic

- Regulated versions of
 - context-free grammars
 - finite and pushdown automata
 - grammar systems

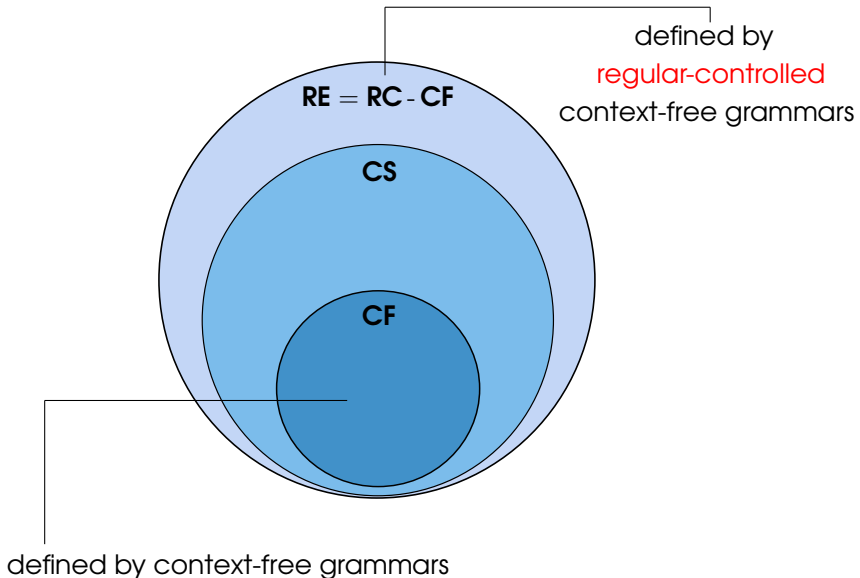
Motivation

- theory: study theoretical properties
 - generative power
 - descriptonal complexity
 - normal forms
 - conversions between formal models
- practice: propose application perspectives
- theory+practice: introduce new regulated formal models





defined by context-free grammars



One-Sided Random Context Grammars



A. Meduna and P. Zemek

One-Sided Random Context Grammars

In: *Acta Informatica*, 2011



A. Meduna and P. Zemek

Nonterminal Complexity of One-Sided Random Context Grammars

In: *Acta Informatica*, 2012



A. Meduna and P. Zemek

One-Sided Forbidding Grammars and Selective Substitution Grammars

In: *International Journal of Computer Mathematics*, 2012



A. Meduna and P. Zemek

One-Sided Random Context Grammars with Leftmost Derivations

In: *LNCS Festschrift Series: Languages Alive*, 2012



A. Meduna and P. Zemek

Generalized One-Sided Forbidding Grammars

In: *International Journal of Computer Mathematics*, 2013



P. Zemek

Normal Forms of One-Sided Random Context Grammars

In: *EEICT*, Brno, CZ, 2012



P. Zemek

One-Sided RCGs: Established Results and Open Problems

In: *EEICT*, Brno, CZ, 2013

Regular-Controlled Grammars



A. Meduna and P. Zemek

Workspace Theorems For Regular-Controlled Grammars

In: *Theoretical Computer Science*, 2011



A. Meduna and P. Zemek

On the Generation of Sentences With Their Parses By Propagating Regular-Controlled Grammars

In: *Theoretical Computer Science*, 2013

Programmed Grammars



A. Meduna, L. Vrábel, and P. Zemek

On Nondeterminism in Programmed Grammars

In: *AFL, Debrecen, HU*, 2011

Scattered Context Grammars



A. Meduna, L. Vrábel, and P. Zemek

LL Leftmost k -Linear Scattered Context Grammars

In: *SCLIT, Halkidiki, GR*, 2011

Automata



A. Meduna and P. Zemek

Jumping Finite Automata

In: *International Journal of Foundations of Computer Science*, 2012



A. Meduna, L. Vrábel, and P. Zemek

An Infinite Hierarchy of Language Families Resulting from Stateless PDAs

In: *DCFS, Braga, PT*, 2012

Regulated ETOL Grammars



A. Meduna and P. Zemek

Left Random Context ETOL Grammars

In: *Fundamenta Informaticae*, 2013



P. Zemek

On the Nonterminal Complexity of Left Random Context EOL Grammars

In: *EEICT, Brno, CZ*, 2011

Regulated Grammar Systems



A. Meduna and P. Zemek

Controlled Pure Grammar Systems

In: *Journal of Universal Computer Science*, 2012

- Molecular Genetics



A. Meduna and P. Zemek

One-Sided Forbidding Grammars and Selective Substitution Grammars

In: *International Journal of Computer Mathematics*, 2012





- Parsing



A. Meduna and L. Vrabel and P. Zemek

LL Leftmost k -Linear Scattered Context Grammars

In: *SCLIT*, Halkidiki, GR, 2011

```
public class TcpClientSample
{
    public static void Main()
    {
        byte[] data = new byte[1024]; string input, stringData;
        TcpClient server;
        try{
            server = new TcpClient(" . . . . ", port);
        }catch (SocketException){
            Console.WriteLine("Unable to connect to server");
            return;
        }
        NetworkStream ns = server.GetStream();
        int recv = ns.Read(data, 0, data.Length);
        stringData = Encoding.ASCII.GetString(data, 0, recv);
        Console.WriteLine(stringData);
        while (true) {
            input = Console.ReadLine();
            if (input == "exit") break;
            newchild.Properties["ou"].Add(
                "Auditing Department");
            newchild.CommitChanges();
            newchild.Close();
        }
    }
}
```

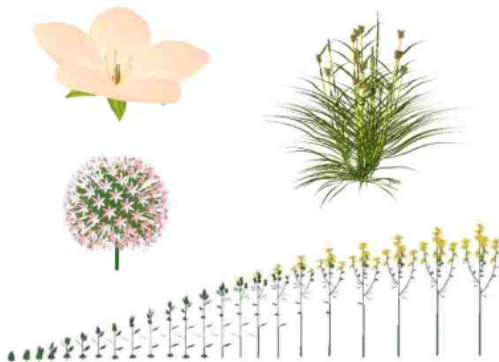
- Biology and Computer Art



A. Meduna and P. Zemek

Left Random Context ETOL Grammars

In: *Fundamenta Informaticae*, 2013



- Reverse Compilation (Decompilation)



L. Ďurфина, J. Křoustek, P. Zemek et al.

Advanced Static Analysis For Decompilation Using Scattered Context Grammars

In: ACC, Angers, FR, 2011



L. Ďurфина, J. Křoustek, P. Zemek et al.

Design of a Retargetable Decompiler For Static Platform-Independent Malware Analysis

In: International Journal of Security and Its Applications, 2011



L. Ďurфина, J. Křoustek, P. Zemek et al.

Detection and Recovery of Functions and Their Arguments in a Retargetable Decompiler

In: WCRE, Ontario, CA, 2012

+3 more papers

```
seg008:C806
seg008:C806          loc_1400_C806:                ; CODE XREF: seg008:
seg008:C806 13 6E 04 05      brclr  *byte_0_6E, #4, loc_1400_C80F ; Bran
seg008:C80A BD 53 F9          jsr   func_seg1              ; Jump to subroutine
seg008:C80D 20 07           bra   loc_1400_C816          ; Branch always
seg008:C80F          ; -----
seg008:C80F          loc_1400_C80F:                ; CODE XREF: seg008:
seg008:C80F 13 6E 08 03      brclr  *byte_0_6E, #8, loc_1400_C816 ; Bran
seg008:C813 BD 53 96          jsr   sub_0_5396             ; Jump to subroutine
seg008:C816
```

<http://decompiler.fit.vutbr.cz>

Publications

- 1 book



A. Meduna and P. Zemek

Regulated Grammars and Their Transformations

BUT FIT, 240 pages, 2010

- 1 book chapter
- 10 international journal papers (9 journals have IF)
- 8 international conference papers
- 3 international conference posters/presentations
- 3 student competition contributions
- 7 currently submitted manuscripts

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A. Meduna and P. Zemek

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In Preparation



A. Meduna and P. Zemek

Regulated Grammars and Automata

Springer, 680 pages, 2014 (expected)