



The Web-SynDic System: Development of the Server and User Interface

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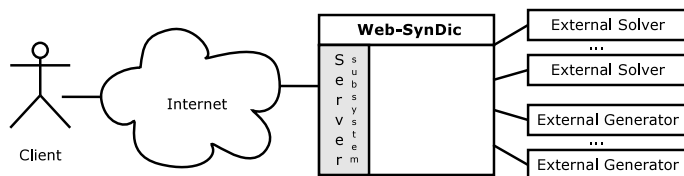
Introduction

Web-SynDic stands for **web**-based demonstration and testing of the **syntactic** algorithms for solving linear **Diophantine** equations in nonnegative integers.

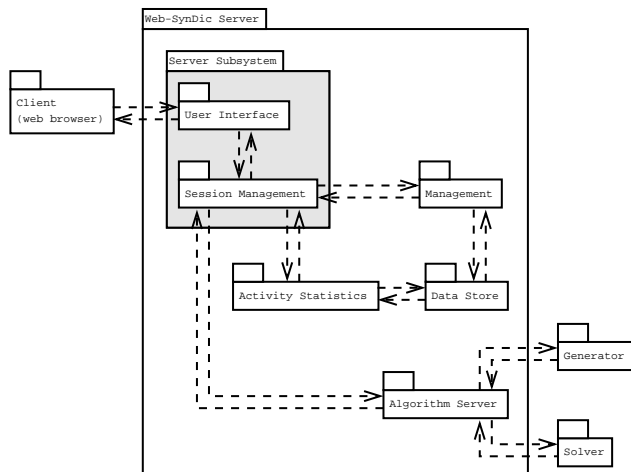
The Web-SynDic project is a student software engineering project of the Petrozavodsk State University (PetrSU), Department of Computer Science. The project is also held in the framework of cooperation between the CS Departments of PetrSU and the University of Helsinki.

The project is related to the research done at CS Department of PetrSU. The research deals with the development of a new type of algorithms for efficient solving some classes of nonnegative linear Diophantine equations (NLDE) by syntactic (parsing) methods.

This poster is about the Server subsystem and User Interface of the Web-SynDic software. The web-based user interface is implemented in the Server subsystem which is responsible for receiving requests from clients (web browsers), forming and sending responses and managing user sessions.



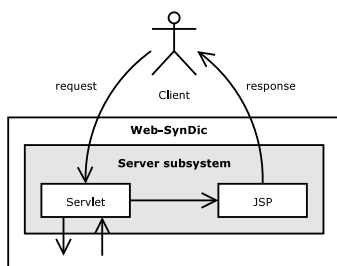
Web-SynDic Architecture



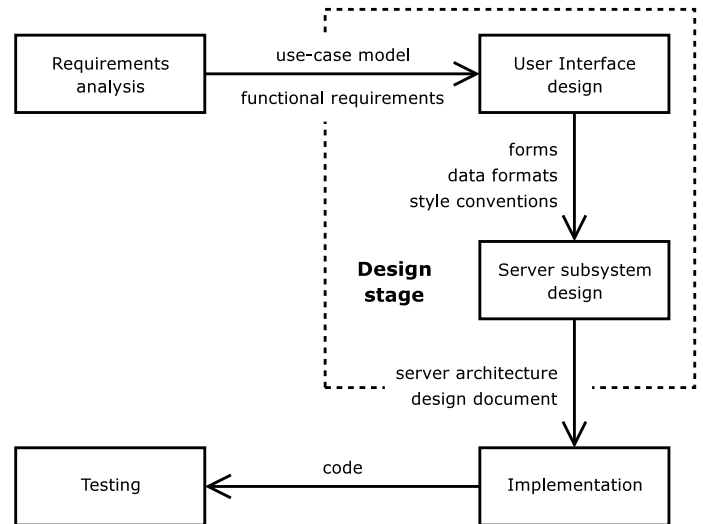
The diagram above shows the general architecture of the Web-SynDic system.

Server Subsystem Architecture

The Server subsystem is based on the Servlets and JSP technologies. Servlets are Java classes used to receive requests from clients and send responses. JSP is a HTML file with Java code insertions which can be compiled to a Servlet. In the Web-SynDic Servlets are used mostly to process client requests and JSP's are used to generate response pages.



Development Process (Waterfall Model)



Requirement analysis:

Analyzed the user requirements, produced detailed functional requirements and use-case model.

User Interface design:

Designed the web-interface forms and data formats (including the input format for the system of ANLDE equations and report on solution format).

Server subsystem design:

Servlets and Java Server Pages (JSP) technologies were used for the Server subsystem design and implementation.

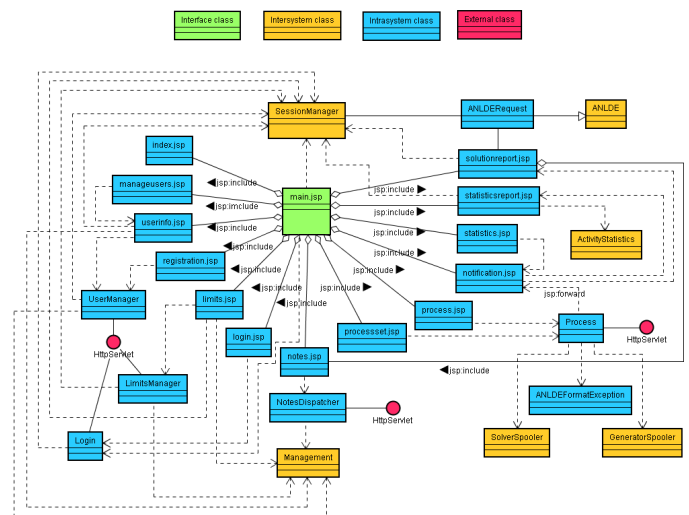
Implementation:

The Server subsystem was implemented in the Java programming language using the Apache Tomcat package for Servlets class library and JSP compiler.

Testing:

Some fixes and improvements to the user interface were made. HTML code was checked for compliance with the HTML 4.01 specification.

The next UML diagram was produced at the design stage of the project and represents the architecture of the Server subsystem.



Metrics of the Server Subsystem

The following items were created during the implementation of the Server subsystem:

- 27 JSP files,
- 9 Java source code files (about 1600 lines of code),
- 10 HTML forms,
- 3 report pages.

User Interface Screenshots

The “Process an ANLDE System” form and corresponding solution report.

Web-SynDic: Process an ANLDE System - Mozilla Firefox

http://localhost:8080/Web-SynDic/main.jsp?page=process

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WEB-SYNDic

Process:

- ANLDE System
- Set of ANLDE Systems

Documentation:

- ANLDE Theory
- User Guide

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Process an ANLDE System

Input a test ANLDE system (a list of samples):

$x_1 = 39*x_1 + 40*x_2 + 61*x_3 + 56*x_{10} + 19*x_{11}$
 $x_{11} = x_2 + 82*x_3 + 27*x_4 + 17*x_6 + 13*x_{10} + 48*x_{11} + x_2$
 $x_3 = 42*x_1 + 13*x_2 + 19*x_3 + 58*x_{10} + 15*x_{11}$
 $x_6 = 74*x_1 + 35*x_2 + 71*x_3 + 27*x_{10} + 59*x_{11}$
 $x_{10} + x_5 + x_6 = 32*x_1 + 38*x_6 + 51*x_{10} + 63*x_{11} + 39*x_{12} + x_5 + x_6$
 $x_6 = 99*x_1 + 37*x_2 + 19*x_6 + 51*x_{10} + 27*x_{11} + x_6$
 $x_7 = 59*x_1 + 30*x_2 + 66*x_6 + 17*x_{10} + 79*x_{11} + x_7$
 $x_8 = 84*x_1 + 58*x_2 + 27*x_6 + 96*x_{10} + 12*x_{11} + x_8$

☒ Solve the given ANLDE system with the syntactic algorithm. You may select one alternative solver to compare the solvers.

Web-SynDic: Solution Report - Mozilla Firefox

http://localhost:8080/Web-SynDic/main.jsp?page=report-solution

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Solution Report

1. Test ANLDE system:

$x_1 = 39*x_1 + 40*x_2 + 61*x_3 + 56*x_{10} + 19*x_{11}$
 $x_{11} + x_2 = 82*x_3 + 27*x_4 + 17*x_6 + 13*x_{10} + 48*x_{11} + x_2$
 $x_3 = 42*x_1 + 13*x_2 + 19*x_3 + 58*x_{10} + 15*x_{11}$
 $x_6 = 74*x_1 + 35*x_2 + 71*x_3 + 27*x_{10} + 59*x_{11}$
 $x_{10} + x_5 + x_6 = 32*x_1 + 38*x_6 + 51*x_{10} + 63*x_{11} + 39*x_{12} + x_5 + x_6$
 $x_6 = 99*x_1 + 37*x_2 + 19*x_6 + 51*x_{10} + 27*x_{11} + x_6$
 $x_7 = 59*x_1 + 30*x_2 + 66*x_6 + 17*x_{10} + 79*x_{11} + x_7$
 $x_8 = 84*x_1 + 58*x_2 + 27*x_6 + 96*x_{10} + 12*x_{11} + x_8$

Number of solutions: 5

2. Performance metrics of the algorithms:

Algorithm name	Summary system time(sec)	Summary work time(sec)	Maximum memory usage(Kb)	Solving result
syntactic	0.010	0.261	2396	solved
slopes	0.360	1.332	2396	solved

3. Solving machine characteristics:

- CPU: AMD Athlon(tm) XP 2000+ (1674.498 MHz)
- RAM: 257084 kB
- Operation system: Linux 2.4.23.1386

Done