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Курсовая работа

Система Web-SynDic: разработка сервера и интерфейса пользователя.

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Содержание

1 Введение

Данная работа является частью проекта Web-SynDic [1], цель которого — разработка web-системы для тестирования алгоритмов решения систем неотрицательных диофантовых уравнений ассоциированных с формальными грамматиками (АНЛДУ) [2]. Система Web-SynDic позволяет сравнивать работу алгоритма эффективного решения систем АНЛДУ, разработанного на кафедре ИМО, с другими алгоритмами, не предоставляя пользователю непосредственного доступа к решающим программам.

Цель данной работы — разработка интерфейса пользователя и подсистемы, реализующей этот интерфейс (Web Server).

Подсистема Web Server отвечает за получение запросов клиента (в качестве которого может выступать любой стандартный интернет-обозреватель) и формирование ответов. Особенностью любой web-системы, в отличие от обычного приложения, является возможность одновременного использования системы несколькими пользователями, поэтому подсистема Web Server должна также обеспечивать совместную независимую работу пользователей и разделение между ними прав доступа к функциям системы (управление сеансами пользователей).

Высокоуровневая архитектура системы Web-SynDic изображена на рис. 1.

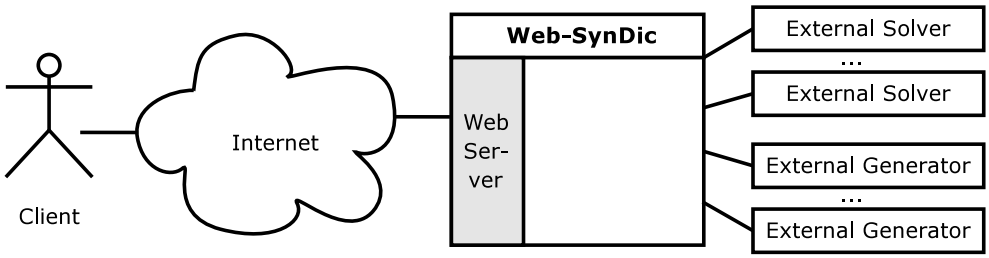

Рис. 1: Высокоуровневая архитектура системы Web-SynDic

Данная работа также представлена в публикациях [1] и [3].

2 Процесс разработки

Процесс разработки (рис. 2) был основан на водопадной модели и состоял и стадий анализа требований, проектирования, реализации и тестирования программной системы.

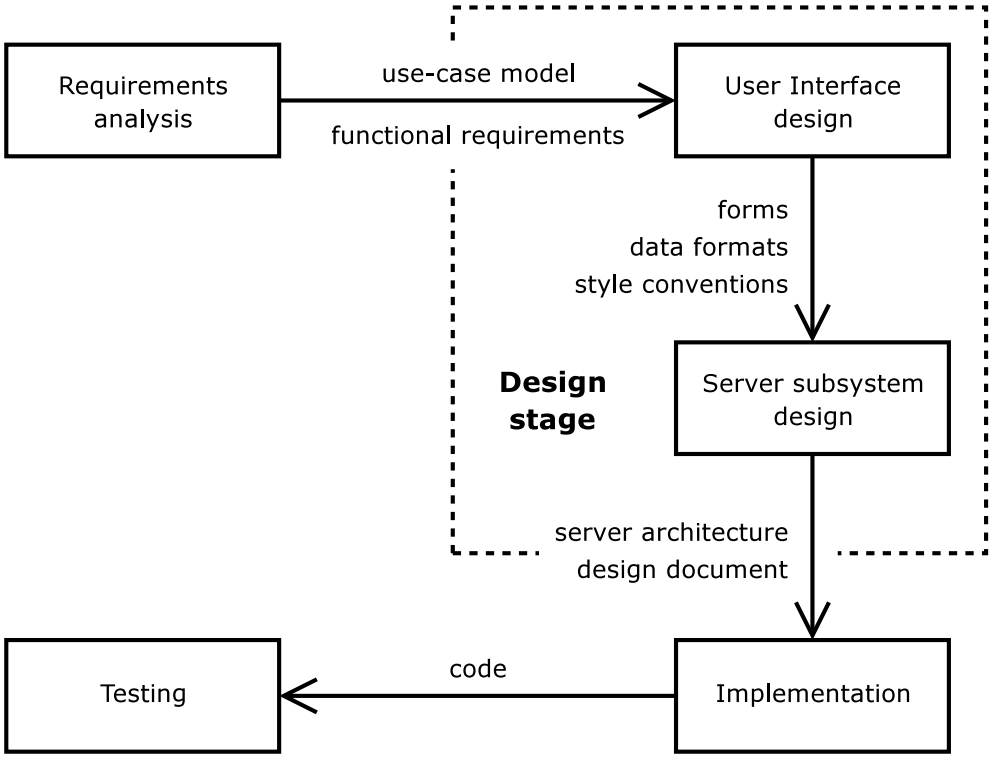

Рис. 2: Процесс разработки

На стадии анализа требований на основе пользовательских требований были определены функциональные требования и построена модель прецедентов [4].

На основе результатов, полученных при анализе требований, на стадии проектирования были разработаны формы (3.2), предоставляющие пользователю интерфейс к функциям системы, и форматы данных (3.3) для взаимодействия с пользователем, включая формат для ввода систем и множеств систем уравнений и страницы отчетов. Кроме того, были разработаны соглашения о стиле пользовательского интерфейса (3.1)

описывающие компановку web-страниц, используемые цвета и принципы построения форм.

Далее была спроектирована подсистема Web Server. При этом использовались технологии Java Servlets [6] и JavaServer Pages [7] (JSP). Servlet (сервлет) — это Java-класс используемый для обработки запросов клиентов и отправки ответов, технология JSP позволяет программировать сервлеты путем вставки Java-кода в HTML-файл. В основном, сервлеты (реализованные на Java) использовались для обработки запросов клиентов, а страницы JSP для формирования ответов (рис. 3).

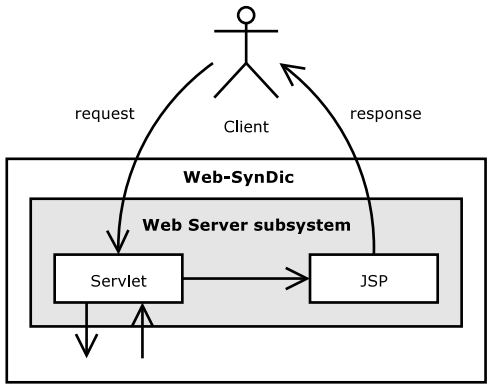

Рис. 3: Использование сервлетов

Далее следовали стадии реализации и тестирования системы. При реализации подсистемы использовался пакет Apache Tomcat, включающий библиотеку классов сервлетов и компилятор страниц JSP.

В следующем разделе приведен фрагмент документации проекта, описывающий интерфейс пользователя системы Web-SynDic.

3 User Interface

This section describes the interface between a user and the Web-SynDic system. The key part of the user interface specification is section “Forms” (sect. 3.2). The forms are used to exchange data between a user and the Web system. Data formats, used in forms, are described in section “IO Data

Formats" (sect. 3.3). Also this document includes section "Style Convention" (sect. 3.1) and section "Notes on Implementation" (sect. 3.4) to describe the corresponding issues.

3.1 Style Convention

3.1.1 Colors

Black text on a white background; blue hyperlinks; red warnings, important notes and required field marks and gray buttons will be used for WebSynDic web pages. Main menu, user menu and log in/status page parts (see section 3.1.3 for Page Layout) have light gray background.

3.1.2 Forms

Key form design principles are ease to use, functionality and simplicity of implementation. Only standard controls (buttons, text field, text areas, check boxes and radio buttons) are used.

3.1.3 Page Layout

Each page consists of the following parts (see Fig. 4):

Header: web system's title;

Main menu: links to the main web system functions (Req. F1–F3) and related documentation;

User menu: links to user information and limits form, administration links (Req. F5–F6);

Log in form: displayed until user logs in. It also shows user's IP address (sect. 3.2.3 Log In Form, Req. F4);

Log in status: current user nickname and "Log out" link and user's IP address (displayed after user logs in);

Content: information and forms the user is currently working with (sect. 3.2). Also content contains brief textual description for each current form.

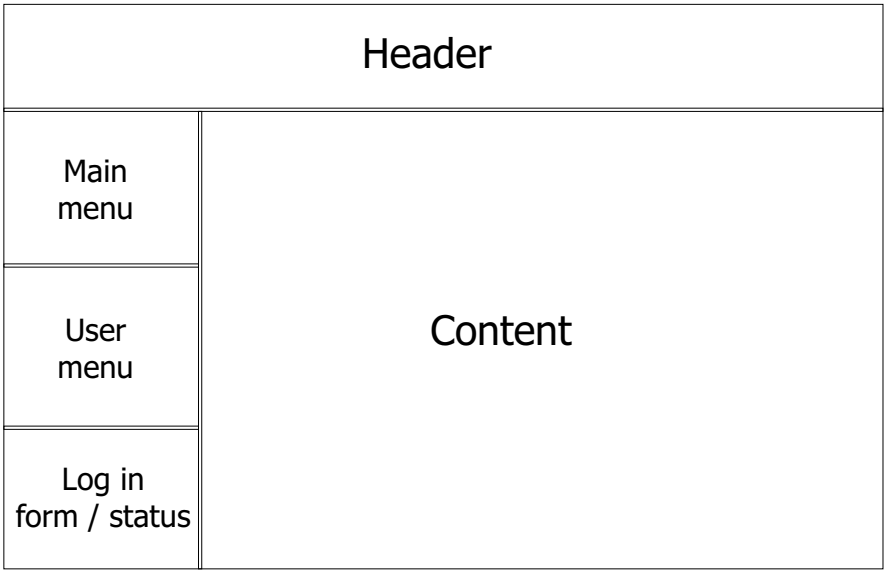

Рис. 4: Page layout

3.2 Forms

3.2.1 Process an ANLDE System

Description: This form allows a user to send one ANLDE system, which may be generated or written manually, to server for solving. In this case a user can see her/his own limits on the same form and change them, whenever she/he wants (using "Change limits" button). Limits values are used as parameters for generating a new ANLDE system. See Fig. 5.

Components:

- text area for manual input of ANLDE system (sect. 3.3.1 ANLDE System Format),
- button "Generate",

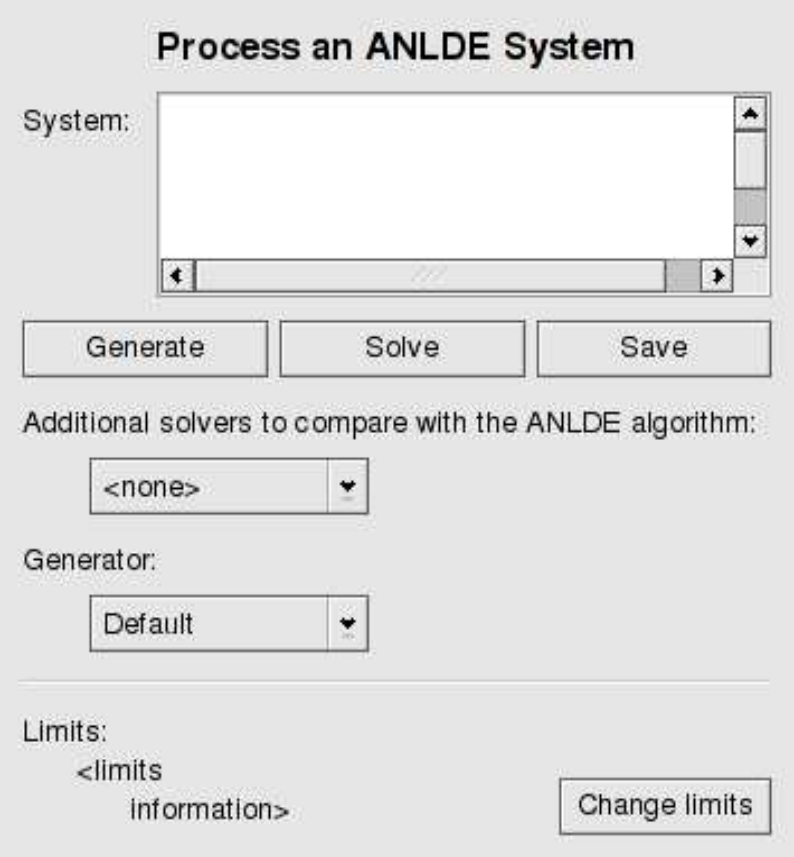

Рис. 5: Process an ANLDE System form

- button “Solve”,
- button “Save” ,
- list “Alternative solver” (sect. 3.3.5 Alternative Solver List Format),
- button “Change limits” (sect. 3.2.7 User Limits),
- limits information (sect. 3.3.9 Limits Format).

References:

Use case: Process an ANLDE System.

Requirements: EU1a.

3.2.2 Process a Set of ANLDE Systems

Description: Process form gives a user an opportunity to work with a set of ANLDE systems, which can be generated or loaded from a file, and then send the systems to the server for solving. A user can see her/his limits and may change them, if necessary, with a "Change limits"button. Limits values are used as parameters for generating ANLDE system. See Fig. 6.

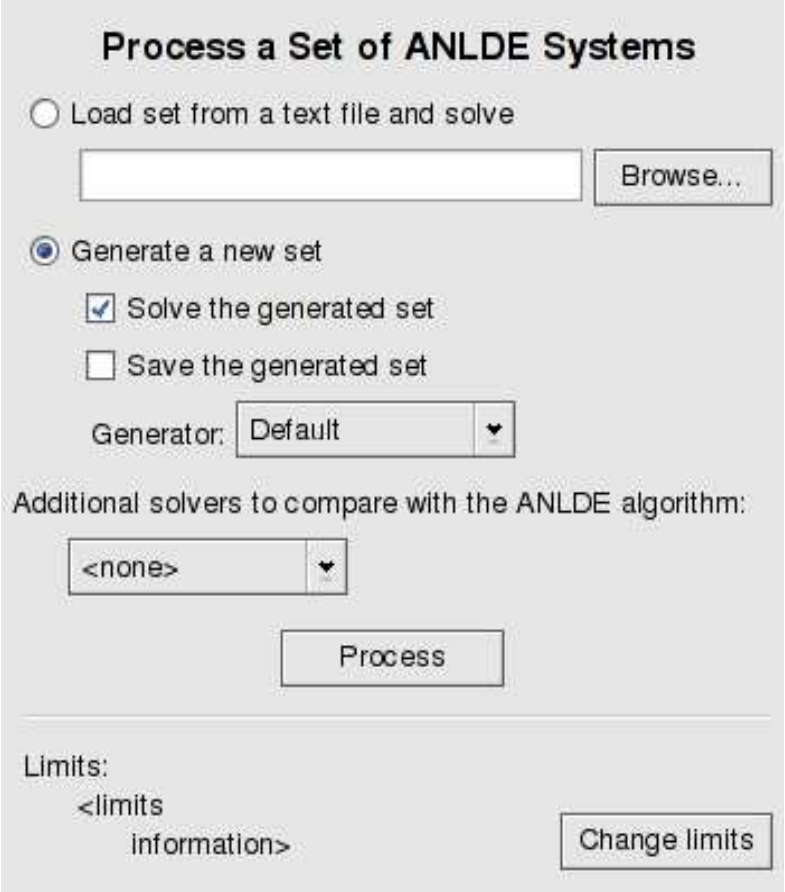

Рис. 6: Process a Set of ANLDE Systems form

Components:

- radio button "Load a set from a text file",
- text field for file name (format depends on operating system, sect. 3.3.2 ANLDE System Set Format),

- radio button “Generate a new set” (selected by default),
- check box “Solve the generated set” (checked by default),
- check box “Save generated set” (does not checked by default),
- list “Alternative solver” (sect. 3.3.5 Alternative Solver List Format),
- button “Process”,
- limits information (sect. 3.3.9 Limits Format),
- button “Change limits” (sect. 3.2.7 User Limits).

References:

Use case: Process a Set of ANLDE Systems.

Requirements: EU1b.

3.2.3 Log In

Description: Log In form allows a registered user to identify her/himself in the web-system. A registered user enters her/his nickname and password. There is a user who has an opportunity to Log In the web-system as a system administrator with access to the administration forms. A "Register"button is also available; thus using this form, a user can register her/himself whenever she/he wants. See Fig. 7.

Рис. 7: Log In form

Components:

- text field for nickname (sect. 3.3.10 User Information format),
- text field for password (sect. 3.3.10 User Information format),
- button "Log In",
- button "Register".

References:

Use case: Log In.

Requirements: EU2d.

3.2.4 Activity Statistics

Description: This form is accessible only for the system administrator. It allows to select necessary characteristics and get a report on activity statistics for the current month. Two lists are available:

- domain: nicknames or IP addresses;
- metrics: number of generated systems, input systems, solved systems, acknowledged systems, resources, etc (sect. 3.3.7).

See Fig. 8.

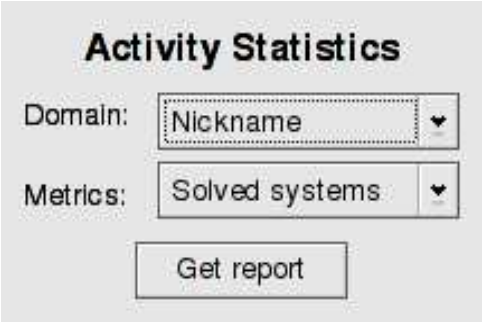

Рис. 8: Activity Statistics Form

Components:

- list of activity domains (sect. 3.3.6 Activity Domain format),
- list of activity metrics (sect. 3.3.7 Activity Metrics format),
- button "Get report".

References:

Use case: Get Statistics.

Requirements: EU3b.

3.2.5 Default Limits

Description: This form is accessible only for the system administrator. It allows changing the default limits of solving ANLDE systems. The form consists of a set of text fields, where necessary default limits are written (only nonnegative integer values). See Fig. 9.

Components:

- text field for maximal time of solution (sect. 3.3.9 Limits format);
- text field for maximal memory used in solution (sect. 3.3.9 Limits format);
- text field for maximal value of coefficients (sect. 3.3.9 Limits format);
- text field for maximal value of basis components in solution (sect. 3.3.9 Limits format);
- text field for maximal number of equations in ANLDE system (sect. 3.3.9 Limits format);
- text field for maximal number of unknowns in ANLDE system (sect. 3.3.9 Limits format);
- text field for maximal size of set of ANLDE systems, which are solved (sect. 3.3.9 Limits format);
- text field for maximal number of solutions (sect. 3.3.9 Limits format);

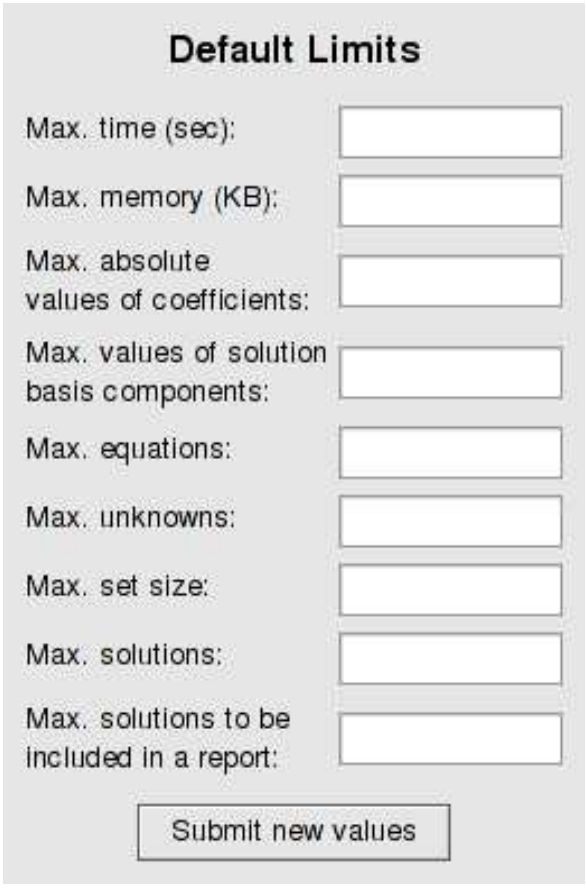

Рис. 9: Default Limits form

- text field for maximal number of solutions to be included in a report (sect. 3.3.9 Limits format);
- button "Submit new values".

References:

Use case: Manage Default Limits.

Requirements: EU3c.

3.2.6 Registration

Description: The form allows a user to register in the web system. In order to do it he/she should enter his/her personal information, nickname

and password; text fields that marked with '*' are required. Brief textual description for this form also contains restrictions on field sizes. See Fig. 10.

Рис. 10: Registration form

Components:

- text field for nickname (sect. 3.3.10 User Information format), required;
- text field for password (sect. 3.3.10 User Information format), required;
- text field for re-entering password (sect. 3.3.10 User Information format), required;
- text field for full name (sect. 3.3.10 User Information format), the same as a nickname by default;
- text field for e-mail (sect. 3.3.10 User Information format);
- text area for personal information (sect. 3.3.10 User Information format);

- Button "Register".

References:

Use case: Register a User.

Requirements: EU2a.

3.2.7 User Limits

Description: The form allows a user to change her/his own limits on solving ANLDE systems. It consists of the set of text fields, where user limits are entered. But they must not exceed the default limits. For user's convenience default limit corresponding to each text field for entering limit is shown. See Fig. 11.

Components:

- text field for maximal time of solution (sect. 3.3.9 Limits format);
- text field for maximal memory used in solution (sect. 3.3.9 Limits format);
- text field for maximal values of coefficients (sect. 3.3.9 Limits format);
- text field for maximal value of basis components in solution (sect. 3.3.9 Limits format);
- text field for maximal number of equations in ANLDE system (sect. 3.3.9 Limits format);
- text field for maximal number of unknowns in ANLDE system (sect. 3.3.9 Limits format);
- text field for maximal size of set of ANLDE systems, which are solved (sect. 3.3.9 Limits format);
- text field for maximal number of solutions (sect. 3.3.9 Limits format);

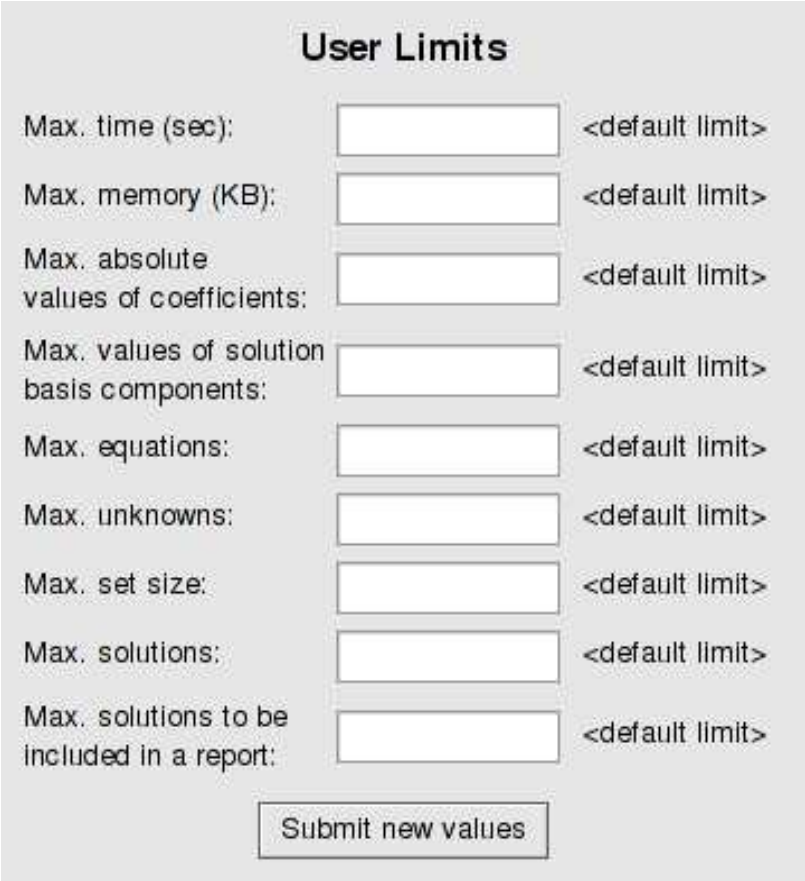

Рис. 11: User Limits form

- text field for maximal number of solutions to be included in a report (sect. 3.3.9 Limits format);
- button "Submit new values".

References:

Use case: Manage User Limits.

Requirements: EU2c.

3.2.8 Manage Users

Description: Accessible only for a system administrator. She/He enters the nickname of a target user and presses "Edit"button. See Fig. 12.

Рис. 12: Manage Users form

Components:

- text field for user's nickname (sect. 3.3.9 User Information format),
- button "Edit"(sect. 3.2.9 User Information).

References:

Use case: Manage Users.

Requirements: EU3a.

3.2.9 User Information

Description: The web system sends this form to the user. System administrator may change this information for any user; other users may change only her/his own information. See Fig. 13.

Components:

- text field for user's nickname (sect. 3.3.10 User Information format),
- text field for user's E-mail (sect. 3.3.10 User Information format),
- text area for extra user's information (sect. 3.3.10 User Information format),
- check box "Change password"(doesn't checked by default),
- text field for user's password (sect. 3.3.10 User Information format),

Рис. 13: User Information form

- text field for re-entering password (sect. 3.3.10 User Information format),
- check box "Remove account"(doesn't checked by default, displayed in admin form only, regular user don't see this check box),
- button "Submit new values".

References:

Use case: Manage Users.

Requirements: EU3a.

3.2.10 General Notes

Description: This form allows a user to send an opinion about the web-system (as whole). See Fig. 14.

Components:

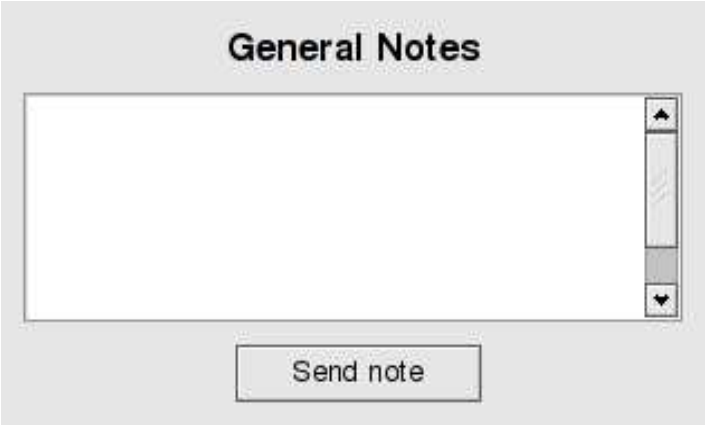

Рис. 14: General Notes

- text area for a textual note (sect. 3.3.11 Note format),
- button "Send note".

References:

Use case: Send a Note.

Requirements: EU2b.

3.2.11 Notes on Solution

Description: This form allows a user to send an opinion about the last processed ANLDE system (or ANLDE systems set). The user chooses one of two possibilities:

1. Agree with solution of the processed ANLDE system (set). In this case the user may or may not attach the ANLDE system (set) to the note.
2. Disagree with solution of the processed ANLDE system (set). In this case the processed ANLDE system (set) is always attached to the note (automatically).

See Fig. 15.

Components:

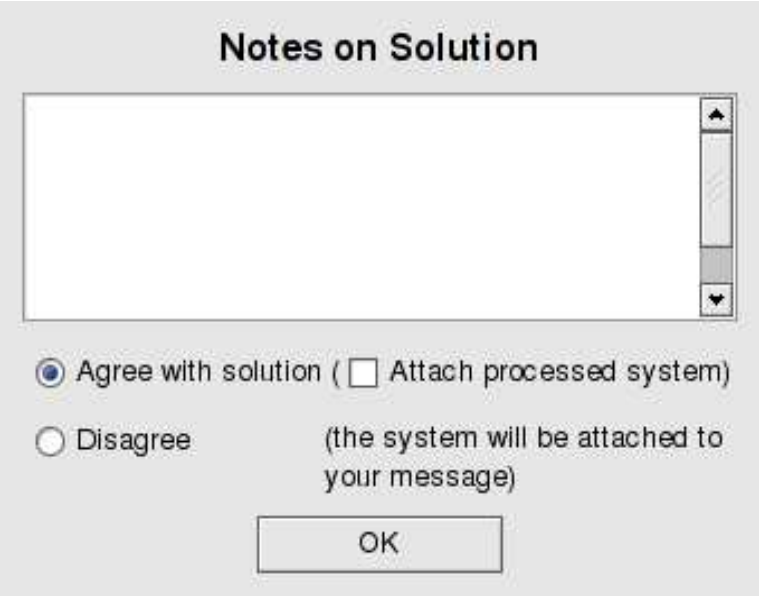

Рис. 15: Notes on Solution

- text area for a textual note (sect. 3.3.11 Note format),
- radio button "Agree with solution"(selected by default),
- radio button "Disagree",
- check box "Attach solved system"(doesn't checked by default),
- button "OK".

References:

Use case: Send a Note.

Requirements: EU2b.

3.3 IO Data Formats

3.3.1 ANLDE System Format

Format:

```
# Comment
```

```
x1 + x2 + ... + xK2 = c11*x1 + c12*x2 + ... + c1N*xN
x[K2+1] + x[K2+2] + ... + xK3 = c21*x1 + c22*x2 + ... + c2N*xN
...
x[KM+1] + x[KM+2] + ... + xN = cM1*x1 + cM2*x2 + ... + cMN*xN
```

Description: The format represents an ANLDE system. c11, c12, ..., c1N, c21, c22, ..., cMN are coefficients (optional, default value is 1). x1, x2, ..., xN are unknowns, may appear in any order, some may be skipped. If there is no unknowns after the "=" sign, write "0". Each unknown must appear in the left-hand side of some equation at most one time. Blank and comment lines are ignored.

Sample:

```
# Sample ANLDE system
x1 + x4 = 2*x1 + 3*x3
x2 + x3 = x1 + 2*x2 + x3
```

Corresponding forms: sect. 3.2.1 Process an ANLDE System.

3.3.2 ANLDE System Set Format

Format:

```
<ANLDE system 1>
%
<ANLDE system 2>
%
...
<ANLDE System N>
```

Description: The format represents ANLDE System Set ⟨ANLDE System 1⟩, ..., ⟨ANLDE System N⟩. Each system is in the ANLDE System Input Format (sect. 3.3.1). Blank and comment lines are ignored. String with symbols(s) '`%`' is a delimiter for ANLDE systems. These strings may additionally contain blank symbols ('␣', '`\t`') only.

Corresponding forms: sect. 3.2.2 Process a set of ANLDE systems.

3.3.3 ANLDE System Solution Format

Description: Format represents a report on solution of an ANLDE System. Each report includes

1. Test ANLDE system (ANLDE system format, sect. 3.3.1).
2. Number of solutions (nonnegative integer).
3. Algorithm name, system time, work time, memory usage, solving result (one of the following: solved, limit exceeded, abnormal solver termination), see sect. 3.3.9 for the these attributes.
4. Server hardware and software characteristics where solving algorithms work (Requirement Specification, Configuration Requirements).
5. List of solutions found by each algorithm (depends on limit view in limits format, see sect. 3.3.9).

Sample:

1. Test ANLDE system:

   ```
   x1 + x4 = 2*x1 + 3*x3
   x2 + x3 = x1 + 2*x2 + x3
   ```

   Number of solutions: 1

2. Performance metrics of the algorithms:

Algorithm	System time(sec)	Work time(sec)	Memory usage(KB)	Solving result
anlde	0	0.580	2192	solved
slopes	0	1.168	2192	solved

3. Solving machine characteristics:

   - **CPU:** IA32, 1200 MHz;
   - **RAM:** 256 MB.
   - **Operating system:** Linux 2.4.19
   - **Priority(nice):** 12

4. Solutions of test ANLDE system:

anlde:

	x_1	x_2	x_3	x_4
$h^{(1)}$	0	0	1	3

slopes:

	x_1	x_2	x_3	x_4
$h^{(1)}$	0	0	1	3

Corresponding forms: sect. 3.2.1 Process an ANLDE System.

3.3.4 ANLDE System Set Solution Format

Description: Format represents a report on solution for a set of ANLDE systems. Each report includes

1. Number of ANLDE systems in the set;
2. ANLDE systems metrics: minimum (positive int), average (positive real,one digit for fractional part) and maximum (positive int) dimensions (equations and unknowns) of test ANLDE systems; average (positive real, one digit for fractional part) and maximum (positive int) coefficients of test ANLDE systems; minimum (nonnegative int), average (nonnegative real, one digit for fractional part); maximum (nonnegative int) number of solutions.
3. Algorithm metrics: algorithm name, sum system time (Limits format), sum work time (Limits format), maximal memory usage (Limits format), solving result (one of the following: solved, limit exceeded, abnormal solver termination).
4. Server hardware and software characteristics (Requirement Specification, Configuration Requirements).

Sample:

1. Number of ANLDE systems in the set: 3
2. The set characteristics:

minimum equations: 3

average equations: 5.0

maximum equations: 7

minimum unknowns: 4

average unknowns: 7.0

maximum unknowns: 10

average coefficients: 4.2

maximum coefficients: 10

minimum number of solutions: 0

average number of solutions: 3.3

maximum number of solutions: 10

3. Algorithm metrics:

Algorithm name	Summary system time(sec)	Summary work time(sec)	Maximum memory usage(KB)	Solving result
anlde	0	0.580	2192	solved
slopes	0.23	5.172	2192	solved

4. Solving machine characteristics:

   - CPU: IA32, 1200 MHz;
   - RAM: 256 MB.
   - Operating system: Linux 2.4.19
   - Priority(nice): 12

3.3.5 Alternative Solver List Format

Description: This is a list of available alternative solvers to compare with the ANLDE algorithm. The List includes special "none" item to disable the comparison feature. At most one alternative solver may be chosen.

3.3.6 Activity Domain List Format

Description: The format represents an activity domain list. There are two items in this list: "Nickname"and "IP address". The first one corresponds to statistics by all registered users, the second one is for statistics by all hosts.
Corresponding forms: sect. 3.2.4 Activity statistics.

3.3.7 Activity Metrics List Format

Description: The format represents an activity metrics list. The list contains the items:

Sessions is the total number of sessions.

Processed ANLDE systems is the total number of processed (input with an attempt to solve) ANLDE systems,

Generated ANLDE systems is the total number of generated (by Web-SynDic) ANLDE systems,

Solved ANLDE systems is the total number of successfully solved (from point of view of the anlde solver) ANLDE systems,

Acknowledged ANLDE systems is the total number of acknowledged (explicitly by user(s)) systems,

Discrepancies for solvers is the total number of ANLDE systems that are solved with a discrepancy (alternative algorithm gives a different solution comparing with the anlde solver),

Sum system time is sum (for all ANLDE systems and their sets) system (from OS point of view) time usage,

Sum work time is sum (for all ANLDE systems and their sets) work (from user point of view) time usage,

Sum session time is sum session work time (time, used by all sessions),

Corresponding forms: sect. 3.2.4 Activity Statistics.

3.3.8 Statistics Report Format

Description: The format represents a statistics report. The report is a table with 2 columns. The first column contains items according to the selected domain (nickname or IP address). The second column contains statistics metrics.

Sample: Statistics report during the October.

Generated at Fri Oct 31 12:22:29 MSK 2003.

nickname	summary used work time
guest	49.40
guest01	10.10
guest2	50.50
guest_2	40.40
user13	20.20
user2	111.00
user21	30.30
user3	50.50
user31	9.0

Corresponding forms: sect. 3.2.4 Activity Statistics.

3.3.9 User limits Format

Description: The format represents user limits. There are eight items in this format:

1. Maximal time allowed for solving process (in seconds, positive integer, checked during a solving process).

2. Maximal memory allowed for solving process (in kilobytes, positive integer, checked during a solving process).

3. Maximal value for coefficients of ANLDE system(s) (positive integer, checked i) after inputing the ANLDE system and ii) during generating process).

4. Maximal value for any component in a basis solution (positive integer, checked during generating and solving processes).

5. Maximal number of equations in ANLDE system (positive integer, checked after inputing the ANLDE system and during generating process).

6. Maximal number of unknowns in ANLDE system (positive integer, checked after inputing the ANLDE system and during generating process).

7. Maximal size of an ANLDE systems set (positive integer, checked after inputing the set and during generating process).

8. Maximal number of basis solutions (positive integer, checked during generating and solving processes).

9. Maximal number of basis solutions to be included in a report on solution (non-negative integer, untestable because using only for output solutions to a user).

Corresponding forms: sect. 3.2.5 Default Limits, sect. 3.2.7 User Limits.

3.3.10 User Information Format

Description: The format used for user information data. There are six items in this format.

1. Nickname consists of following characters: Latin letters, digits and '_' symbol. It is case sensitive. Maximum length is 32 characters.

2. Password consists of following characters: Latin letters, digits and punctuation marks. It is case sensitive. Maximum length is 32 characters.

3. Re-entering password format is the same as password format.

4. Full name is a text (text). Maximum length is 256 characters.

5. E-mail is a text (text). Maximum length is 256 characters.

6. Personal information is a text (no more than 256 characters).

Corresponding forms: sect. 3.2.6 Registration, sect. 3.2.8 Manage Users, sect. 3.2.9 User Information.

3.3.11 Note Format

Description: The note format is a text (no longer than 4096 symbols).
Corresponding forms: sect. 3.2.10 General Notes, sect. 3.2.11 Notes on Solution.

3.3.12 Acknowledgment Format

Description: This format represents a different types of acknowledgments. The acknowledgment format is a one of following types:

1. Log in acknowledgment ("You are logged in as 'nickname'.").

2. Modification acknowledgment ("Changes have been submitted. Thank you.").

3. Sending note acknowledgment ("Your message have been sent. Thank you.").

4. Registration acknowledgment ("Thank you for registering.").

Corresponding forms: sect. 3.2.3 Log In, sect. 3.2.5 Default Limits, sect. 3.2.7 User Limits, sect. 3.2.8 Manage Users, sect. 3.2.10 General Notes, sect. 3.2.11 Notes on Solution, sect. 3.2.6 Registration.

3.3.13 Error Message Format

Description: Format represents a different types of error messages. The error message format is one of following types:

1. Invalid nickname or password.

2. Invalid value (also empty).

3. Too big message.

4. Invalid ANLDE system format.

5. ??? Chosen be absent.

6. Registration error.

7. The ANLDE system does not satisfy the user limits.

8. Server is already processing your task.

Corresponding forms: sect. 3.2.3 Log In, sect. 3.2.5 Default Limits, sect. 3.2.7 User Limits, sect. 3.2.8 Manage Users, sect. 3.2.10 General Notes, sect. 3.2.11 Notes on Solution, sect. 3.2.1 Process an ANLDE System, sect. 3.2.2 Process a Set of ANLDE Systems.

3.3.14 Process Message Format

Description: The process message has to be shown to a user when ANLDE solving or generating process takes more than 20 seconds (Req. AP3). Possible message types are:

1. Solving your ANLDE system(s). Wait, please...

2. Generating ANLDE system(s) to you. Wait, please...

Corresponding forms: sect. 3.2.1 Process an ANLDE System, sect. 3.2.1 Process a Set of ANLDE Systems.

3.4 Notes on implementation

User interface for Web-SynDic will be implemented using Java Server Pages and Servlets technologies. Web server produces HTML 4.01 compliant pages and send them to a client (browser). Forms will be represented using HTML 4.01 form tags
(see `http://www.w3.org/TR/html401/interact/forms.html`).

4 Подсистема Web Server

4.1 Общая архитектура web-системы

На рис. 16 изображена общая архитектура системы Web-SynDic. На UML диаграмме представлены следующие подсистемы:

Web Server: интерфейс пользователя и управление сеансами,

Management: управление учетными записями пользователей,

Activity Statistics: сбор и анализ данных об использования системы,

Data Store: хранение учетных записей пользователей,

Algoritm Server: работа с внешними программами-решателями и генераторами.

Архитектура подсистемы Web Server показана на рис. 17. Подсистема Activity Statistics и механизмы управления сеансами пользователей представлены в работе [5].

Далее приведены разделы из документации проекта, описывающие страницы JSP, сервлеты и другие Java-классы подсистемы Web Server.

4.2 JSP Files

The user interface is implemented using Java Server Pages technology.

main.jsp the only page directly accessible from the user's web browser, implements page layout (sect. 3.1.3), responses of all other JSP's are included in the content part, except responses of the login.jsp are included in the login part;

index.jsp displays start page;

manageusers.jsp displays Manage Users form (sect. 3.2.8);

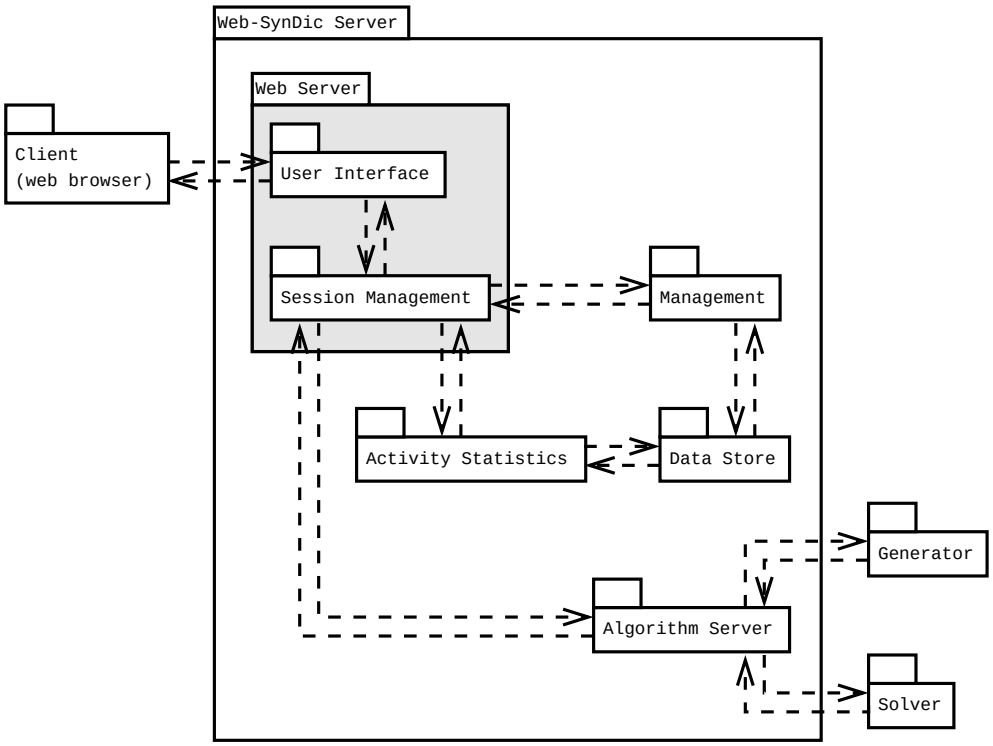

Рис. 16: Архитектура системы Web-SynDic

userinfo.jsp displays User Information form (sect. 3.2.9);

registration.jsp displays Registration form (sect. 3.2.6);

limits.jsp displays User Limits (sect. 3.2.7) or Default Limits (sect. 3.2.5) forms;

login.jsp displays Login form (sect. 3.2.3);

notes.jsp displays General Notes (sect. 3.2.10) of Notes on Solution sect. 3.2.11) forms;

process.jsp displays Process an ANLDE System form (sect. 3.2.1);

processset.jsp displays Process a Set of ANLDE Systems form (sect. 3.2.2);

notification.jsp displays notification message (sect. 3.3.12 Acknowledgment Format, sect. 3.3.13 Error Message Format,

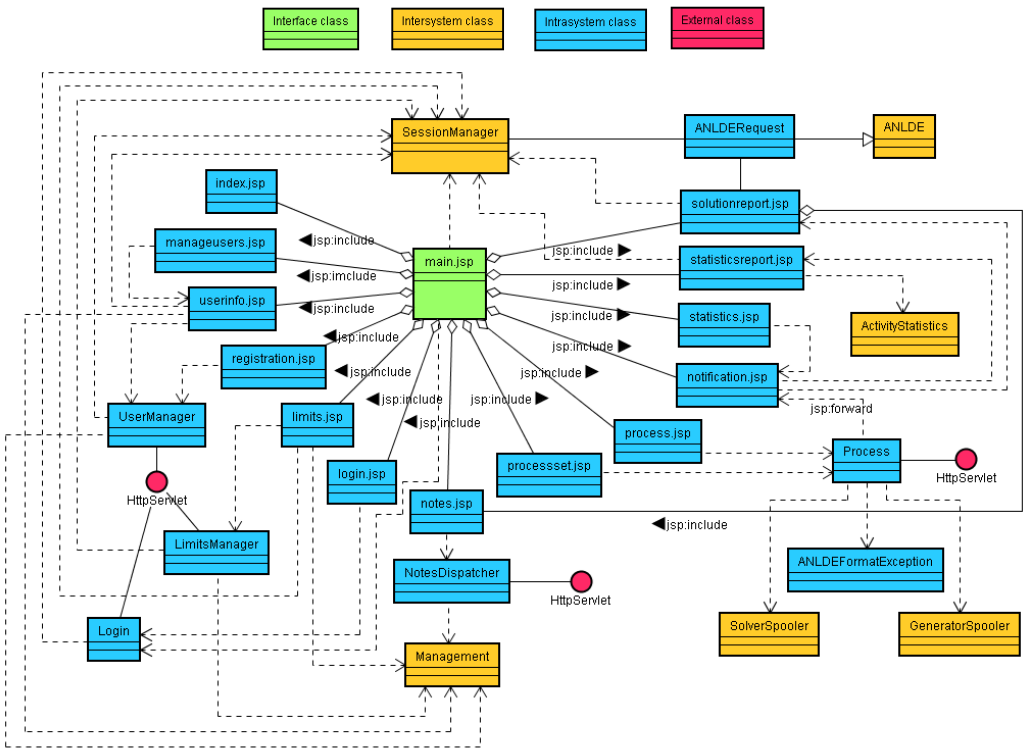

Рис. 17: Web Server Architecture

sect. 3.3.14 Process Message Format);

statistics.jsp displays Statistics form (sect. 3.2.4);

statisticsreport.jsp displays a statistics report (sect. 3.3.8 Statistics Report Format);

solutionreport.jsp displays solution report (sect. 3.3.3 ANLDE System Solution Format, sect. 3.3.4 ANLDE System Set Solution Format).

4.3 Servlets

Servlets are used to handle various user requests. Servlets classes extend javax.servlet.http.HttpServlet and override doPost() method to handle POST requests.

UserManager receives information from User Information and Registration forms, invokes the Management subsystem to add or change user accounts;

LimitsManager receives information from User Limits and Default Limits forms;

Login receives information from Login form and logout request;

NotesDispatcher receives information from General Notes and Notes on Solution forms;

Process receives information from Process an ANLDE System and Process a Set of ANLDE Systems forms, translates data in ANLDE System Format (sect. 3.3.1) to the internal format (class ANLDE).
Additional methods:

- `private ANLDERequest parseANLDE(String source, boolean set, Limits limi`
  `throws ANLDEFormatException;`
  translates ANLDE system (if `set` value is `false`) or ANLDE system set (if `set` value is `true`) from the ANLDE System Format (sect. 3.3.1) or ANLDE System Set Format (sect. 3.3.2) to the internal format (instance of the ANLDERequest class). ANLDEFormatException is thrown in case of parsing error or when the ANLDE system does not conform to the limits.

4.4 Exceptions

ANLDEFormatException thrown by Process.parseANLDE() method when it fails to parse ANLDE system (set).

4.5 Other Classes

ANLDERequest extends ANLDE, used to receive notifications on solving and generating ANLDE systems and system sets from the Algorithm Server subsystem.

Fields:

- `private SolverOutcome solution;`
- `private processing = false;`
  true — ANLDE System (Set) is currently in process of generating or solving, false — ANLDE System (Set) is ready to be processed.

Following abstract methods are implemented:

- `public void solved(SolverOutcome);`
  called by Algorithm Server, notifies waiting thread of report.jsp, stores `SolutionOutcome` in `solution` variable;
- `public void generated();`
  called by Algorithm Server, notifies the Process servlet about finishing ANLDE generation;
- `public void error(String);`
  called by the Algorithm Server to notify waiting report.jsp or Process servlet thread about ANLDE generation or solution errors.

5 Заключение

В ходе работы над проектом были получены следующе результаты:

- разработан интерфейс пользователя системы Web-SynDic;
- спроектирована подсистема Web Server, реализующая интерфейс пользователя и управление сеансами;
- реализована подсистема Web Server:
  - 27 страниц JSP,
  - 9 классов Java, включая сервлеты (около 1600 строк кода);

- частично выполнена стадия тестирования, в ходе которой были внесены улучшения в пользовательский интерфейс, обнаружены и исправлены некоторые ошибки, достигнуто полное соответствие HTML кода, возвращаемого сервером, спецификации HTML 4.01.

В настоящее время проект находится на стадии α-тестирования. Размещение системы в сети Интернет планируется в сентябре 2004 г.

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