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Union of Scientists - Ruse
16, Konstantin Irechek Street
7000 Ruse
BULGARIA
Phone: (++359 82) 828 135,
(++359 82) 841 634
E-mail: suruse@uni-ruse.bg
web: suruse.uni-ruse.bg

Contacts with Editor
Phone: (++359 82) 888 738
E-mail: zzdravkova@uni-ruse.bg

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BOOK 5

"MATHEMATICS, INFORMATICS AND PHYSICS"

VOLUME 11

CONTENTS

Mathematics

Informatics

BOOK 5

"MATHEMATICS, INFORMATICS AND PHYSICS"

VOLUME 11

Physics

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SIMPLE SYSTEMS AID THE SOFTWARE DEVELOPMENT

Valentin Velikov, Aleksandar Iliev

Angel Kanchev University of Ruse

Abstract: *This paper presents some of the interesting systems (sample, free, open source) for automated software creation/generation or the stages of its development, so and its documentation.*

Keywords: *Computer Science, program generation, software generation.*

INTRODUCTION

In many places people work in the automatic software generation area. That is a problem, connected not only with human resources and saving time for development. Program generation allows creating syntactically clear and logically correct units – that is connected with time and price for software development, too. Another reason – sometimes it's difficult to find the suitable specialist to create the necessary correction in a software unit.

In a limited budget a large software system can be developed on a modular basis. In the absence of technological module it can be used an external developer, or open source. In this case, the individual subsystems can exchange data using some common format (free) for import and export (for example - XML).

Another important point is the product or project documentation creation - it takes too much time and resources. This documentation has to respond to different requirements depending on the country or company it was created by. One of the prerequisites for their unification, in addition to the national and international standards, is the IBM's acquisition of Rational Software Corp. (2003) with its iterative software development process framework (RUP).

All this suggests more widespread use of variety systems for software automated creation or separate modules for modelling the subject area [1], for a Custom software designed requirements description, for documents creation.

This article presents some of the widely used systems in that area. To be well acquainted with these products is a necessary condition for the software systems creation with modern information technologies.

DETAILED DESCRIPTION

1. Borland Together

Borland Together [5] is a Borland company product. It is a tool for modeling with UML, which is integrated with Java IDE.

Initially the system consisted of three modules with different functionality:

- Together Developer
- Together Designer
- Together Architect

Since 2007, these three modules are collected in one product that combines their functionality and opportunities. Earlier versions are offered as separated (independent) applications, but since 2006 they are dependent on the Eclipse platform. Technically, Together is a set of additions (Add-Ins) for Eclipse. Its main features are:

- Support of UML 2.0
- Business Process Modeling
- Support to Eclipse 3.2 up (incl.)
- Design by source code
- Templates

Advantage of Together is the operating system independence, as the product is based on the language Java. Functions are consistent with the Eclipse, which is preferred by the users actively using that platform for their projects realization.

Problems:

- As a disadvantage can be specified the dependence on Eclipse - in terms of consumers who do not wish to install that platform;
- The interface is inherited directly from Eclipse, which imposes some restrictions;
- Together also lacks some of the features for automatic elements generation which are present in other UML modelling tools;
- Future development of the product is unclear, meaning of the Borland company existence.

2. StarUML

StarUML [7] is an open source code product serving to the UML modelling. Although the latest stable version of the product is 2005, the program is still relatively high usability. The main purpose for its creation was the substitution of some of known commercial products, such as Borland Together. [5]

StarUML was written in the Delphi language, which is a cause of termination the system development. It has a standard graphical interface, covering essential requirements of the user. Supports UML 2.0, C, C++ and Java code generation, as well as documentations.

During the development, the product maintenance is partly increased by the fact that consumers have access to the source code. That allows efficient further development and rapid distribution of StarUML.

Problems:

The disadvantages stem from the terminated product development. StarUML currently does not support some of the newly introduced in UML diagrams. There is no option to export documents as PNG files. The system is platform dependent – it works on the Microsoft Windows operating system only.

3. Acceleo

Acceleo [2] is one of the more unconventional solutions in modelling. It allows model-based approach for project creation by code generation. By itself, the program is classified as "code generator".

Acceleo was created in 2006, mainly in Java. Integrated in Eclipse, the source code is open and accessible for the users. It can be used on different operating systems, including Microsoft Windows, Mac OS and Linux.

The Acceleo interface differs from the standard graphical interface of most UML diagrams development systems due to the different functionality. Some of the more significant interface elements are:

- Editor – a segment that permits the source code editing in a real time, which, in turn, changes the model structure, which is code generated form. The segment supports in real time code adjustments and debug, and autocomplete items using a template;

- Debugger - that segment is different from a standard debugger because it allows the user monitoring in real-time the code generation. It is possible to suspend the generation at any time, to verify the variables state and step by stepthe code generation in order to monitor the process. So debugger allows better errors identification and their effective removal.

- Profiler - a segment that allows the user to set instructions for execution during a code generation. That allows multiple experiments with various operations during code generation in order to avoid mistakes or to lead to more effective results. Any changes can be reflected directly in the models themselves.

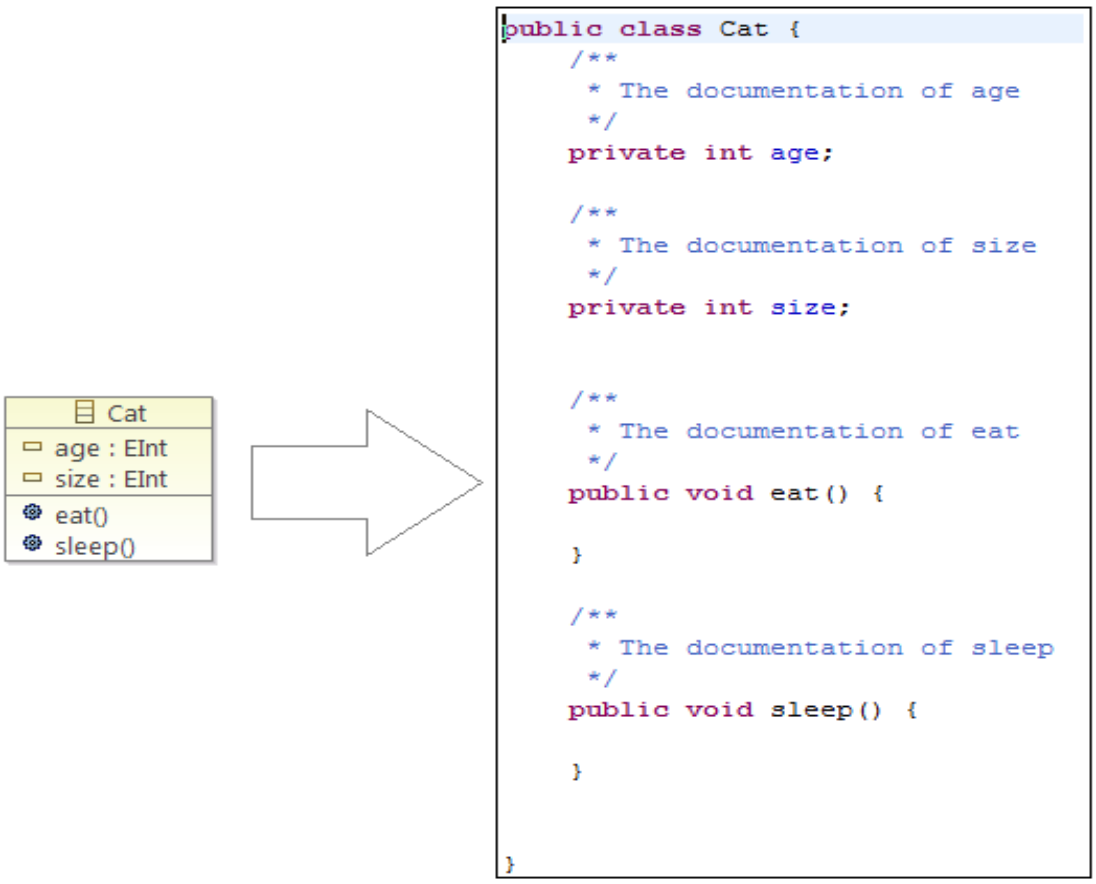

Fig. 1. - Code generation from class by Acceleo

The remainder of an interface provides a standard graphical environment for creating and editing various diagrams supported by UML 2.0. In the case of a standard class diagram creating, by the user will be required the class designing by inputing its name, attributes and methods, and then code generation can be accomplished. The process can be monitored and be an impact by segment management. The finished code is formed against the standards of the used language, including spaces for documentation apply.

An Acceleo key advantage is the ability to use the basic functions without an installed Eclipse. Platform independent and open source distribution makes its distribution easy. The ability of code generation is preferred by many systems engineers, as the process relieves much of the project work implementation by the described models, even if the code is presented in relatively raw form.

4. Microsoft Visio

Microsoft Visio [6] is one of the most famous contemporary solutions, providing comprehensive UML support and the class diagrams development. Known as Microsoft Office Visio to 2007, the system is considered as a part of the package of Microsoft Office Tools, although it is not included in the latest versions of the kit by default.

Visio is intended for use under the Microsoft Windows operating system only. It works with multiple file formats, which include reserved formats for projects, diagrams, templates, and more.

The Visio advantages begin with a large amount of invested time to provide simple and effective consumer environment. Developed with the idea of a parallel working with other Office products, Visio provides easy data transfer with Word and Excel together. The interface meets modern desktop environment, offering quick data entry and easy editing. Visio is divided in three versions:

- Visio Standard – a basic version of the system. It is equipped with a standard user interface and capabilities.

- Visio Professional – that version has the same user interface as Visio Standard. The differences are in the additional number of charts and templates, designed to save work during the preparation of standard compositions. A feature is available that enables users to connect data sources to any number of diagrams and to display the results graphically.

- Visio Premium – featuring complicated version, but with more functional user interface. It supports three additional types of charts, with the possibility of intelligent rules and secondary processes.

There are many differences between the three versions in terms of patterns, key elements, navigation, dynamic charts and the integration with other products possibility.

Table 1. Comparison of the three Visio versions

Characteristic	Standard	Professional	Premium
Brainstorming cards	✓	✓	✓
Organizational charts	✓	✓	✓
Project management charts	✓	✓	✓
Architectural diagrams		✓	✓
Detailed network diagrams		✓	✓
Software charts and database diagrams		✓	✓
Business process modelling template, using intelligent rules			✓
Automatic alignment	✓	✓	✓
Themes and forms	✓	✓	✓
Smart error searching			✓
Decomposition of sub processes			✓
Automatic data connection		✓	✓
Automatic data refresh		✓	✓
Data legend		✓	✓
Static shearing of diagrams	✓	✓	✓
Forms editing	✓	✓	✓
Integrated XML web services	✓	✓	✓
Interface for sub processes			✓
Compatibility with AutoDesk AutoCAD	✓	✓	✓

Integrity with Microsoft Excel	✓	✓	✓
Integrity with Microsoft Outlook	✓	✓	✓
Integrity with Microsoft Project	✓	✓	✓

The Advantages of Visio due to the high range of services that the system provides for work are not in its own environment only. Users are facilitated by the presence of a set of templates and ready-made forms that help the modelling process and allow easy data presentation using graphics.

The Disadvantages are due to the fact that the system is maintained by a particular operating system, which is a negative factor in terms of distribution. Like other shortcomings can be identified the lack of open source and the high product price.

Known problems

- this is a drawing tool – does not support a chart created logical control.

5. UMLet

Free UML Tool for Fast UML Diagrams, last version: 12.2

UMLet [8] is a free, open-source UML tool with a simple user interface: draws UML diagrams fast, produces sequence and activity diagrams from plain text, exports diagrams to eps, pdf, jpg, svg, and clipboard, shares diagrams using Eclipse, and creates new, custom UML elements. UMLet runs stand-alone or as Eclipse plug-in on Windows, OS X and Linux. (Also, check out its sister tool PLOTlet to create chart grids, our other tools, and our new web-based UMLet, called UMLetino v0.1 experimental.)

Some possibilities to easy using:

- - Adding elements to a UML diagram with a double click.
- - Editing elements using the lower-right text panel.
- - Selecting multiple elements using Ctrl or lasso.
- - Pressing 'C' to copy diagram to the system clipboard.
- - Using +/- or Ctrl+mousewheel to zoom.

UML Tool Concepts, realizing in this system:

UMLet is a UML tool aimed at providing a fast way of creating UML diagrams. UML elements are modified using text input instead of pop-up dialogs. Elements can be modified and used as templates; this way, users can easily tailor UMLet to their modelling needs. UMLet supports a variety of UML diagram types: class diagrams, use case diagrams, sequence diagrams, state diagrams, deployment diagrams, activity diagrams

UMLet allows users to create their own custom UML elements. An element's look can be modified at run-time by changing a few lines of Java code; UMLet then compiles the new element's code on the fly. Without leaving UMLet, users can thus create and add new element types to their diagrams

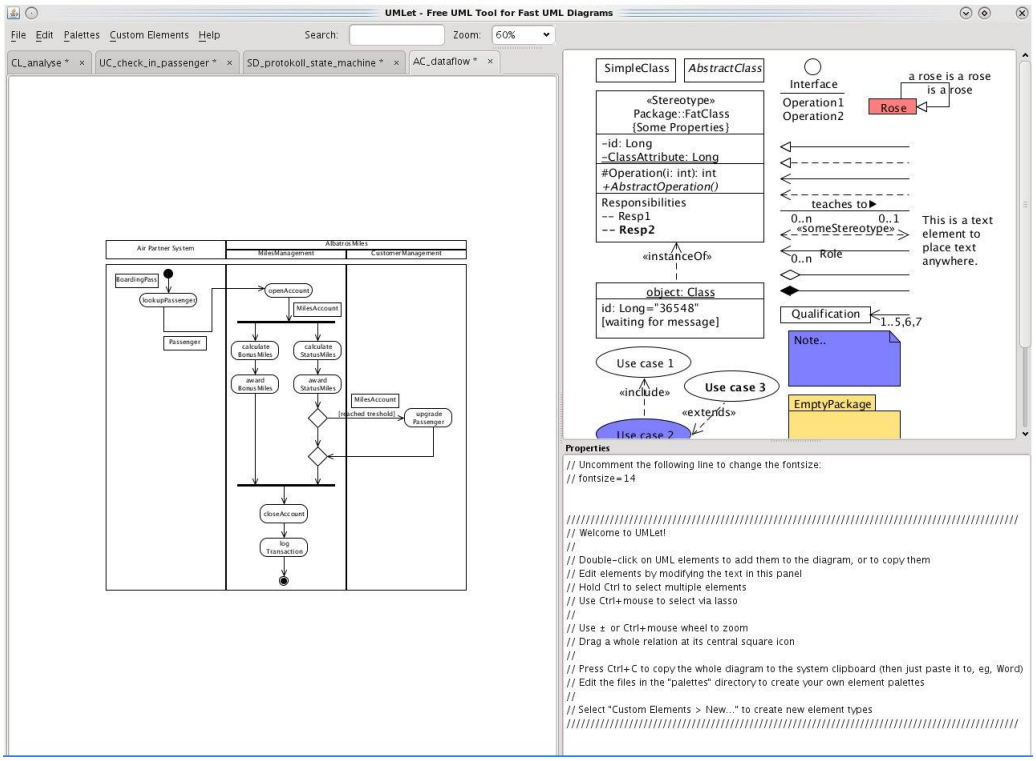

Fig. 2 - UMLet

6. ArgoUML

ArgoUML [3] is one of the leading open source UML modelling tool and includes support for all standard UML 1.4 diagrams. It runs on any Java platform and is available in ten languages. The core model repository is an implementation of the Java Metadata Interface (JMI) which directly supports MOF and uses the machine readable version of the UML 1.4 specification provided by the OMG.

ArgoUML uses GEF, the UCI Graph Editing Framework to edit UML diagrams. The following diagram types are supported [4]:

- Class diagram.
- Statechart diagram.
- Activity diagram (including Swimlanes).
- Use Case diagram.
- Collaboration diagram.
- Deployment diagram (includes Object and Component diagram in one).
- Sequence diagram.

ArgoUML's user interface is divided into 4 panels:

- Top left: a hierarchical view of the current project file.
- Top right: editor for the selected part of the project, in this case a class diagram.
- Bottom left: the designer's "to do" list.
- Bottom right: details of the selected object in the diagram or the selected "to do".

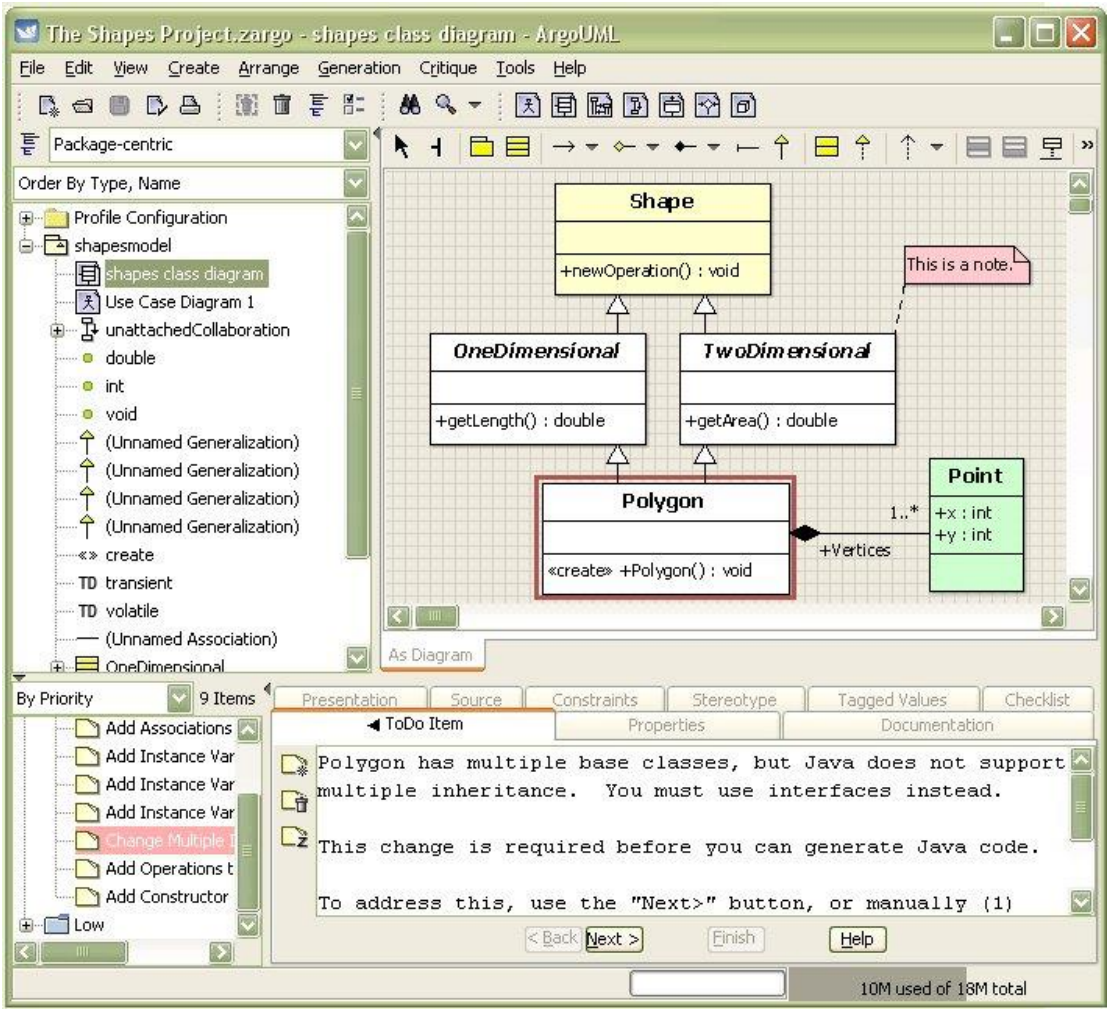

Fig.3 – ArgoUML – user interface

7. Web-based systems, supporting UML modelling

There are many modern web – based applications, giving users the ability to create different UML 2.0diagrams. These systems rely on an efficient graphical user interface and in most cases provided limited functionality when working with charts. The fact that the system is running on a remote server and is downloaded from the Internet means that intensive operations performed on it are minimized. The advantage of these products is the user working platform independent. In most of the cases they are available not on computers only but also on phones, tablets or other browser supporting devices. Some of the products offer additional security as the ability to store working files on the server and not on the user working machine.

The disadvantages come from the limited functionality. Rarely possible operations such as external files importing, loading data or finished models from another source, code generation, etc. These systems also support the work of one only member of a project, making them unsuitable for intensive work on complex projects in large teams.

8. Others

Very interesting comparative analysis of the ability of different modeling tools can be found at:

http://en.wikipedia.org/wiki/List_of_Unified_Modeling_Language_tools, but due to the size of comparative tables it is impossible to be included here.

CONCLUSION

1. There is a great number of various software systems, accomplish documents generation at different levels (XML and other formats), diagrams, software.
2. The majority of these systems are not open-source, i.e. - Internal machine representation of the structures is not available (Know-How). Even be found it, in question is the possible manipulation of these structures (copyright, etc..).
3. Best products are commercial. Their price is such, that even big Bulgarian developers and potential customers would think.
4. The last opens up a market niche for new developments in the field.
5. Regardless of whether a new system is realized as a web-based or as a standalone application, it should be provided with good support in order to rapidly changing standards (due to the many innovations) in the software industry.

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CONTACT ADDRESSES

Pr. Assist.Valentin Velikov,
Department of Informatics and Information Technologies
Faculty of Natural Sciences and Education
Angel Kanchev University of Ruse
8 Studentska Str., 7017 Ruse,Bulgaria
Phone: (++359 82) 888 326,
Cell Phone: (++359) 886 011 544,
E-mail: val @ ami. uni-ruse. bg

Alexandar Iliev, MSc
Department of Informatics and Information Technologies
Faculty of Natural Sciences and Education
Angel Kanchev University of Ruse
8 Studentska Str., 7017 Ruse,Bulgaria
Cell Phone: (++359) 899 702 159
E-mail: al.juggernation@gmail.com

МАЛКИ СИСТЕМИ, ПОДПОМАГАЩИ РАЗРАБОТКАТА НА СОФТУЕР

Валентин Великов, Александър Илиев

Русенски университет "Ангел Кънчев"

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