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Book 5
**Mathematics, Informatics and
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BOOK 5

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SUBSYSTEM FOR GRAPHICAL USER INTERFACES CREATING

Valentin Velikov, Mariya Petrova

Angel Kanchev University of Ruse

Abstract: *This paper presents a system to create user graphical interface – dialog boxes, custom forms, menus and more. There are presented the architecture and product requirements, objects to describe the graphical primitives, class hierarchy and relations between them, preservation and restoration of the created elements.*

Keywords: *Computer Science, graphical user interface, user dialog interface, dialog frames.*

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.

Significant amount of time to application develop is spent on designing and creating a friendly oriented human-machine interface. In modern application systems, mostly working in the graphic mode, this means additional resources to create multiple dialogs, forms to exchange information, menus and more. It is natural to be created tools to automate this activity. Conditionally it can be divided into two stages:

- Graphic editor – for painting/creating user screens, menus. etc.;
- Subsystem for generating code, describing (realized) the created forms and dialog elements.

There exist several environments with similar features, such as: Delphi / RAD (with the most of intuitive interface), MS Visio C++/VB/C# [1], [4]. Unfortunately they are commercial and they are not open source.

As next stage in the development methodology it was created that subsystem, realizing the first stage and allowing creation in graphic mode shapes with the main types of dialog elements.

DETAILED DESCRIPTION

This subsystem should be able to collect and display in graphic window great number of different dialog elements [6], [8], [7]. That means to have a major panel to painting, toolbox (dialog elements to synthesize a form), some management tools (implemented as option buttons in the first version), simple menu with basic file manipulation and settings, i.e. - The interface should not be arbitrary, it has to be consistent and resembles those of the previous project sub-system.

1. Requirements for the interface creation

The graphical interface (as part of the human-machine interface) should be easy and understandable [5]. It has not contained unnecessary elements, either. It has to have the correct (ergonomic) colour schemes and appropriate colour combinations between the various elements. They have to be positioned effectively, to be found easy and intuitive.

The elements that interface shows must be graded on the screen according to their importance (more important in the foreground).

The successful design of a software product (in particular the interface) relies on several key features:

- elimination of redundant elements;
- gradation to display of screen elements according to their importance – more important to the fore;
- avoid an end in itself using technologies that did nothing to contribute to meeting the requirements of the project;
- correct colour design decision. Often overlooked requirement, that despite well-engineered interface, repels natural eye colour perception;
- effective placement of the interface elements - quickly find the relevant information, convenient and intuitive navigation.

Another key feature of a software product is the way in which information is organized in it (i.e. – the architecture). From the developer perspective, these are the methods by which the content is managed in the project – the used technologies and software. Their base is constructed program modules relating to the design of the interface that users see and through which they communicate with the application.

2. Logical organization of the interface

- In the left panel (Fig. 1) are two subpanels: one for a set of primitives and dialog elements (label, button, text box, radio buttons, check boxes), and one for a set of functionalities (*preview* of established, clear the drawing area, exit);

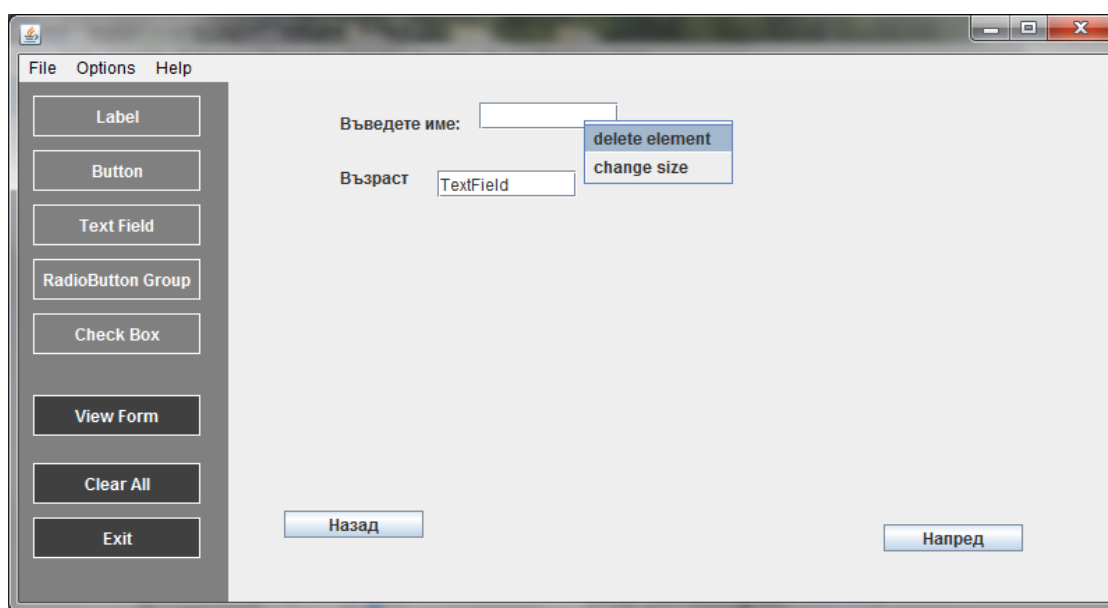


Fig.1. General appearance of the interface

- Menu bar containing intuitive options for file manipulation and settings;
- Workspace to create a dialog form. Selected with the mouse primitive is dragged into the work area, then double-click or right click add or edit properties of the element.

3. Internal-machine representation of the dialog elements

The system should store information for an unlimited plurality of dialog elements, which may be of one or of different types. For each element, except its type, it must be

kept for additional information, as location, name, content, and more. Therefore it has to define frames [3], [2] (classes) for each of the standard types, like the names are extended with a symbol prefix: GButton, GLabel, GTextEdit, GCheckBox, GRadioBtn. The requirement for unlimited number and type of crowd created elements is realized by storing the information in an **ArrayList** of **JComponent**.

4. Architecture of the subsystem

The general architecture of the subsystem can be illustrated by the class-diagram in Figure 3. It shows the realized classes, their fields, methods and relationships between them. The main class is called the **MainWindow** and it is related to next four classes **LleftPanel**, **DesignElement**, **Design Document** and **GColonTupe**. The class **DesignElement** manages **Design Document** and **GColonTupe**.

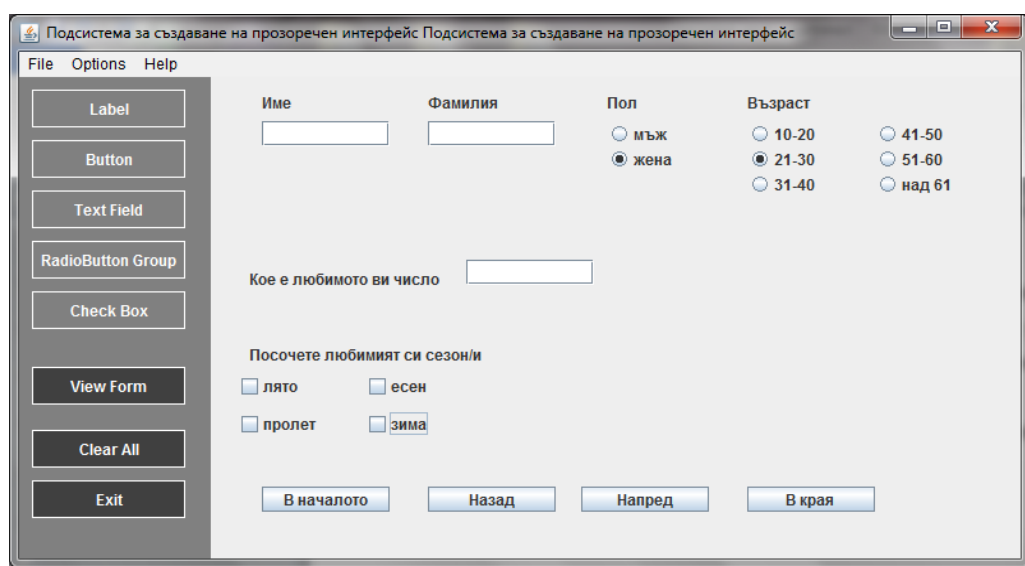


Fig.2. Painted form

MainWindow is used to start the application. Successor of the **JFrame**.

DesignElement - successor to the **JPanel**. Allows to draw on it and move graphical objects. Located in the central area of **MainWindow**.

GColonType - a new data type, by means of which can be recorded and retrieved an information into and from graphical objects (Java components) regardless of data type.

FormViewer – window in which the developer sees the final result – it's own painted form (Fig.2).

LeftPanel – contains graphic objects. Using them it can be “painted” the future application. Inherits **JPanel**.

Design Document - contains information about the painted elements, their location and size. It allows to be recorded (saved), and for this purpose it was created a special type (class) **GColonType** (instead of serialization).

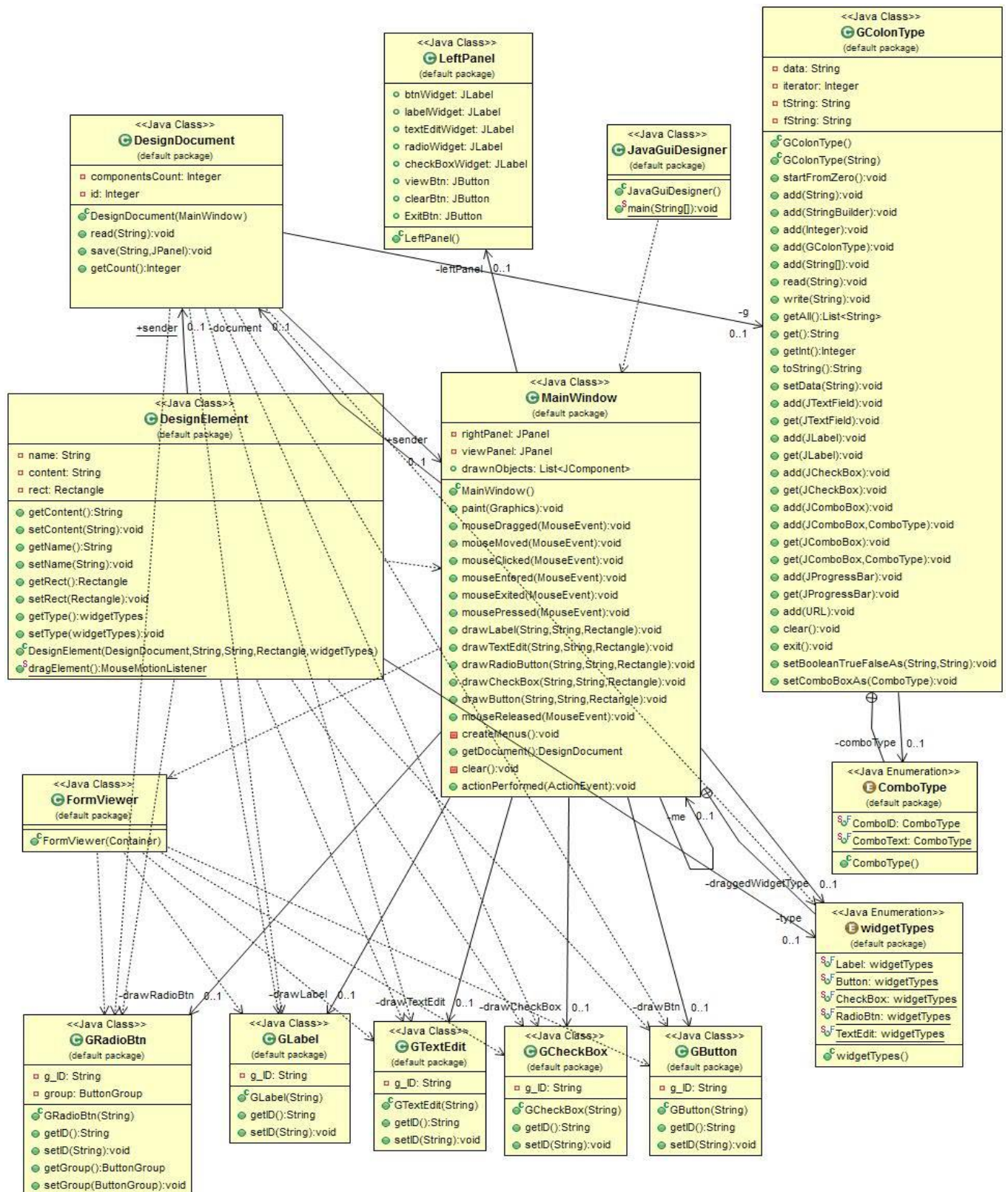


Fig.3. Class-diagrams – general

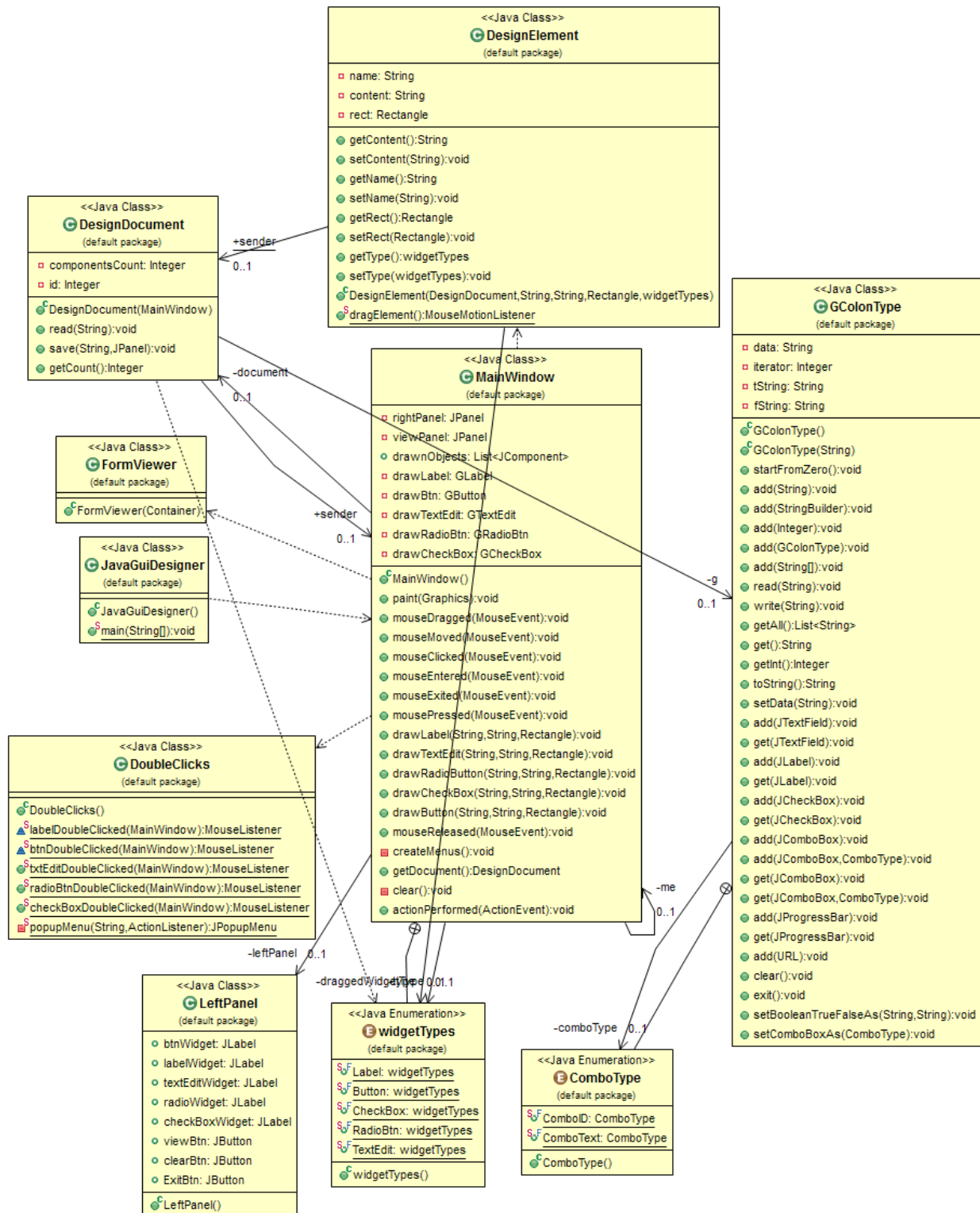


Fig.4. Functional links

Figure 4 illustrates the functional connections between **MainWindow** and basic classes.

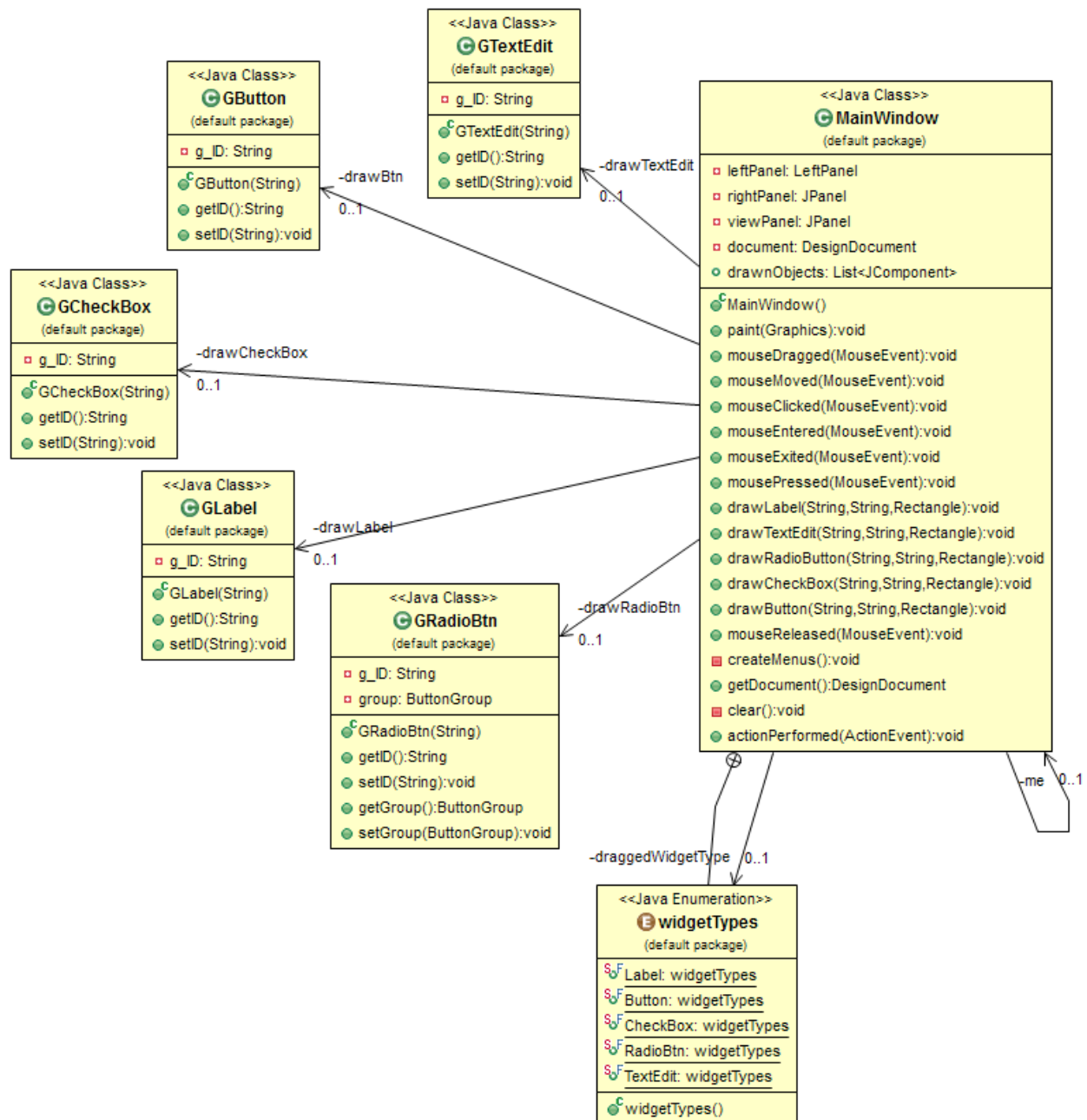


Fig.5. Links between predefined classes and MainWindow

Figure 5 describes the classes of the instruments and their links with the main class MainWindow.

5. Structure of the output file

When a form is saved in a file, the thereof data are arranged in the following manner:

First record the number of the elements in the form;

The type of the element;

Its coordinates in the form;

Height and width;

ID of the element;

Name, if it is changed; if not - the default name of each item;

The data is written on one line and separated with ";". If no data there is left over space and put a sign ";". The file can be opened with a text editor (e.g. NodePad ++). In the file the tools of the same type are recorded one after the other. The sequence of the recording elements in the file is as follows:

Labels;

Buttons;

TextFields;

Radio-Buttons groups;

Check-box fields.

CONCLUSION

It was realized is a graphic editor for creating a custom window-interface. With his help can be described dialogs, menus, custom screens, frames and more. The described structures are stored in an external file, where they can be refunded or transferred for further processing.

This subsystem is the first step in a module for generation of user interfaces in Java.

ACKNOWLEDGEMENTS

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REFERENCES

- [1] Mueller J.P., VBA for Dummies, Wiley Publishing, Hoboken, NJ, 2003.
- [2] Великов В. Генерация на програми за създаване и обслужване на бази от данни по задание на ограничен естествен език. В: Научни трудове на РУ & СУ, т. 51, серия 6.1 - Математика, информатика и физика, Русе, РУ & СУ, 2012, стр. 103 - 107, ISSN 1311-3321.
- [3] М. Мински, Фреймы для представления знания. "Энергия", Москва, 1979. <http://www.litmir.net/br/?b=134682>, <http://www.raai.org/library/library.shtml?extbooks> 2014 г.
- [4] М. Теодосиева, В. Рашкова, Проектиране на диалогови прозорци с VBA. Ръководство, Издателство Примакс- Русе, 2011, ISBN 978-954-8675-18-5.
- [5] П. Христова, Д. Атанасова, Web-базиран курс по Човеко-машинен интерфейс, Русенски университет, 2014, http://e-learning.uni-ruse.bg/indexc.php?open_item=905090909070913190900440.
- [6] Сигалов, П.: Инструментални Среда за Програмиране. Въведение в Java, Русе, 2005. ISBN 954-712-310-6.
- [7] Oracle® / Sun Java™ Technologies webpage – <http://java.sun.com/>.
- [8] Sun, Oracle The Java Tutorials => <http://download.oracle.com/javase/tutorial/>.

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ПОДСИСТЕМА ЗА СЪЗДАВАНЕ НА ГРАФИЧЕН ПОТРЕБИТЕЛСКИ ИНТЕРФЕЙС

Валентин Великов, Мария Петрова

Русенски университет „Ангел Кънчев“

Резюме: Статията представя система за създаване на потребителски графичен интерфейс – диалогови прозорци, потребителски екрани, менюта и др. Представени са архитектурата и изискванията към продукта, обектите за описание на графичните примитиви, йерархията на класовете и връзките между тях, съхраняването и възстановяването на създадените елементи.

Ключови думи: информатика, графичен потребителски интерфейс, диалогови прозорци.

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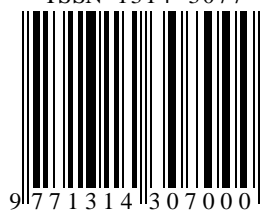
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