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C++ PROGRAMMING
FROM BASICS

Textbook

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Textbook is aimed for students and all computer-mindeds who would like to be familiarize to C++ programming. Course basics from zero as well as applied console and windows solutions are presented and discussed for educational purposes.

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About textbook

Computer programming is one of the exciting work and leisure time activities, carried out by many enthusiasts. This is a hobby, formed from the school time, for many programmers. With the development of computers and operating systems, many programmers are familiarized with the several generations of computer hardware and software as well as variety of programming techniques.

A question about the choice of programming languages belongs to the field of "topic" questions in the teaching processes. In order to manage a programming language, it is necessary to learn the language syntax and expressions, to develop the ability to think algorithmically and to use the modern programming paradigms.

We have gained a lot of teaching experience in programming over the last decade at universities and colleges. We have become real enthusiasts in C++ programming. Even though like any programmers, we have an experience from the past to program using *Fortran* and *Pascal*, but we appreciate that *C++* as the best due to user-friendly expressions. Market analysis and choice of developers indicate that nowadays the most popular languages are languages created in C style only.

We have decided to write the textbook which could be useful for students as well as for computer-minded audience who would like to be familiarized with C++ programming. This textbook contains five chapters: the first - *Preface and history* (written by AG and SI), the second - *C++ basics* and the fifth - *Graphical programming using wxWidgets* (both written by SI), the third - *Algorithms* and the fourth - *Graphical programming using windows.h* (both written by AG).

The first chapter - *Preface and history* is devoted to describe the behaviour of programming language, main programming paradigms, family of C programming language and programming environment used for samples in this textbook.

The second chapter - *C++ basics* contains a C++ language tutorial. The main concepts and control structures of C++ programming language are presented here.

The third chapter - *Algorithms* is devoted to describe the practical tasks how to use 1D, 2D, 3D, etc, dynamic arrays, how to implement it into the matrix manipulation. Several popular sorting algorithms are presented and discussed. The three types of containers from STL are presented in typical situations. Finally, several simplified applied algorithms (prime numbers, random numbers, Vernam encryption) are presented for analysing purposes.

The fourth chapter - *Graphical programming using windows.h* is devoted to observe the properties of *Windows* graphics. The creation of windows, organization of menu bar and drawing of graphical primitives - such algorithms are presented in order to estimate *Windows* graphics possibilities, when any IDE platform is necessary.

The fifth chapter - *Graphical programming using wxWidgets* observes the possibilities of using *wxWidgets* to create a graphical programs. *wxWidgets* projects are presented and the

most common controls have been reviewed.

For advanced readers, an additional literature is recommended. First of all, textbooks for beginners written by famous programmers Liberty [24], [25], Lippman [26], [21], [27], Prata [36], Schildt [40], [42], [43], could be very useful in order to recognize the language syntax and to form good programming style. Secondly, improving of own programming code through algorithm optimization is always acceptable due to protection of computer resources. Several publication of Meyers [30], [31], Eckel [12], [4] Deitel [10], Qualline [37] are significant for programmers who would like to understand the best world programming tendencies. And finally, several publications could be recommended as specialized textbooks for applied scientific programming - written by Cheng [7], Bertly [6], Bulka [28], for solving of debugging problems - written by Pappas [8].

To make this textbook easy to read, we have used several fonts for different text types.

WinMain()	programming code in typewriter style
<i>Matrices</i>	term first time, in italic style
<i>LINUX</i>	proper name, in italic style

All algorithms and portions of source code, presented here, are tested by authors using non-commercial software *wxDev-C++ 7.4.2*. This IDE [1] can be downloaded from the internet <http://wxdsgn.sourceforge.net/>. All code presented here can be used without any restrictions anywhere "as it is". Authors assume no liability for hardware and/or software failures, and also for any financial disadvantages using presented code material.

This book was carefully produced including an additional support material containing source code. Nevertheless, editors and authors do not warrant the information contained therein to be free of errors. Readers are advised to keep in mind that all programming items may inadvertently be inaccurate. For communication to authors, you are wellcome to use the following addresses: Alytis.Gruodis@gmail.com or Ivanikovas@gmail.com.

Enjoy C++ !

Vilnius, May 1, 2012

Alytis Gruodis
Sergėjus Ivanikovas

Abbreviations

1D	one-dimensional, depending on one parameter
2D	two-dimensional, depending on two parameters
3D	tree-dimensional, depending on three parameters
ANSI	American National Standards Institute
AOP	Aspect-Oriented Programming, paradigm of programming
Big-O	Complexity notation
CLI	Common Language Infrastructure
DC	Descriptor
DEQUE	Double-Ended QUEue
FAT	File Allocation Table
FIFO	First In, First Out
GPL	General Public License
GUI	Graphical User Interface
I/O	Input and Output
IDE	Integrated Development Environment
LIFO	Last In, First Out
ND	N-dimensional, depending on N parameters
NT	New Technology (File system)
OOP	Object-Oriented Programming, paradigm of programming
OS	Operating System
RC	Resource Script
RGB	Red Green Blue, colour coding
RNG	Random Number Generator
STL	Standard Template Library

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