Java Programming with NetBeans for A-level Computer Science

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Introduction

The purpose of this book is to provide a simple introduction to Java programming with the NetBeans Integrated Development Environment. The book has been designed initially for students at Coleg Meirion-Dwyfor in North Wales who are undertaking the two year WJEC A-level course in Computer Science. The objective was to produce simple example program applications which illustrate a range of theoretical concepts, such as: abstract data structures, object oriented programming, random access and indexed sequential files, and batch processing by sequential update. In this way, it is hoped the students will gain a practical appreciation of the value of these computing techniques.

Java and NetBeans provide a very wide range of programming tools for software development. It is therefore possible to solve the same software problem in a number of different ways, and each individual programmer is likely to develop their own preferred techniques and methods of working. The solutions demonstrated in this book are not necessarily claimed to be the 'correct' or 'best' programming approaches, but have been found to work reliably and to be relatively easy to understand.

For reasons of space, comment lines have not been included in the program listings, although programming techniques are explained in the accompanying text. Students are strongly encouraged to add their own comment lines to the program listings, both as a way of checking their understanding of the program and as a way of easily identifying sections of code which can be copied into other projects as standard modules.

By working through the example programs in this book, students should gain an understanding of basic interface construction, processing and file handling operations in an object oriented Java environment, and a number of important standard algorithms included in the A-level course. Students are encouraged to develop the programs further by adding extra functionality, or to create their own similar projects which incorporate the programming techniques demonstrated here. Programming is a very practical activity, requiring extensive practice to develop a high level of skill.

Grateful thanks are due to students of Coleg Meirion-Dwyfor who have helped in the design and testing of the example programs in this book. However, the author accepts sole responsibility for any errors in the work.

Chapter outline

The initial chapters: **Using the NetBeans IDE**, **Calculations** and **Multiple windows** demonstrate the construction of graphical user interfaces from toolbox components. Conversion between string and numeric data formats is explained, and the TRY…CATCH error handling structure is introduced.

Decision making introduces flowcharts to represent conditional structures in program algorithms. Boolean variables are used in conjunction with radio button groups.

Loops and arrays demonstrates the use of FOR…TO…DO loop structures in storing and accessing data in one dimensional arrays. Methods are introduced for transferring data between arrays and the NetBeans Table component.

Drawing graphics explains techniques for producing graphics in Java at run time, including the plotting of column and line graphs from input data.

Saving data on disc examines methods for the saving, loading and updating of variable length records and fixed length records in text format.

The chapters **Sorting** and **Searching** demonstrate standard algorithms for a bubble sort, linear search and binary search of data in arrays.

Object oriented programming introduces the concept of classes and the creation of sets of objects. Properties, methods and parameters are used to store and transfer data values between objects.

Stacks and queues looks at the implementation of these two abstract data structures by means of arrays and pointers. Applications of stacks and queues in software applications are demonstrated.

The chapter **Batch processing** brings together many of the techniques developed in earlier chapters. Object oriented design is employed in an application to produce customers' electricity bills. Master and transaction files are created using fixed length records. Sorting is carried out on records, and the sequential update algorithm is introduced.

Recursion is introduced through various applications, including the Quicksort algorithm. The efficiencies of Quicksort and Bubble Sort methods are compared.

Linked lists and **Binary trees** develop software applications to demonstrate the operation of these abstract data structures. Run-time graphics are used to produce diagrammatic representations of the linked list and binary tree data.

The final chapters, ***Random Access files*** and ***Indexed Sequential* files,** demonstrate two fast methods of accessing fixed length records from disc in large data applications.