An Introduction to the C Programming Language and Software Design

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Preface

This textbook began as a set of lecture notes for a first-year undergraduate software engineering course in 2003. The course was run over a 13-week semester with two lectures a week. The intention of this text is to cover topics on the C programming language and introductory software design in sequence as a 20 lecture course, with the material in Chapters 2, 7, 8, 11, and 13 well served by two lectures apiece. Ample cross-referencing and indexing is provided to make the text a servicable reference, but more complete works are recommended. In particular, for the practicing programmer, the best available tutorial and reference is Kernighan and Ritchie [KR88] and the best in-depth reference is Harbison and Steele [HS95, HS02]. The influence of these two works on this text is readily apparent throughout.

What sets this book apart from most introductory C-programming texts is its strong emphasis on software design. Like other texts, it presents the core language syntax and semantics, but it also addresses aspects of program composition, such as function interfaces (Section 4.5), file modularity (Section 5.7), and object-modular coding style (Section 11.6). It also shows how to design for errors using `assert()` and `exit()` (Section 4.4). Chapter 6 introduces the basics of the software design process—from the requirements and specification, to top-down and bottom-up design, to writing actual code. Chapter 14 shows how to write generic software (i.e., code designed to work with a variety of different data types).

Another aspect that is not common in introductory C texts is an emphasis on bitwise operations. The course for which this textbook was originally written was prerequisite to an embedded systems course, and hence required an introduction to bitwise manipulations suitable for embedded systems programming. Chapter 12 provides a thorough discussion of bitwise programming techniques.

The full source code for all significant programs in this text can be found on the web at the address `www.acfr.usyd.edu.au/homepages/academic/tbailey/index.html`. Given the volatile nature of the web, this link may change in subsequent years. If the link is broken, please email me at `tbailey@acfr.usyd.edu.au` and I will attempt to rectify the problem.

This textbook is a work in progress and will be refined and possibly expanded in the future. No doubt there are errors and inconsistencies—both technical and grammatical—although hopefully nothing too seriously misleading. If you find a mistake or have any constructive comments please feel free to send me an email. Also, any interesting or clever code snippets that might be incorporated in future editions are most welcome.

Tim Bailey 2005.

Draft 0.6 (July 12, 2005)

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TODO:
 - complete Chapter 16
 - complete appendices
 - complete the index
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