Introduction to Programming Concepts with Case Studies in Python

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Preface

Purpose

This is a book aiming to be an introduction to Computer Science concepts as far as programming is concerned. It is designed as the textbook of a freshman level CS course and provides the fundamental concepts and abstract notions for solving computational problems. The Python language serves as a medium for illustration/demonstration.

Approach

This book introduces concepts by starting with the Q/A 'WHY?' and proceeds by the Q/A 'HOW?'. Most other books start with the Q/A 'WHAT?' which is then followed by a 'HOW?'. So, this book introduces the concepts starting from the grassroots of the 'needs'. Moreover, the answer to the question 'HOW?' is somewhat different in this book. The book gives pseudo-algorithms for the 'use' of some CS concepts (like recursion or iteration). To the best of our knowledge, there is no other book that gives a recipe, for example, for developing a recursive solution to a world problem. In other textbooks, recursion is explained by displaying several recursive solutions to well-known problems (the definition of the factorial function is the most famous one) and hoping for the student to discover the technique behind it. That is why students following such textbooks easily understand what 'recursion' is but get stunned when the time comes to construct a recursive definition on their own. This teaching technique is applied throughout the book while various CS concepts got introduced.

This book is authored in concordance with a multi-paradigm approach, which is first 'functional' followed by 'imperative' and then 'object oriented'.

The CS content of this book is not hijacked by a programming language. This is also unique to this book. All other books either do not use any PL at all or first introduce the concepts only by means of the PL they use. This entanglement causes

a poor formation of the abstract CS concept, if it does at all. This book introduces the concepts 'theoretically' and then projects it onto the Python PL. If the Python parts (which are printed on light greenish background) would be removed, the book would still be intact and comprehensible but be purely theoretical.

Audience

This book is intended for freshman students and lecturers in Computer science or engineering as a text book of an introductory course frequently named as one of:

– Introduction to Programming
– Introduction to Programming Constructs
– Introduction to Computer Science
– Introduction to Computer Engineering

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