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Book reviews

Schlieren and Shadowgraph Techniques: Visualizing Phenomena in Transparent Media
G.S. Settles (Springer-Verlag, Berlin, Germany, 2001)

The problem with most encyclopedia is that you find a little about everything, mainly nice pictures. However, each time you have a specific problem you do not find the precise quantitative information that you are looking for.

The good news about the book of Settles is, that it is a monograph. There is a lot of detailed information about the schlieren and shadowgraph methods combined with very nice pictures. In the second edition, it would be nice to have all these pictures on poster format rather than A16.

One could argue that schlieren and shadowgraph are simple, well-known, 19th century techniques. Why would they deserve a monograph in the 21st century?

Firstly, any person that tried to make the kind of schlieren quality reached by Schardin (book cover) knows that high-quality flow visualization is an art. You need a master to teach you the art.

Secondly, you will discover that recently smart people, like Weinstein, succeeded in making in-flight schlieren pictures of the flow around an aircraft and that Settles has developed a set-up to make schlieren pictures for a full-scale tractor!

In this book the master provides you with a systematic and straightforward discussion of the theory (Chapters 2 and 3), an overview of recent developments (Chapter 4) and an excellent practical guide (Chapters 7 and 8). This bulk of the book is topped of by an entertaining survey of the history (Chapter 1) and inspiring examples of applications (Chapter 9).

In comparison, Chapter 10 on quantitative evaluation is quite short. It should be extended in a second edition.

How could I summarize? I have recently borrowed the book to a friend involved in research on the Marangoni effect. He wanted to build a schlieren set-up. His reaction was: “you saved me six months of hard work!” This book should be in all fluid dynamics laboratories, but you will enjoy having your own copy. I am happy with mine.

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Computational Methods for Environmental Fluid Mechanics
O. Kolditz (Springer-Verlag, Berlin, Germany, 2002)

The present book is concerned with flows in porous media considering the aspects of heat transport, variable density, multiple phases and fractured media. Strong emphasis is given to the numerical methods and programming techniques oriented to the solution of the mentioned problems. The book consists of fifteen chapters gathered into four parts: continuum mechanics, numerical methods, software engineering and selected topics.

The first three parts have a final list of references while in the fourth part each chapter (4) has its own bibliography. Seven of the fifteen chapters present at the end a list of problems; these, however, pose additional theoretical questions or ask for proofs rather than proposing numerical applications of the explained concepts. At the end of the book an alphabetical index is provided with a list of the most important topics.

Chapter 1 opens the book with the standard fluid dynamics background up to the conservation and balance equations for mass momentum and energy. Chapter 2 gives a very short description of turbulence; this however should be regarded as an invitation to read more specialized textbooks for further details.

Chapter 3 reconsiders the conservation and balance equations for porous media, therefore separating the contributions of fluid and solid phases. Chapter 4 gives a mathematical classification of partial differential equations and comments on the physical meaning by some examples. Chapter 5 opens the second part with the basic properties of numerical methods and the description of some method classes. Chapters 6, 7 and 8, respectively, introduce finite-difference, finite-element and finite-

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