

*Sankhyā : The Indian Journal of Statistics*  
2006, Volume 68, Part 1, p 177-178  
© 2006, Indian Statistical Institute

### **S+ Functional Data Analysis User's Guide**

DOUGLAS B. CLARKSON, CHRIS FRALEY, CHARLES C. GU AND JAMES O. RAMSEY

(2005) Springer, 194 pp

Price \$49.95, ISBN 0-387-24969-9

This book is a short user's manual for functional data analysis software in S+FDA library, which is an S-Plus implementation of Ramsey and Silverman's (1997,2002) books by Insightful Corporation. This software is free, and S+FDA library can be easily downloaded from Insightful's webpage. However, statistical analysis part of S+FDA library is still on the way of development, and many data analysis options are not available at this moment. This is mentioned by the authors in various places in Chapters 6-10. Hopefully, a new version incorporating all these modules will come out soon. This book assumes substantial knowledge in S-Plus object oriented programming using Windows and basic understanding of functional data.

The book starts with a tutorial chapter on functional data, which uses some examples to show some applications of S+FDA library functions. The next four chapters present some basic tools for functional data analysis. Chapter 2 is devoted to basis functions, which deal with some popular univariate and bivariate bases. However, a little more discussion on B-spline basis and finite element basis with their functional forms would have been helpful for the reader. Chapter 3 describes functional data objects and some basic operations on them. Chapter 4 deals with linear differential operators and smoothing of functional data objects. Chapter 5 is devoted to functional registration, which is concerned with eliminating uninteresting differences in functions.

The next six chapters of this book deal with some functional data analysis methodologies. Functional linear models and functional generalized linear models are described in Chapter 6 and 7, respectively. Classification problems are also addressed in Chapter 7. However, without substantial prior knowledge on finite element basis, the reader may find it difficult to follow the materials in page 119. Chapter 8 and 9 deal with functional principle component analysis and functional canonical correlation analysis, respectively. Functional cluster analysis is presented in Chapter 10. The last chapter of

this book is on functional differential analysis.

Simple presentation using some suitably chosen examples is a nice feature of this book but one unfortunate aspect is the presence of many typographical errors. Some references like Kooperberg and Clarkson; Tuddenham and Snyder; Ramsey; Hindmarsh; Petzoid are cited in the text but they are surprisingly missing from the reference list in page 187. Nevertheless, the S-Plus codes and illustrations given in this book will be helpful for the reader to learn how to use S+FDA library for carrying out functional data analysis on their own data set.

### References

- RAMSEY, J.O. and SILVERMAN, B. (1997). *Functional Data Analysis*, Springer-Verlag, New York.
- RAMSEY, J.O. and SILVERMAN, B. (2002). *Applied Functional Data Analysis*, Springer-Verlag, New York.

ANIL K. GHOSH  
CENTRE FOR MATHEMATICS AND ITS APPLICATION  
AUSTRALIAN NATIONAL UNIVERSITY, CANBERRA  
ACT 0200, AUSTRALIA  
E-mail: anilkghosh@rediffmail.com