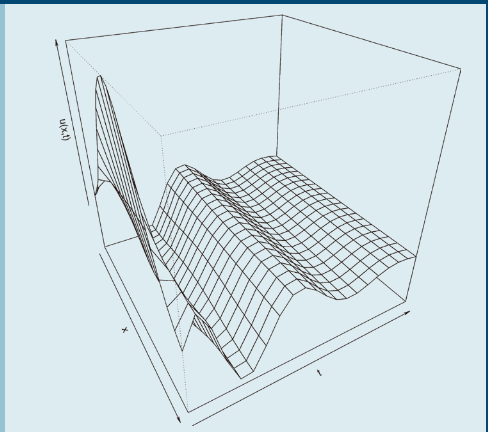

Time Delay ODE/PDE Models

Applications in Biomedical Science and Engineering

The intent of this book is to present a methodology for the formulation and computer implementation of mathematical models based on time delay ordinary differential equations (DODEs) and partial differential equations (DPDEs) in biomedical science and engineering (BMSE). The book applies DODE/DPDE models to biological/physiological systems through a series of examples. The first chapter has four example DODE applications that illustrate various properties of delayed systems. This discussion is then extended in the second chapter to an introductory DPDE model with the model solution presented as spatiotemporal numerical and 2D and 3D graphical (plotted) output. Subsequent chapters pertain to a series of DPDE BMSE applications. The author facilitates the use of the models with reasonable time and effort on modest computers. The book is intended for medical researchers, medical clinicians, biophysicists, biochemists, biomedical engineers, chemical engineers, applied mathematicians and applied numerical analysts. The book could also be used at the graduate level for courses in computer-based numerical analysis of delay differential equations. R routines are included throughout the text, and readers can access the R compiler (system) from the Internet to execute the downloaded R routines.

- Introduces time delay ordinary and partial differential equations (DODE/DPDEs) and their numerical computer-based integration (solution)
- Illustrates the computer implementation of DODE/DPDE models with coding (programming) in R, a quality, open-source scientific programming system readily available from the internet
- Applies DODE/DPDE models to biological/physiological systems through a series of examples
- Provides the R routines for all of the illustrative applications through a download link
- Facilitates the use of the models with reasonable time and effort on modest computers

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Schiesser

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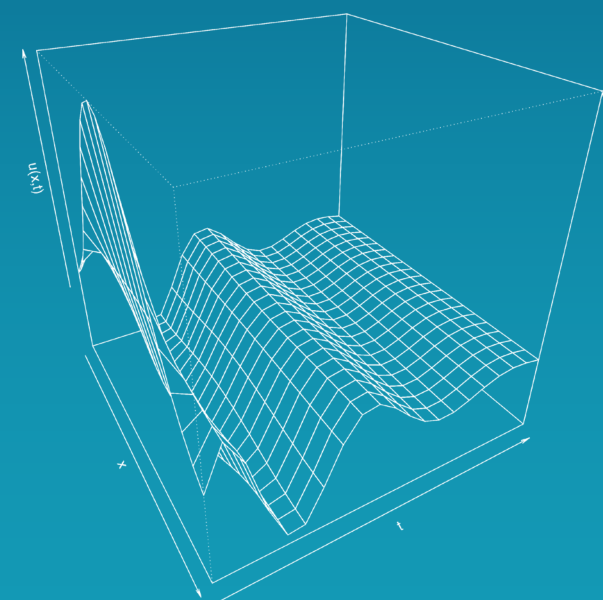
W. E. Schiesser

$$\frac{\partial u(x,t)}{\partial t} = d\frac{\partial^2 u(x,t)}{\partial x^2} - au(x,t-1) - bu(x,t)$$

$$\frac{\partial u(x=x_l,t)}{\partial x} = \frac{\partial u(x=x_u,t)}{\partial x} = 0$$

$$u(x,t=0) = u_0(x)$$



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