DOWNLOAD PDF DYNAMICS, THE GEOMETRY OF BEHAVIOR

Chapter 1 : Complexity Explorer

Abraham's Geometry of Behavior series was originally planned to be a five volume set explicitly designed to cover DST VISUALLY, with as little symbolic math as possible, to give students a real intuitive feel for the geometry and inner meaning of saddle points, attractors and repellors, characteristic exponents, chaos, oscillation and much more.

Show Context Citation Context In practice, the systems of differential equations that describe these interactions are often unsolvable. The accounts of cognition that arise from Dynamical System Theor Transport in two-dimensional maps by V. Anal , " The mechanism for the transport is associated with the dynamics of homoclinic an In this case the formulae imply, for example, that the evolution of only two lobes determines the mass transport from the upper to the lower half plane of the fluid flow. As opposed to previous studies this formulation takes into account the effect of re-entrainment of the lobes, i. The formulation is developed for both area-preserving and non-area-preserving two-dimensional diffeomorphisms and does not require the map to be near-integrable. The techniques involved in applying this formulation are discussed including the possible use of the generating function for computing the distributions of the Iobes in phase space, as well as the use of Poincar6 maps, which enable one to study the transport in continuous time systems using the above formalism. In particular, we demonstrate how the right choice of the Poincar6 section can reduce the labor of transport rate calculations. Shaw , " Knowledge acquisition research supports the generation of knowledge-based systems through the development of principles, techniques, methodologies and tools. What differentiates knowledgebased system development from conventional system development is the emphasis on in-depth understanding and forma What differentiates knowledgebased system development from conventional system development is the emphasis on in-depth understanding and formalization of the relations between the conceptual structures underlying expert performance and the computational structures capable of emulating that performance. Personal construct psychology is a theory of individual and group psychological and social processes that has been used extensively in knowledge acquisition research to model the cognitive processes of human experts. The psychology takes a constructivist position appropriate to the modeling of human knowledge processes but develops this through the characterization of human conceptual structures in axiomatic terms that translate directly to computational form. In particular, there is a close correspondence between the intensional lo Dynamical Modules by Hillel J. Can one develop an abstract description of the dynamics of pattern generators that provides quantitative insight into their operation? We explored this question by examining the dynamics of a model central pattern generator that was created using an evolutionary algorithm. We propose an abstract des We propose an abstract description based on the concept of a dynamical module, a set of neurons that simultaneously make their transitions from one quasistable state to another while the synaptic inputs that they receive remain essentially constant, thus temporarily reducing the dimensionality of the circuit dynamics. Using the mathematical tools of dynamical systems theory, we describe a method for identifying dynamical modules, and demonstrate that this concept can be used to quantitatively characterize constraints on neural architecture, account for phase durations, and predict the effects of parameter changes. Moreover, this abstract description reveals coordinated parameter changes that leave the overall circuit

Chapter 2 : CiteSeerX â€” Citation Query Dynamics: The Geometry of Behavior, parts

Dynamics, the Geometry of Behavior by Ralph H. Abraham and Christopher D. Shaw Authors Ralph Abraham is Professor of Mathematics at the University of California at Santa Cruz, director of the Visual Math Institute, and author or coauthor of many books and articles on chaos theory, dynamics, mechanics, and the history of mathematics.

Friday, December 14, Dynamics: The Geometry of Behavior When I was working at the National Institutes of Health in the s, I ran across a wonderful series of books from the Visual Mathematics Library that had a big impact on the way I thought about math. The fascinating feature of these books was that they contained almost no equations; everything was explained in pictures. At first glance, they look like comic books, but on closer inspection you realize that the math is presented in a very accurate and rigorous way. There are lots of plots of phase planes , and drawings of experimental apparatus that are being modeled by the math. I highly recommend these books for anyone interested in developing an intuitive feeling for nonlinear dynamics which should be everyone. Scholars of the time became familiar with classical mathematics. When calculus was born in , the new ideas spread quickly through the intellectual circles of Europe. Our history shows the importance of the diffusion of these mathematical ideas, and their effects upon the subsequent development of the sciences and technology. Today, there is a cultural resistance to mathematical ideas. Due to the widespread impression that mathematics is difficult to understand, or to a structural flaw in our educational system, or perhaps to other mechanisms, mathematics has become an esoteric subject. Intellectuals of all sorts now carry on their discourse in nearly total ignorance of mathematical ideas. We cannot help thinking that this is a critical situation, as we hold the view that mathematical ideas are essential for the future evolution of our society. The absence of visual representations in the curriculum may be part of the problem, contributing to mathematical illiteracy, and to the math-avoidance reflex. This series is based on the idea that mathematical concepts may be communicated easily in a format which combines visual, verbal, and symbolic representations in tight coordination. It aims to attack math ignorance with an abundance of visual representations. In sum, the purpose of this series is to encourage the diffusion of mathematical ideas, by presenting them visually. In fact, I suspect many of our readers would claim we have too many, rather than too few, equations. Nevertheless, we try to convey our subject in figures as well as math, visually as well as symbolically. We discuss nonlinear dynamics in Chapter 10, and we have some state space figures that are similar to those found in Abraham and Shaw although they use 4-color figuresâ€”green, red, blue, and blackâ€”while we use the less attractive black and white. I believe all the illustrations in Abraham and Shaw are hand-drawn, giving them a charm that often is lacking in this age of computer-generated drawings. Unfortunately, Russ and I never cited Abraham and Shaw. The Geometry of Behavior is one of those rare gems that you should become familiar with, both for what it can teach and also for its beauty.

Chapter 3 : CiteSeerX â€" Citation Query Dynamics: the Geometry of Behavior

Dynamics: The Geometry of Behavior is a profusely illustrated, inventive book designed for anyone who wants to learn more about dynamical system theory. This is the.

An algorithm for identifying the center of swirling flow in 3-D discretized vector fields has been developed. The algorithm is based on critical point theory and has been implemented as a visualization tool within pV3, a package for visualizing 3-D transient data. The scheme works with gridding supp The scheme works with gridding supported by pV3: The results have been validated using artificially-generated vector fields and 3-D CFD data. Introduction This work is motivated by the need to easily locate vortices in large 3-D transient problems. A tool that will automatically identify such structures is definitely needed to avoid the time-consuming and tedious task of manually examining the data. However, the question of what defines a vortex raises considerable confusion. As a result, various definitions have been proposed by investigators, including, among others, Moin and Kim [1] [2] As part of an effort to define a unified formal semantics for beliefs, desires and action, this paper sketches a model theory for the axiological aspects of agent theory: Particular attention is paid to modelling the intensity of likes. The main intuition und The main intuition underlying the model theory is that the axiological aspects of agent theory can be modelled through computational generalisations of physical dynamics. Computational analogues of force, mass and potential are offered. Introduction An important part of agent theory appears to be the notion of desires. Several formulations of agent theory have adopted beliefs, desires and intentions as a set of basic notions the so-called BDI models. However, to our knowledge, so far relatively little has been said explicitly in the AI literature about a theory of desires Cohen and Levesque, and in press, Moore, a; Kiss, , Shoham, This paper takes some initial steps towards the explicit f An important issue in scientific visualization systems is the management of data sets. Most data sets in scientific visualization, whether created by measurement or simulation, are usually voluminous. The goal of data management is to reduce the storage space and the access time of these data sets t The goal of data management is to reduce the storage space and the access time of these data sets to speed up the visualization process. A new progressive transmission scheme using spline biorthogonal wavelet bases is proposed in this paper. By exploiting the properties of this set of wavelet bases, a fast algorithm involving only additions and subtractions is developed. Due to the multiresolutional nature of the wavelet transform, this scheme is compatible with hierarchical--structured rendering algorithms. The formula for reconstructing the functional values in a continuous volume space is given in a simple polynomial form. Lossless compression is possible, even when using floating--point numbers. This algorithm has been applied to data from a global ocean model. How does environmental structure influence the dynamics of adaptive behavior and its underlying mechanisms? Evolutionary algorithms were used to generate neural network controllers able to support target fixation in environmental and phenotypic conditions of qualitatively different complexity. Networks that evolved in rich conditions showed higher behavioral flexibility and robustness, and higher neural complexity, than networks that evolved in simple conditions. These results show that neurally complex dynamics can accompany adaptive behavior in rich environmental and pheno-typic conditions; they are consistent with the proposal that neural complexity may represent a com-mon property of the functional organization of adaptive neural systems. Dynamical systems analysis typically uses differential or difference equations to describe the evolution of a system in terms of trajectories in a phase s Many of the interesting features of v are associated with its critical points. The field in the neighborhood of each critical point is approximated by the Taylor expansion. Curves integrated from initial points on the eigenvectors a small distance from a critical point connect with other critical points or the boundary to complete the topology. In addition, one class of critical surfaces important in computational fluid dynamics is analyzed. FAST is general purpose visualization software with modules for isosurface generation, particle tracing, etc. TOPO operates on curvilinear, structured grids, including large multi-zone grids. The results agree well with other topology software and hand generated topologies. TOPO has proved useful in finding surface topology, flow attachment and separation points, vortex cores, scalar field local extrema, and generally interesting regions of v. We

believe there may be other interesting applications yet to be discovered. This paper, along with the references, contains most of the information needed for a scientific programmer to code a topology module in another environment. Show Context Citation Context Many of them were, however, known to Poincare. One of the first applications of the qualitative theory of differential equations to three dimensional fluid flows was by Lighthill [12]. Perry and Fairlie [13] extended the approach to a more gener

Chapter 4 : Dynamics--the geometry of behavior (edition) | Open Library

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It is shown that animation can be very useful to further improve the visualization. During the paper we present a set of examples which demonstrate the usefulness of our techniques. Show Context Citation Context We present a thread of streamlets as a new technique to visualize dynamical systems in three-space. A trade-off is made between solely visualizing a mathematical abstraction through lower-dimensional manifolds, i. Bundlers of streamlets are selectively placed near characteristic trajectories. An over-population of phase space with occlusion problems as a consequence is omitted. On the other hand, information loss is minimized since characteristic structures of the flow are still illustrated in the visualization. Dynamical systems provide a mathematical framework to deal with the dynamics of a set of v For example, a separatrix is visualized to indicate two subsets of phase space with qualitatively different dynamics. A brief overview on the relation between local linearization and characteristic Journal of Neuroscience Methods 62 2 l A phase plane representation of rat exploratory behavior by Ofer Tchemichovski, Ilan Golani , " Rat spontaneous spatial behavior is considered to he stochastic and is therefore commonly analyzed in terms of cumulative measures. Here, we suggest a method which generates a moment-to-moment representation of this behavior. It has heen proposed earlier that rat spatial behavior can be partitioned The results reveal a geometrical pattern, typical of young age and early exposure. The presentedynamics could provide a framework for the interpretation of concurrent neural events associated with navigation and spatial memory. Go with the flow Dynamical systems theory includes an extensive body of knowledge about qualitative properties of generic smooth families of vector fields and discrete maps. The theory characterizes structurally stable invariant sets [The theory abandons the goal of describing the qualitative dynamics of all systems as hopeless and instead restricts its attention to phenomena that are found in selected systems. The subtlety comes in specifying the systems of interest and which dynamical phenomena are to be analyzed.

Chapter 5 : Dynamics, the Geometry of Behavior

A visual introduction to the concepts of dynamical systems theory, a branch of Mathematics commonly referred to as chaos theory. Volume 2 (Chaotic Behavior) is devoted to recent developments, to the present, on the chaotic behavior observed in experiments. The book assumes nothing in the way of.

Chapter 6 : Intermediate Physics for Medicine and Biology: Dynamics: The Geometry of Behavior

Dynamics: The Geometry of Behavior is a profusely illustrated, inventive book designed for anyone who wants to learn more about dynamical system theory. This is the first part of a four part series, which is also published as a single volume.

Chapter 7 : Dynamics, the Geometry of Behavior, Part 2: Chaotic Behavior by Ralph H. Abraham

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Chapter 8 : Aerial Press Catalog

Dynamics: The Geometry of Behavior, by Ralph Abraham and Christopher Shaw, was published in four volumes: 1 Periodic Behavior, 2 Chaotic Behavior, 3 Global Behavior, and 4 Bifurcation Behavior. The fascinating feature of these books was that they contained almost no equations; everything was explained in pictures.