Resource Summary Report

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XPP-Aut: X-Windows Phase Plane plus Auto

RRID:SCR_001996
Type: Tool

Proper Citation

XPP-Aut: X-Windows Phase Plane plus Auto (RRID:SCR_001996)

Resource Information

URL: http://www.math.pitt.edu/~bard/xpp/xpp.html

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Description: XPPAUT is a tool for solving differential equations, difference equations, delay equations, functional equations, boundary value problems, and stochastic equations. It evolved from a chapter written by John Rinzel and me on the qualitative theory of nerve membranes and eventually became a commercial product for MSDOS computers called PHASEPLANE. It is now available as a program running under X11 and Windows. The code brings together a number of useful algorithms and is extremely portable. All the graphics and interface are written completely in Xlib which explains the somewhat idiosyncratic and primitive widgets interface. XPP contains the code for the popular bifurcation program, AUTO . Thus, you can switch back and forth between XPP and AUTO, using the values of one program in the other and vice-versa. I have put a ``friendly'' face on AUTO as well. You do not need to know much about it to play around with it. XPP has the capabilities for handling up to 590 differential equations. There are over a dozen solvers including several for stiff systems, a solver for integral equations and a symplectic solver. Up to 10 graphics windows can be visible at once and a variety of color combinations is supported. PostScript output is supported as well as GIF and animator GIF movies Post processing is easy and includes the ability to make histograms, FFTs and applying functions to columns of your data. Equilibria and linear stability as well as one-dimensional invariant sets can be computed. Nullclines and flow fields aid in the qualitative understanding of two-dimensional models. Poincare maps and equations on cylinders and tori are also supported. Some useful averaging theory tricks and various methods for dealing with coupled oscillators are included primarily because that is what I do for a living. Equations with Dirac delta functions are allowable. I have added an animation package that allows you to create animated versions of your simulations, such as a little pendulum moving back and forth or lamprey swimming. See toys! for examples. There is a curve-fitter based on the Marquardt-Levenberg algorithm which lets you fit data points to the solutions to dynamical systems. It is possible to automatically generate "movies" of three-dimensional views of attractors or parametric changes in the attractor as some parameters vary. Dynamically link to external subroutines XPP has been successfully compiled on a SPARC II under OpenLook, a SPARC 1.5 running generic X, a NeXT running X11R4, a DEC 5000, a PC using Linux or Windows, and SGI and an HP 730. It also runs under Win95/NT/98 if you have an X-Server. I cannot vouch for other platforms but it has been compiled on the IBM RS6000. Building XPP requires only the standard C compiler, and Xlib. Look at the any README files that come with the distribution for solutions to common compilation problems.

Synonyms: XPP as well as XPPAUT

Resource Type: software resource

Keywords: functional equations, boundary value problems, delay equations, difference equations, differential equations, membranes, nerve, stochastic equations

Availability: THIS RESOURCE IS NO LONGER IN SERVICE

Resource Name: XPP-Aut: X-Windows Phase Plane plus Auto

Resource ID: SCR_001996

Alternate IDs: nif-0000-10767

Record Creation Time: 20220129T080210+0000

Record Last Update: 20260725T190514+0000

Ratings and Alerts

No rating or validation information has been found for XPP-Aut: X-Windows Phase Plane plus Auto.

No alerts have been found for XPP-Aut: X-Windows Phase Plane plus Auto.

Data and Source Information

Source: SciCrunch Registry

Usage and Citation Metrics

We found 193 mentions in open access literature.

Listed below are recent publications. The full list is available at kravitz2 .

Kraikivski P, et al. (2024) A Mechanistic Model of Perceptual Binding Predicts That Binding Mechanism Is Robust against Noise. Entropy (Basel, Switzerland), 26(2).

Novák B, et al. (2024) The bistable mitotic switch in fission yeast. Molecular biology of the cell, 35(6), ar77.

Yin F, et al. (2023) Hsp70-Bim incoherent feedforward loop contributes to cell-fate heterogeneity and fractional killing. British journal of pharmacology.

Eriksson O, et al. (2022) Combining hypothesis- and data-driven neuroscience modeling in FAIR workflows. eLife, 11.

Zhang Y, et al. (2022) Computational analysis of memory consolidation following inhibitory avoidance (IA) training in adult and infant rats: Critical roles of CaMKII? and MeCP2. PLoS computational biology, 18(6), e1010239.

Zhang T, et al. (2022) Understanding virtual patients efficiently and rigorously by combining machine learning with dynamical modelling. Journal of pharmacokinetics and pharmacodynamics, 49(1), 117.

Nandan A, et al. (2022) Cells use molecular working memory to navigate in changing chemoattractant fields. eLife, 11.

Yao X, et al. (2022) Mathematical analysis of robustness of oscillations in models of the mammalian circadian clock. PLoS computational biology, 18(3), e1008340.

Márton M, et al. (2022) A systems biological analysis of the ATF4-GADD34-CHOP regulatory triangle upon endoplasmic reticulum stress. FEBS open bio, 12(11), 2065.

Verma A, et al. (2021) A Spatial Model of Hepatic Calcium Signaling and Glucose Metabolism Under Autonomic Control Reveals Functional Consequences of Varying Liver Innervation Patterns Across Species. Frontiers in physiology, 12, 748962.

Chever O, et al. (2021) Initiation of migraine-related cortical spreading depolarization by hyperactivity of GABAergic neurons and NaV1.1 channels. The Journal of clinical investigation, 131(21).

Raina D, et al. (2021) Cell-cell communication through FGF4 generates and maintains robust proportions of differentiated cell types in embryonic stem cells. Development (Cambridge, England), 148(21).

Novák B, et al. (2021) Computational modeling of chromosome re-replication in mutant strains of fission yeast. Molecular biology of the cell, 32(9), 830.

Laomettachit T, et al. (2021) A model of infection in honeybee colonies with social immunity. PloS one, 16(2), e0247294.

Miyamae T, et al. (2021) Kcns3 deficiency disrupts Parvalbumin neuron physiology in mouse prefrontal cortex: Implications for the pathophysiology of schizophrenia. Neurobiology of disease, 155, 105382.

Boeri J, et al. (2021) Two opposite voltage-dependent currents control the unusual early development pattern of embryonic Renshaw cell electrical activity. eLife, 10.

Zhang T, et al. (2021) A Modeling and Machine Learning Pipeline to Rationally Design Treatments to Restore Neuroendocrine Disorders in Heterogeneous Individuals. Frontiers in genetics, 12, 656508.

Zhang Y, et al. (2021) Quantitative description of the interactions among kinase cascades underlying long-term plasticity of Aplysia sensory neurons. Scientific reports, 11(1), 14931.

Gérard C, et al. (2021) Temporal dynamics of a CSF1R signaling gene regulatory network involved in epilepsy. PLoS computational biology, 17(4), e1008854.

Mosig RA, et al. (2021) Natural antisense transcript of Period2, Per2AS, regulates the amplitude of the mouse circadian clock. Genes & development, 35(11-12), 899.