Some interesting pursuit curves can be obtained if the quarry moves along other curves, such as $(a\cos(t)+b\cos(ct), a\sin(t)-b\sin(ct))$ for different choices of the parameters a, b, c. ❑

Sources:

[1] Davis, Harold T.: Introduction to Nonlinear Differential and Integral Equations, Dover, 1962

[2] American Mathematical Monthly, Vol. 28, 1921, pp. 91-93

[3] Dunbar, Steven: Differential Equations, Football, and Chase Problems, CODEE, Summer-Fall '93 pp. 11-14

ODE ARCHITECT: INTERACTIVE MULTIMEDIA MODELING, DIFFERENTIAL EQUATION SOLVING.

Courtney Coleman

The CODEE group has nearly completed its latest project for the design and production of ODE ARCHITECT, a multimedia tool for modeling and differential equations. Some of the features are described in the bit of puffery I wrote on page 2; here is more:

ODE ARCHITECT has several aims. One is to show how students can have a hands-on experience with an ODE solver in an interactive multimedia environment. This heightens their understanding of the behavior and the geometry of the solutions of ODEs and other dynamical systems. Another aim is to show how to model physical phenomena with ODEs or discrete systems. A third aim is to show how to introduce systems of ODEs naturally and early in an introductory course. As can be seen from their titles, the modules cover many of the traditional (linear and nonlinear) topics in the ODE course. But the delivery mechanism and the emphasis on using solvers to deepen understanding is strictly contemporary.

The 50 submodules and the O.D.E.'s in the library range from the straightforward to the advanced. For example, the second module presents a juggler tossing a ball from hand-to-hand and helps the user build the model O.D.E.'s and then see what happens as the launch angle and speed are changed. The animations are funny, the voice-overs and text are informal, but the modeling and the math

ODE ARCHITECT

List of modules and appendices

MODELING WITH THE ARCHITECT
Douglas Campbell, Wade Ellis
(West Valley Community College)

INTRODUCTION TO O.D.E.'S
Margie Hale, Michael Branton
(Stetson University)

COOL FIRST ORDER O.D.E.'S
Margie Hale
(Stetson University)

SECOND ORDER O.D.E.'S
William Boyce, William Siegmann
(Rensselaer Polytechnic Institute)

MODELS OF MOTION
Robert Borrelli, Courtney Coleman
(Harvey Mudd College)

LINEAR SYSTEMS
William Boyce, William Siegmann
(Rensselaer Polytechnic Institute)

NONLINEAR SYSTEMS
Michael Branton
(Stetson University)

COMPARTMENT MODELS
Courtney Coleman, Michael Moody
(Harvey Mudd College)

POPULATION MODELS
Michael Moody
(Harvey Mudd College)

THE PENDULUM AND ITS FRIENDS
John Hubbard, Beverly West
(Cornell University)

APPLICATIONS OF SERIES SOLUTIONS
Anne Noonburg, Ben Pollina
(University of Hartford)

CHAOS AND CONTROL
John Hubbard, Beverly West
(Cornell University)

DISCRETE DYNAMICAL SYSTEMS
Thomas LoFaro
(Washington State University)

* *

FUNDAMENTALS OF NUMERICAL METHODS
Lawrence Shampine
(Southern Methodist University)

LIBRARY
Michael Moody
(Harvey Mudd College)

are the real thing. Each submodule leads the user through a model building process and several exploration screens, then ends with questions. These questions take the user to the solver tool and to the accompanying workbook, where the user is asked to carry out experiments, use the solver to produce solution curves and orbits, write a report that includes these pictures, and explain what is going on.

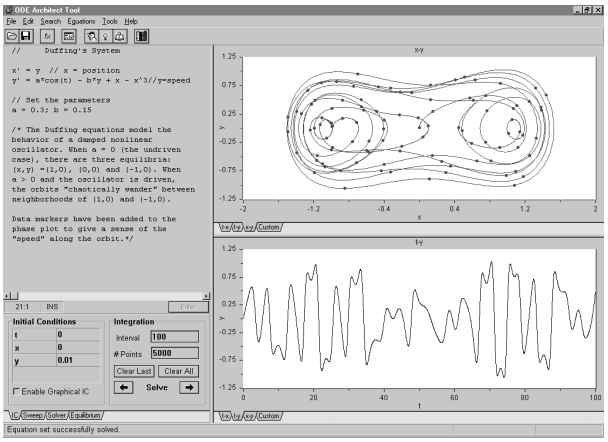

Figure 1 A screen dump from the ODE ARCHITECT solver tool

The state-of-the-art solver was written by Lawrence Shampine and is extremely robust - it's a real challenge to get it to crash! Users can experiment with their own ODEs, Duffing oscillators and chaotic wandering, a virtually unlimited number of single and coupled linear and nonlinear ODE's, 1st and 2nd order ODE's of the traditional syllabus, plus all sorts of dynamics in 3-D. Users can do parameter and initial value sweeps to see the effects of data changes on orbits and solution curves. Graphs are editable, and you can scale and label axes, mark equidistant-in-time orbital points, color the graphs, change line styles, overlay graphs of functions and solution curves for different ODE's - everything you would expect a good graphics/solver package to do today - and all with no programming or special commands to remember.

Do you want to be a beta-tester for this package? Write to Barbara Holland at John Wiley & Sons, 605 Third Ave., New York, NY 10158-0012. ❑

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The sponsors of the ODE Consortium and the institutional representatives are:

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