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A spreadsheet solution of a system of ordinary differential equations using the fourth-order Runge-Kutta method.

Spreadsheets Educ. 5, No. 2, 10 p., electronic only (2012).

Summary: Solving systems of ordinary differential equations (ODEs) by using the fourth-order Runge-Kutta (RK4) method in classroom or in examinations is quite tedious, tiring and boring since it involves many iterative calculations. Hence, there is a need to design a suitable tool in teaching and learning the numerical methods involved, especially those for solving systems of ODEs. Here, we present a new approach to solving systems of ODEs by the RK4 method through the use of an Excel spreadsheet to tackle these drawbacks. In doing so, we employ the concept of relative row, relative column and fixed column in the spreadsheet to obtain the solution of systems of ODEs by the RK4 method. With the appropriate differential function given by the user, it is found that the way suggested here is faster than applying a scientific calculator and the solution obtained is significantly more accurate. Besides, the concept presented here can be extended to solve systems of ODEs up to n equations using the spreadsheet. In addition to this, the students can gain a deep understanding of the iterative procedure involved in solving the systems of ODEs. Although the spreadsheet approach is not as good as other mathematical software, it does provide a step-by-step environment for teaching and learning the numerical methods. We conclude that the spreadsheet approach increases the interest of students in learning the RK4 method.

Classification: N45 I75 M55 U75
Keywords: systems of ordinary differential equations; spreadsheets; fourth-order Runge-Kutta methods; numerical examples; electrodynamics; teaching; computer as educational medium; calculators
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