

Student Project on Using a Spreadsheet for Solving Differential Equations by Euler's Method

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Abstract : Engineering students often have certain difficulties in mastering major theoretical concepts in mathematical courses such as differential equations. Student projects were proposed to motivate students' learning and can be used as a tool to promote students' interest in the material. Authors propose a student project that includes the use of Microsoft Excel. This instructional tool is often overlooked by both educators and students. An integral component of the experimental part of such a project is the exploration of an interactive spreadsheet. The aim is to assist engineering students in better understanding of Euler's method. This method is employed to numerically solve first order differential equations. At first, students are invited to select classic equations from a list presented in a form of a drop-down menu. For each of these equations, students can select and modify certain key parameters and observe the influence of initial condition on the solution. This will give students an insight into the behavior of the method in different configurations as solutions to equations are given in numerical and graphical forms. Further, students could also create their own equations by providing functions of their own choice and a variety of initial conditions. Moreover, they can visualize and explore the impact of the length of the time step on the convergence of a sequence of numerical solutions to the exact solution of the equation. As a final stage of the project, students are encouraged to develop their own spreadsheets for other numerical methods and other types of equations. Such projects promote students' interest in mathematical applications and further improve their mathematical and programming skills.

Keywords : student project, Euler's method, spreadsheet, engineering education

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