Developing a Self-Paced Online Numerical Methods Course

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Abstract

NCLab (Network Computing Laboratory) is an open public cloud computing platform that provides free web-browser access to quality open source software. This includes programming languages such as Python, Javascript and R, computing tools such as GNU Octave, Scipy and Scilab, 3D modeling software such as PLaSM and OpenSCAD, finite element software such as Hermes and FEniCS, and more. New software is added every year and NCLab also provides self-paced and self-graded gamified courses where students learn how to use the software and fully benefit from NCLab. Students learn using tutorials, examples and videos, and the server checks and grades their projects and provides instant feedback.

The purpose of these courses is not to eliminate teachers from the educational process, but on the contrary, to empower them. When the teacher does not have to explain elementary concepts, he or she has more time to coach the students and provide personalized instruction. These courses is that they are truly available to everyone - students of all ages can take them at school or at home because all necessary components are available through the web browser. In the previous years, NCLab has focused on developing computer programming and 3D modeling courses.

Recently, NCLab has started to develop a first introductory numerical methods course that provides the standard contents, but it is web-browser based and has a self-paced and self-graded format. Therefore, it can be taught at high schools where the teachers are not experts in the subject, and taken by individual users such as scientists and engineers who want to solidify the foundation of their underlying math and computing skills.

References

1. P. Solin and L. Korous and P. Kus. Hermes2D, a C++ Library for Rapid Development of Adaptive hp-FEM and hp-DG Solvers. Journal CAM (270) pages 152-165, 2014..
2. M. Braun. Electrostatics Simulations on the Cloud with NCLab. Journal CAM (270) pages188–197, 2014.
3. A. Logg and K.-A. Mardal and G. N. Wells et al.. Automated Solution of Differential Equations by the Finite Element Method. Springer, 2012.