



Chaste: An open source C++ library for computational physiology and biology

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Chaste (Cancer, Heart And Soft Tissue Environment) is an open source C++ library for the simulation of mathematical models developed for physiology and biology. Code development has been driven by two initial applications: cardiac electrophysiology and cancer development. A large number of cardiac electrophysiology studies have been enabled and performed in Chaste, including high-performance computational investigations of defibrillation on realistic human cardiac geometries. New models for the initiation and growth of tumours have also been developed in Chaste. In particular, cell-based simulations have provided novel insight into the role of stem cells in the colorectal crypt. Chaste is constantly evolving and is being applied to a far wider range of problems. The code provides modules for handling common scientific computing components, such as meshes and solvers for ordinary and partial differential equations (ODEs/PDEs). Re-use of these components avoids the need for researchers to 're-invent the wheel' with each new project, accelerating the rate of progress in new applications. Chaste is developed using industrially-derived techniques, in particular test-driven development, to order to increase code quality, re-use and reliability. The Chaste source code, both for specific releases and the development version, is available to download under an open source Berkeley Software Distribution (BSD) licence at <http://www.cs.ox.ac.uk/chaste>, together with details of a mailing list and links to documentation and tutorials. In this talk I will provide examples that illustrate the types of problems that Chaste can be used to solve, highlight some scientific studies that are using Chaste and the insights they have provided, and discuss the Chaste team's collective experience of the development of such software tools in an academic setting.