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Oxford Numerics is a focused team of experienced professionals with a wide skill set and strong academic background. We specialize in providing end-to-end solutions for complex problems: starting with mathematical models and progressing to commercial software deployed in the field. We work in a range of sectors including oilfield services, financial and property development industries.

We utilize an extensive toolkit of mathematical modelling techniques and cutting-edge programming technologies to provide fast, reliable and versatile simulators. These are integrated with an ergonomic user interface, using 2D and 3D graphics and help and training materials to deliver powerful and easy-to-use tools to our customers.

Key Areas of Expertise

Mathematical Modelling

Physics

Newtonian and non-Newtonian fluid flows, solid mechanics stress analysis, temperature simulation in solids and liquids, signal processing, sensitivity and optimisation analysis

Financial

Pricing of fixed income instruments such as swaps, bonds and FRAs, indices and derivatives including vanilla options, CDOs and CDSs

Urban Planning

3D and 2D drawing and visualization of large scale urban layout, integrated parametric modelling, liveability indicators, appraisal costs and value analysis, CAD and data format interoperability

Programming Technologies

C++ for computationally-intensive tasks

Development of highly optimised simulators and components, profiling and optimisation of existing code, translation and cleanup of legacy Fortran/C/Matlab code

C# .NET for User Interfaces

Component development, plug-in interfaces, integration with 3rd party components, graphs, custom diagrams and 2D/3D visualization, context-sensitive help, interactive tutorials

OpenCL/CUDA for GPU Compute

Massive parallelisation of existing or new mathematical models, versatile and stable framework for utilizing GPU resources for computations, application of GPU compute in field-deployed software using consumer-level or specialized hardware

DirectX and OpenGL for 2D and 3D visualization

Optimised rendering of complex geometries, visualization of computed simulation results, extensive use of latest shader-based techniques for high visual impact, robustness and low end-user system requirements

Operations

Source control system

Subversion-based source control system, remote global access via SSH, hosting on machines at our location, automated hard-copy backup, optional cloud/client-based hosting

Testing

Customer-specified or designed on per-project basis, automated unit and regression testing integrated with source control

Integration with client systems and procedures

History of successful projects developed solo or as part of client's team, remote operation with access to client systems - source control, documentation, export certification and acceptance procedures, sustaining of existing projects and direct support of customer's clients

Legal, security and access

Registered UK company with legal and accounting representation, professional indemnity insurance of £2,000,000 and product liability insurance of £1,000,000, contractor or supplier contract framework, over 10 years of trusted relationship with major multinational clients, central London office location

Services

Consultancy Services

From optimising existing models to prototyping new ideas, we offer a broad range of consultancy services. Flexible contract framework enables you to bring us in if and when needed to resolve a specific set of problems or to accelerate on-going development.

Contract Research and Development

Given an overall goal you would like to achieve, we can suggest the most effective development options and deliverables we can provide. We will use our experience of managing longer-term projects to establish milestones, time frames and associated costs for each stage of the process. We can work through the agreed plan relying on our resources, in collaboration with your development teams or a third party of your choice. Fixed term agreements with established milestones enable you to plan ahead with full confidence your requirements will be met.

Software Development

From the initial idea, we will take you through the development process: defining specifications with you, prototyping initial drafts, main development stage, software deployment and user training and support. As standard, we will offer several development options and time frames to suit your budget and deadlines. Once a development option is selected, we can offer a fixed term fixed price agreement on completion of which you will receive the finished product with full ownership of all code and IP rights.

Collaborative Projects

We are always interested in proposals for joint project development. Whether on the basis of part ownership of resulting IP, submitting a joint proposal to another organization or simply a topic of discussion – get in touch.

Projects

Over the last 10 years we have been involved in a variety of commercial projects in several fields - most notably oilfield services and urban planning and design. Our programs have been sold commercially, used as engineering tools and deployed to the production environment in the field. Some of the projects we have been involved in include:

Stress Analysis

During the construction and life of an oil well it can experience temperature and pressure changes. Some of the operations - such as steam injection - can lead to large rapid changes of casing temperature. Well pressure drops during production or increases during well stimulation lead to variations of pressure on the casing. Both of these can generate large stresses on the cement sheath, well casings and bordering formation. These can then lead to compression or tension failure in cement and in more extreme cases casing bursting or formation fracturing.

We have developed an integrated stress analysis tool to help the engineers identify the potential problems and suggest remedies or alternative job designs for resolving them. It includes such features as cement failure risk assessment, sensitivity and robustness analysis, user interface with selectable level of detail and customizable report generation. This product has been commercially deployed and is used in cementing operations throughout the world.

Non-Newtonian and Compressible Fluid Placement

We have developed a library of fluid simulators for dynamic fluid placement in the context of well cementing and stimulation jobs. At the simplest level, the user can simulate job designs starting with simple incompressible fluid assumptions with 1D piston placement, subsequently increasing the level of analysis complexity. Compressible fluids, pressure and temperature dependent fluid rheology, handling of foamed fluids, customizable arrangement of valves and well equipment can all be handled by the package. Higher-dimensional simulators in the package can examine effects of interface evolution to determine degree of fluid mixing during placement. Other simulators allow for comparison of data acquired from sensors and computed results from the original job design.

The simulators were subsequently integrated with several User Interface shells implemented by us according to customer specifications and targeted at different user types: field, engineering and research. The shells allow for import and manipulation of well, fluids and job design data, simulator control and multiple output options: from tabulated data and graphs to 3D well visualization and pre-formatted customer reports. Both the UI shells and the simulators are now deployed and used throughout the world and are subject to an ongoing development and sustaining effort both by us and our customer's teams.

Urban Planning and Design

As part of the Holistic City Ltd team, we have developed CityCAD: an innovative CAD tool for urban masterplanning and design. CityCAD allows quick sketching of urban layouts in a 3D environment and real-time analysis of its most important aspects. In addition to detailed massing and floor area information the program computes key liveability indicators, costs and values appraisal, trip generation and parking spaces balance, approximate energy and resource use and many others. Shading according to computed parameters quickly highlights of parts of the masterplan most requiring attention. Export to other CAD and data formats enables the user to work up plan further and in more detail.

CityCAD has launched in 2008 and we have been involved in sustaining and development effort since. Please visit www.holisticcity.co.uk for further information and a free trial version of the program.

People

Dr Simon Impey

MPhys (Warwick) PhD (ICL)
Senior Partner

Simon's background is in Physics, mathematical modelling and software development. He has over 10 years of experience developing numerical software in both academia and commercially for financial institutions and IT consultancies.

Following the completion of his PhD in 2004 he worked as a quantitative developer for several Tier 1 investment banks. He developed pricing software for a wide range of fixed income products, accumulating significant knowledge of modern software development practices and financial products.

From 2008 he was engaged as a Senior Consultant for the scientific and IT consultancy Detica. During this time he gained significant exposure to the full consulting product life-cycle, from requirements gathering through elaboration, development and product delivery.

Svet Pelipenko

MMath (Oxon) MSc (UBC)
Senior Partner

Svet has a background in applied mathematics, mathematical modelling and scientific programming. He has over 14 years experience of applying his knowledge to practical commercial and research projects in a diverse range of fields.

Since early 2003 he has been continuously engaged as a scientific consultant with Schlumberger - a leading multinational oilfield services firm. His models and software are now in field use throughout the world helping to simulate multiple aspects of well construction, estimating the risks and making the process safer by informing the operator of potential pitfalls.

In parallel, since 2005 he has served as the Technical Director for Holistic City Ltd in charge of developing a CAD application for conceptual urban design. Guiding this major project from conception in 2003 to commercial launch in 2008 to current on-going sustaining and expansion has provided him with a wealth of experience in project management, planning and end-user relations.

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