Objective

Objectives:
The SimBio project will produce a generic simulation environment for advanced clinical practice and health care. A key feature is the input of individual patient data to the modelling and simulation process. While future SimBio users will be able to develop application specific tools to improve practices in many areas, the project evaluation & validation will demonstrate improvements in: non-invasive diagnosis and pre-operative planning, design of prostheses and of the operative procedures for their implantation. The SimBio environment components are: discrete representation of the physical problem; numerical solution system; inverse problem and optimisation; visualisation. The SimBio environment will be designed for execution on parallel and distributed computing systems, component interaction aims to exploit CORBA. The compute-intensive environment components will be implemented on HPC platforms.

Work description:
The SimBio project will produce a generic simulation environment for advanced clinical practice and health care. This environment will be a highly innovative combination of: sophisticated medical imaging; high-level image processing; finite element techniques; parallel and distributed computing technologies. A key feature is the input of individual medical scan data to the modelling and simulation process.

The SimBio environment will be comprised of the following components: Discrete Representation of the
Physical Problem (Medical scan data is transformed into a finite element mesh and provides data for tissue modelling within the finite elements); Numerical Solution System (SimBio-internal parallel finite element solvers and numerical library routines will be provided, together with an interface to allow for external codes to interact with the SimBio environment); Inverse Problem & Optimisation Component (This component provides a framework for inverse problem and design optimisation solver development, based on the use of the numerical solution system. Sensitivity and reliability analysis is also included); Visualisation (Advanced, and standard, visualisation tools will be included via SimBio-internal tools and interfaces to external software).

The SimBio environment will be designed for execution on parallel and distributed computing systems, component interaction aims to exploit a portable object-oriented interoperability architecture, such as CORBA. In order to meet the computational demands of the SimBio environment simulations, the compute-intensive environment components will be implemented on HPC platforms.

The generic environment will be validated and evaluated by three specific applications: electromagnetic source localisation within the human brain; bio-mechanical simulations of the human head; the design of human knee joint menisci replacement parts and methods for their surgical implantation.

Milestones:
The central project result is the SimBio environment. This is completed by an evaluation of that environment, which provides a demonstration of the impact of SimBio employment in the clinical and health care area. The project has two major project milestones (supplemented by task-specific technical milestones) and these reflect the coupled project results: a preliminary environment release plus application evaluation after 18 months; a final SimBio release and evaluation at project completion.

Programmes

FP5-IST - Programme for research, technological development and demonstration on a "User-friendly information society, 1998-2002"

Topics

1.1.2.-4.4.1 - Real-time simulation and visualisation technologies

Funding Scheme

CSC - Cost-sharing contracts

Coordinator
Participants (9)

**ADVANCED NUMERICAL TECHNOLOGIES BV - A.N.T. SOFTWARE B.V.**
- Netherlands
  - Hengelosestraat 705
  - 7500 Am Enschede

**CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE**
- France
  - 3, Rue Michel-Ange
  - 75794 Paris Cedex 16

**ENGINEERING SYSTEMS INTERNATIONAL**
- France
  - 20 Rue Saarinen Silic
  - 94150 Rungis

**FRIEDRICH-SCHILLER-UNIVERSITAET JENA**
- Germany
  - Fuerstengraben 1
  - 07743 Jena

**MARIBOR GENERAL HOSPITAL**
- Slovenia
  - Ljubljanska 5
  - 2000 Maribor