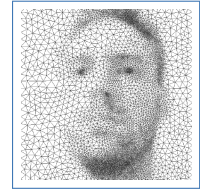


Sébastien Bigot

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New Zealand resident



Middleware engineer

Scientific, high performance and embedded computing, complex systems

Experience

Nov. 2016 **Software engineer**, 8i, Technology startup specialising in AR & VR, Wellington, New Zealand.

8i is developing technologies around reconstruction of 3D models from multiple image streams: offline and realtime reconstruction methods as well as ad hoc compression methods. In the reconstruction and stage squads: I worked on optimizing solvers (C++, OpenMP & Cuda) for non-rigid registration of point clouds used to build temporal correspondances. That work was used both to improve temporal stability of the reconstruction and to compute motion vectors required by temporal compression schemes. I then implemented from scratch 8i's in-house real-time GPU image compression pipeline (8bits & 12bits Jpeg). The solution is a drop-in replacement for the FastVideo codec. It is used in production to process the output of three 12bits RGB streams per GPU. It is handling framerates as high as 100 frames per second. Lastly I worked on Vive lighthouse to camera array calibration methods and more generally "hand to eye" calibration problems: the goal was to use consumer grade MOCAP system (HTC Vive, Oculus Rift) trackers and bring them into the reconstruction space to allow for automatic integration of CG assets. As part of my software development duties, I also facilitated the migration of 8i's reconstruction and stage technologies to Linux and Docker.

→ *Good knowledge of non-linear optimization methods applied to point clouds* → *Advanced knowledge of real time video encoding implementation on the GPU* → *Good knowledge of multi-camera & "hand to eye" calibration methods*

Apr. 2016 **Software engineer, contractor**, Caterpillar & Trimble Control Technologies LLC,
June 2016 Earth moving and heavy civil construction, Christchurch, New Zealand.

For the GCS900 product: GCS900 is a grade control embedded system implementing guidance and automated control mainly for hydraulic excavator, motor grader and bulldozer using multiple combinations of inertial measurement units, tilt sensors, GNSS receivers ... It is written in C++ and Matlab (simulink coder) and is targetting hardware designed in house. CTCT contracted me to help them deliver the next "all machine release" of their product. I worked closely with application specialists and operators from test sites in Christchurch (NZ), Dayton (OH) as well as the Caterpillar Peoria Proving Ground (IL). I mainly focused on improving and fixing defects related to state estimation, control as well as user interface for the motor grader, dozer and hydraulic excavator machines.

→ *Good knowledge of grade control systems for earthmoving equipment*

June 2014 **Software engineer**, Caterpillar & Trimble Control Technologies LLC, Earth moving
Jan. 2016 and heavy civil construction, Christchurch, New Zealand.

For the GCS900 and next generation products: over that period I maintained, re-engineered and integrated several hydraulic excavator state estimators. I worked closely with the CAT & Trimble control system and research teams based in the US to integrate and validate heavy equipment control solutions.

→ *Good knowledge of state estimation and automation for heavy equipment* → *Good knowledge of CAN & J1939*

Sept. 2013 **Touring New Zealand.**

June 2014 During this period I recharged my batteries while touring New Zealand and working on a numerical simulation of waves penetrating the Lyttelton port of Christchurch. The current version of the simulator is solving the non-linear mild-slope equation (taking into account diffraction, reflection, refraction, shoaling, wave breaking and bottom friction) using finite element method for a set of monochromatic waves. Parallelism is achieved using a Schur domain decomposition method. It's written from scratch in C++ and Cuda, uses MPI, cuBlas and Pardiso. The current version of the solver has been tested on an Nvidia K40 GPU accelerator cluster. I've started working on a Web UI using WebGL, the Google Maps API as well as the Open Street Map dataset in order to animate and combine the simulated waves on top of a map. I'm aiming to build a useful online service to simulate the behavior of any harbor.
→ *Good knowledge of the finite element method implementation on a GPU*

Jan. 2011 **Middleware engineer, team leader**, Telogis, cloud-based location intelligence platform, Christchurch, New Zealand.

Sept. 2013 For the GeoBase product : GeoBase is a geospatial development toolkit written in C# and C++, running on Windows, Windows CE, Linux (via Mono) as well as Android & iOS (via Xamarin). It provides the core functionalities needed by enterprise-grade GIS applications such as routing, geocoding, reverse-geocoding, mapping, navigation. It emphasizes on logistics and the transport industry needs. During that time, I had the opportunity to enhance or debug most of these functionalities although my areas of expertise were the routing engines, the C++ codebase as well as portability on the Linux and Android platforms.
→ *Advanced knowledge of routing algorithms and strategies applied to road networks* → *Good knowledge of implementation and applications of spatial data structures* → *Advanced knowledge of C#*

Oct. 2008 **Middleware engineer**, AMADEUS SAS, leader in travel technology solutions (airline, train, cruise ship, rental car, hotel, ...), Sophia-Antipolis, 06, France.

Mai 2006 **Middleware engineer**, Thales Information System, acting for AMADEUS SAS, Oct. 2008 Sophia-Antipolis, 06, France.

In the Communication and Security Middleware teams : development of new AMADEUS' enterprise service bus (Services Integrator, SI) and application server platform (Open Transaction Framework, OTF) on which relies AMADEUS' global distribution system (GDS) and IT activities. SI and OTF are written in C++, are multi-process, multi-thread, designed to achieve extreme TCP performance, to be fault-tolerant, distributed and infinitely scalable. One of the main purposes of SI/OTF is to decommission expensive IBM Z system mainframes running legacy TPF operating system (Transaction Processing Facility) still in use at AMADEUS. Major features include handling of Airline IT protocols (Interactive EDIFACT, Host To Host, TN3270 ...), handling of W3 protocols (HTTP, Soap, ...), protocol translation, session management, load balancing and monitoring.

→ *Advanced knowledge of multi-thread programming* → *Advanced knowledge of networked and concurrent architectures* → *Good knowledge of TCP implementation*

2005 **Engineer internship, master's thesis**, Commissariat à l'énergie Atomique (French Atomic Energy Commission), Saclay, 91, France.

7 months In the SERMA Lab (reactor physics and applied mathematics) : parallelization of the MINOS method of the DESCARTES project (neutronic flux and effective multiplication coefficient computation using finite element method). Development with C++/MPI/OpenMP and deployment on the CCRT's supercomputers (Center for Computing, Research and Technology), Tantale (236 AMD Opteron processors) and Nickel-Chrome (960 Alpha processors).

→ *Knowledge in parallelization of numerical methods* → *Advanced knowledge of C++ language*
→ *Advanced knowledge of the MPI library*

2004 **Engineer internship**, *Heudiasyc Lab (heuristics and diagnostics of complex systems)*,
 6 months *CNRS (French National Center for Scientific Research)*, Compiègne, 60, France.
 Dev from scratch in C/MPI of mesh partitioning and load balancing parallel tools targeted for Beowulf clusters (15 dual-AMD Athlon nodes) used for the numerical simulation of the swell in the harbor at Brest.
 → *Knowledge in implementation of parallel algorithms* → *Advanced knowledge of C language*
 → *Knowledge of the MPI library*

Patents & publications

- [1] J.P. Boufflet, S. Bigot, and E. Lefrançois. “Applications des techniques de calculs distribués à un code de calcul de houle aléatoire”. In: *VIIIèmes Journées Nationales Génie Côtier - Génie Civil*. 2004. URL: http://www.paralia.fr/Files/08_42__8p__lefrancois.pdf.
- [2] M. Fryer and S.S.R. Bigot. *System for classifying streets for vehicle navigation*. US Patent App. 13/587,705. 2013. URL: <http://www.google.com/patents/US20130204524>.

Education

2002–2005 **M.Sc: computational science**, *Université de Technologie de Compiègne*, Compiègne.
 2000–2002 **B.Sc: mathematics (with highest honors)**, *Université de Picardie Jules VERNE*, Amiens.

Languages

French **Mother tongue**

English **Good** *Good skills, both written and oral, daily interaction with english-speaking people*

Computer skills

| | | | |
|-------------------|--|-------------------|--|
| Languages | C & C++, Cuda, Python, Matlab, OCaml, .NET, bash | Libraries | STL, Boost, Eigen, Ceres, MPI, OpenGL, Posix thread, BSD socket |
| Operating Systems | GNU/Linux, Windows | Development tools | gdb, nvvp, wireshark, tcpdump, valgrind, hg, git, CVS, Subversion, docker, Gnu Make, Visual Studio |

Interests

Sports & outdoors moutain biking, swimming, running, hiking and climbing

Reading Sci-Fi, French literature ...