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Staff Associate - Ocean Engineer Lamont-Doherty Earth Observatory

The Earth Institute of Columbia University in the city of New York

Day to day activity: Main engineer at the Ocean Bottom Seismology Facility with 1 technician and 2 researchers. Instrumentation design: from the electronic PCB and firmware development to the instrument housing and running tests in lab and at sea. Key words: Autonomous instrument, low power design, scientific instrumentation for harsh environment.

Instrument deployments: International shipping (40' containers), deployments on several ships around the world for weeks at sea (Pacific and Atlantic Ocean).

Education:

- January 2009 *Certification of ultra low power design using FPGA and DSP co-processing by Mathworks and Texas Instrument.*
- May 2008 *Certification of FPGA and high speed electronic design workshop at University of New Mexico*
Soft implementation of microcontrollers and Digital Signal Processors on FPGA:
- 2003 – 2005 *Masters degree in Electronics and Telecommunications at University of Toulon, FRANCE*
electronic design, signal processing, programming (C/C++, Matlab and JAVA), CAD with Solidworks, radio frequency and acoustic transmitter/receiver theory and design, sensor calibration and integration techniques, internship for 4 months in Quito, Ecuador, internship for 4 months in Sudbury, Canada.
- 2001 – 2003 *BA in Electrical Engineering at the University of Toulon*
electronic and computing science: embedded electronic and electronic design, looped systems, automated systems, highly powered electronics and programming (C/C++).

Professional Experience

Oct 2006 – Present *Ocean Engineer, Ocean Bottom Seismology Instrument Facility, Lamont-Doherty Earth Observatory, NY*

Team: 1 technician and 2 researchers.

Referees: Andrew Barclay, PhD (barclay@ldeo.columbia.edu) and Spahr Webb, PhD (scw@ldeo.columbia.edu)

Oct 2005 – Sept 2006 *Autonomous Underwater Vehicle Engineer, Naval Postgraduate School of Monterey, California*

Robotics and Simulation Research Laboratory at the Naval Postgraduate School of Monterey, California

Referees: Don Brutzman, PhD (brutzman@nps.navy.mil) and Terry Norbraten, (tdnorbra@nps.edu)

Complex Naval Systems Laboratory at the University of Toulon, France

Referee: Didier Leandri, PhD (leandri@univ-tln.fr)

July 2004 – Oct 2005 *Complex Naval Systems Lab, ISITV Toulon, France*

6 months project: Sea glider UUV project design, develop and test of an autonomous system. Robotics and automated systems design.

Referee: Didier Leandri (leandri@univ-tln.fr)

Ongoing Research Projects:

- Ocean Bottom Seismometer Instrument Facility,. Activities: Maintaining, Deploying and Refurbishing a pool of 30 underwater broadband seismometers. R&D involvement: low power design and wider bandwidth to record. PI: Maya Tolstoy, Andrew Barclay, James Gaherty.
- Rapid Deployment Instrument,.: Short Period Instrument recording air-gun shootings and local underwater earthquakes. Short period response and air deployable by helicopter. PI: Andrew Barclay and Spahr Webb and James Gaherty.
- Optical Plume Velocimeter: Instrument to observe and process the particle velocity of seafloor hydrothermal vents plumes. PI: Tim Crone.
- AFAR depression seismic instrument , **OTIC Project**: Design of a 3-axis buried land-seismometer instrument which will be deployed in March 2009 in the AFAR region of Ethiopia. PI: Scott Nooner, Roger Buck.

Research Cruises:

- TAIGER experiment, Taiwan 2008 (3 weeks) and 2007(3 weeks), deployment of 20 Ocean Bottom Seismometers for 1 year and recovery of 20 Ocean Bottom Seismometer deployed for 7 months (**successful**) .
- San Diego, CA on the R/V SPROUL for 1.5 week (successful) - Long Island, NY on the Sea Wolf 2 days (**successful**) –

- **Research and Development cruise:** R/V Atlantis for 4 weeks at the East Pacific Rise **June 2008** : about 200 miles west of Costa Rica with Scott Nooner and Spahr Webb. (**successful**) for geodesy studies of the East Pacific Rise. Monterey, CA on a scuba diving boat for a SeaDiver glider tests (during a month in the bay)
 - Deep sea dive on the DS/V Alvin: 2850 meters of depth during 7 hours on June, 9th 2008.

Recent Scientific Collaborators:

- Dr. Andrew Barclay (LDEO) and Dr. Spahr Webb (LDEO) – hardware design, sensors design.
Dr. Won-Young, Kim and Dr. Colin Stark (LDEO) for satellite and GSM modules and inland seismometers threshold theory for emergency awareness (www.shakenet.org) and requirements to calibrate MEMS accelerometers,
Dr. Jeffrey Babcock and OBS team of UCSD Scripps Institute of Oceanography - OBS deployment and resource sharing.

Engineering Research Experience

- **Electronic Engineering:**
 - Inertial Motion Unit with MEMS accelerometers and accurate 3-axis pressure and seismometers sensors. Heading control to deploy remotely an Underwater Seismometer without a Research Vessel.
 - High-resolution A/D converters and implementation design (24 bits), low-power design, smart data acquisition on flash memory and RAM memory.
 - SD/microSD protocol (new generation) and logging instruments.
 - Ethernet stack implementation with TCP/IP layer implemented on soft and hard microcontrollers (PowerPC and Microblaze) File transfer through Ethernet.
 - Sensors: Broadband seismometers, pressure sensors and hydrophones: calibration and certification. MEMS accelerometers integration for low cost short period seismometers. Temperature sensors.
 - Telemetry including frequency and time modulation, underwater telemetry: bathymetry, CTD and XPD deployment and data processing.
 - Satellite and GSM modules (serial "AT commands") and GPS interface (NMEA protocol).
 - Acoustic transponders (Benthos releases, ORE/Edgetech), transducer head expertise, underwater positioning network with tethered off the seafloor beacon, side-scan sonar, and multi-beam systems.
 - Underwater video and still cameras, and lights systems.
 - Batteries: lithium, lithium-ion, alkaline, lead acid batteries: state of health, aging, pack designs, circuit protection, mean time between failures, capacity calculation for several environments characteristics.
- **Mechanical Engineering**
 - Stainless steel, aluminum, titanium and glass pressure housing design for deep water observation (≈6000m of depth/600bars)
 - Proficiency in epoxy systems and corrosion assessment/treatment. Metal coating techniques.
 - Bearings assembly and damping systems design for low noise sensors.
- **Software Engineering**
 - 3-D Computer Aided Design (SolidWorks) → **Mechanical design**
 - Schematic Capture and Printed Circuit Board Design (Altium DXP suite) → **Electronic design**
 - Programmable logic design (CPLD/FPGA design in VHDL) → **Software for low power and versatile design**
 - Microcontroller firmware: C code (Persistor), Java (Sunspot), Assembler (PIC).
 - Instrument interface software code (Java, C)
 - Positioning systems and underwater navigation. Underwater "GPS" with multiple underwater tethered baseline pingers.
 - Matlab

Publications:

- US Pentagon Report: Implementing a Low-Cost Long-Range Unmanned Underwater Vehicle: The SeaDiver Glider
Authors: David Gassier; Jerome Rebollo; Romain Dumonteil; NAVAL POSTGRADUATE SCHOOL MONTEREY CA MODELING VIRTUAL ENVIRONMENTS AND SIMULATION. Published: 09 January 2007
- Collaboration with writing proposal for budget to NSF (National Science Foundation): Shakenet Project (Earthquake Emergency System for emerging countries), Ocean Bottom Seismometer New Design.

Language:

- French: mother tongue
- English: fluent. writing papers/presentations
- Spanish: speaking and writing