

Manish Goyal

CONTACT INFORMATION Ch. H 6018, Res Houille Blanche
2 Av Des Jeux Olympiques
CEDEX 2, Grenoble, France 38029
e-mails: g.manish@alumni.iitg.ernet.in
manish.goyal@imag.fr
mobile: +33-62359-7511

INTERESTS Algorithms, Logic and Computation

EDUCATION **Master of Technology(Computer Science and Engineering)** Jul 2008 – Jun 2010
Indian Institute of Technology Guwahati, India

- CPI: **8.88/10**

Bachelor of Technology (Computer Engineering) - Hons Aug 2003 – May 2007
Maharshi Dayanand University, Rohtak, India

- Aggregate Percentage: **78.96%**

WORK EXPERIENCE **Verimag Research Lab**, Grenoble, France
Research and Development Engineer Feb 2011 – May 2012

- Worked on bi-directional translation between *Compositional Interchange Format (CIF)* and *SX* format via SpaceEx internal representation, as a module of MULTIFORM framework.
- Worked on non-linear functions parsing and evaluation. Designed an automaton library which aims at assisting SpaceEx in computing reachable sets by utilizing various automaton operations such as Union, Intersection, Minimization etc.
- Currently, we are working on interfacing automaton library with SpaceEx using *Exploration Graphs* so as to find a counter example and refine the approximation, if required, as a part of *Counter Example Guided Abstraction Refinement (CEGAR)* strategy.

IBM India Labs, Bangalore, India
Associate Software Engineer Jul 2010 – Jan 2011

Provided clients with an interface using servlets, jsp and struts to cater their business needs, and help us understand the complete workflow from requirement analysis to design and implementation.

Verimag Research Lab, Grenoble, France
Research Intern May 2009 – Jul 2009

Worked on an algorithm to refine initial parameter state space which assists **Breach** to better estimate the reachable set for the refined partition using sensitivity analysis. The algorithm finds its application in *parameter synthesis problem* and aims at speed improvement by writing Matlab routines as mex functions in C++.

Cognizant Technology Solutions, Pune, India
Programmer Analyst Jun 2007 – Jun 2008

Configured and managed production environments for PeopleSoft modules. Administered and learned to optimize SQLs based on their back end performance.

HCL Technologies, NOIDA, India
Industrial Trainee Jan 2007 – May 2007

Designed and implemented *Traffic Control System* in Java to comprehend system functioning.

PUBLICATIONS

- M. Goyal, “*Reachability Analysis of Hybrid Systems: An Experience Report*,” in *Proc. 3rd Intl. Conf. on Computer Modeling and Simulation (ICCMS’11)*, Mumbai, India: 489-493, IEEE, 2011.
- M. Goyal, G. Frehse, “*Translation between CIF and SpaceEx/PHAVer*,” Technical Report, MULTIFORM Deliverable D1.3.1, VERIMAG, France: May, 2011.
- M. Goyal, G. Frehse, “*Automata Library: A User Guide*,” Technical Report, VERIMAG, France: April, 2012.

TALK *Translation between CIF and SpaceEx/PHAVer* during MULTIFORM annual meeting at Sonderberg, Denmark: July 2011.

MASTERS THESIS	<p><i>Reachability Analysis of Hybrid Systems</i>, under the guidance of Dr. Purandar Bhaduri (Head, Computer Science Department in IIT Guwahati).</p> <p>- Evaluated two tools PHAVer and HSolver, used for safety verification of linear and nonlinear hybrid systems respectively, and concluded about their behaviors in terms of time, memory and decidability. Another contribution is the computation of <i>linearization error</i>, otherwise difficult to compute, which is incurred during approximation of a nonlinear system by its linear counterpart. We also worked in the direction of improving simulation coverage of Simulink/Stateflow models.</p>
SCHOLASTIC HONOURS	<p><i>Department Rank 1st</i> in M Tech Computer Science Batch during first year at IIT Guwahati.</p> <p><i>Department Rank 2nd</i> in B Tech Computer Engineering Batch.</p> <p>Stood among top 1% in <i>Graduate Aptitude Test in Engineering (GATE)</i> 2008.</p> <p><i>3rd Prize</i> in Wired Robot race organized by Technophilia Solutions as a part of Techniche'08.</p> <p>Qualified for the final round in <i>Trinity of Neo(TON)</i> at Techniche'09.</p>
TECHNICAL SKILLS	<p>Languages: C, C++, Java</p> <p>Tools: Matlab/Simulink, NuSMV, Esterel Studio, PHAVer, HSolver</p>
ASSOCIATED TOOL PROJECTS	<ul style="list-style-type: none"> • SpaceEx: Tool platform to facilitate hybrid systems safety verification. • MULTIFORM: European research project for integrated multi-formalism tool support. • Breach: Matlab/C++ toolbox for reachability analysis of dynamical systems.
ACADEMIC PROJECTS	<p>Clock Synchronization in Client Server Architecture</p> <p><i>Chat Client Server</i> is an architecture where a server provides an interface for various clients to communicate. Clock synchronization was applied in this existing architecture using <i>Berkeley Algorithm</i>. The server averages the skews of client clocks, and then reports back to clients the adjustment required for their local clocks to achieve the synchronization.</p> <p>Model Checking of Fault-tolerant Comm. Protocol for Distributed Consensus</p> <p>The protocol was modeled in NuSMV and verified whether given LTL constraint such as, eventually every reliable process has the same value in its local variable, is satisfied. NuSMV-bmc was employed to generate counter- examples, if any. A counter- example emphasizes the requirement $N > 3K$ which is the necessary and sufficient condition for building consensus in a fault-tolerant communication protocol. N and K represent number of reliable and unreliable processes respectively.</p> <p>VME Bus Communication Protocol</p> <p><i>VERSAModule Eurocard(VME) bus</i> - an architecture exemplifies a Real Time system where bus describes the data path. Data transfers are asynchronous and the protocol allows transfer between master and slaves using various address, data and control signals. The protocol was modeled in <i>Esterel Studio</i> and the master slaves' communication, in the form of data transfers, was explained with the help of signals flow and timing graphs.</p> <p>Key Distribution for Secure and Trusted Group Communication</p> <p>An algorithm was designed for evaluating trust to check the integrity of network nodes in inter and intra group communication based on the notion of <i>hybrid trust</i>. Solutions related to various challenges including network traffic reduction, efficiency of computation were also presented.</p> <p>Matsumoto Imai Cryptosystem</p> <p>The <i>Matsumoto Imai cryptosystem</i>, based on substitution over Galois Field $GF(2^m)$, was developed in Java and plaintext was successfully retrieved after encryption - decryption; therefore verifying the correctness of the implementation.</p>
EXTRA CURRICULAR	<p>Batch Representative of MTech Computer Science Batch in IIT Guwahati.</p> <p>Member of Computer Science and Engineering Association(CSEA) in IIT Guwahati.</p> <p>Batch Representative of Peoplesoft'07 Batch in Cognizant.</p> <p>Key Organizer of National Level Festival CULMYCA'06 during B. Tech.</p>