



SIG on Formal Methods

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SIG on Formal Methods:

Formal Methods (FM) has been in existence since 1940's, when Alan Turing proved the logical analysis of sequential programs using the properties of program states; and Floyd, Hoare and Naur used axiomatic techniques to prove program correctness against the specifications in 1960's.

These initial successes helped inculcate an interest in applying FM to the field of computer science.

Academia has been instrumental in bringing this field to the forefront, through continued research and development. The use of Formal Methods requires an expert skill-set expertise and therefore, its use is limited to those trained in the field.

Mission Statement:

Computer Society of India wants the field of Formal Methods to have a wider audience and more people to benefit from the application of these methods to all spheres of life. There is a need to use effective, correct and reliable approaches to design, develop and qualify complex, high assurance system software with the rigid schedules and budget. For this we need advanced tools, techniques and methods. Industry standards like RTCA DO-178C (Civil Aerospace), ISO 26262 (Automotive), IEC 61513(Nuclear), EN50126 (Railways) have recommended the usage of formal –method based approach to be used in the various phases of engineering process to achieve the required levels of safety and security.

Today there are proven techniques and tools that can be used in specification, design and verification & validation phases to assure correct requirement-capture, implementation, software functionality and security. This helps in developing high assurance software for applications such as cyber-physical systems, net-centric warfare systems, autonomous robots and Next Generation Air Transportation.

- **One day workshop on FM was conducted during April 2013**

Objectives of the Special Interest Group (SIG) are:

- To bring together scientists, academicians active in the field of formal methods and willing to exchange their experience in the industrial usage of formal methods
- To coordinate efforts in the transfer of formal methods technology and knowledge to industry
- To promote research and development for the improvement of formal methods and tools with respect to their usage in industry.
- To bring out practical engineering methods where formal methods will be integrated with current engineering methods

Some of the known applications of formal methods are:

- Formal verification, including theorem proving, model checking, and static analysis
- Techniques and algorithms for scaling formal methods
- Use of formal methods in automated software engineering and testing
- Model-based formal development
- Formal program synthesis
- Formal approaches to fault tolerance
- Use of formal methods in safety cases
- Use of formal methods in human-machine interaction analysis
- Use of formal methods in compiler validation and object code verification

3. Committee Members

1. Ms. Bhanumathi K S, Convener
2. Mr.Chander Mannar
3. Prof.Anirban basu
4. Mr. Suman Kumar
5. Prof. Shyam Sundar
6. Ms. Manju Nanda
7. Ms. J. Jayanthi
8. Ms. Saroja Devi
9. Prof. Meenakshi D'Souza
10. Dr. Yoganand Jeepu
11. Dr. Swatnalatha Rao
12. Dr. Aditya Kanade
13. Dr. A. Indira
14. Mr. Dhinakaran Pillai

Convener:

Bhanumathi K S
"Ganadhakshya" #406, 8 C Main,
H R B R First Block
Kalyan Nagar
Bangalore 560043
Email:bhanushekar@gmail.com
Mobile:+91 95350 92589

Industry Standards Supporting Formal Methods

Compiled by Dr. Manju Nanda

The widespread use and increasing complexity of systems require advanced techniques that address their specification, verification, validation, and certification. Formal Methods are used in achieving the safety assurance in these complex systems. The usage of Formal Methods in industry is possible only if the industry standard supports it. Over the years, industry has embraced formal methods for activities such as :

- Static analysis
- Runtime verification
- Systematic testing
- Program refinement
- Compositional verification
- Security and intrusion detection
- Model-based development
- Model-based testing
- Requirement engineering
- Formal approaches to fault tolerance
- Formal approaches for safety analysis

Standards help to:

Deliver technology to the marketplace

Benefit humanity

Improve quality of life

Create and grow global markets

Drive innovation

Protect health and public safety

Industry standard that support formal methods listed in the Table below:

Industry	Standard
Aviation	RTCA DO-178C
Railways	CENELEC: EN50126/8/9
Nuclear	IEC 61513
Medical	IEC 62304
Automotive	ISO 26262
Generic Standard	IEC 61508
