

Process models

CONT.....

Formal Method

Formal method is branch of software engineering, in which we analyse software systems.


- Develop a program in a way that each step leads to a final solution, follow proper method to make sure that we do not take wrong steps.
- “Formal methods used in developing computer systems are mathematically based techniques for describing system properties. Such formal methods provide frameworks within which people can specify, develop, and verify systems in a systematic, rather than ad hoc manner”

A method is formal if it has a sound mathematical basis, typically given by a formal specification language. This basis provides a means of precisely defining notions like consistency, completeness, and more relevantly specification, implementation and correctness.

- Correctness, the property that an abstract model fulfils a set of well defined requirements.
- Consistency, to be consistent, facts stated in one place in a specification should not be contradicted in another place.
- Used to specify programs, what the system is suppose to do.
- Used for constructing programs.
- Used to verify the program.

Importance of formal methods in Software

This is what we are going to study in formal methods.

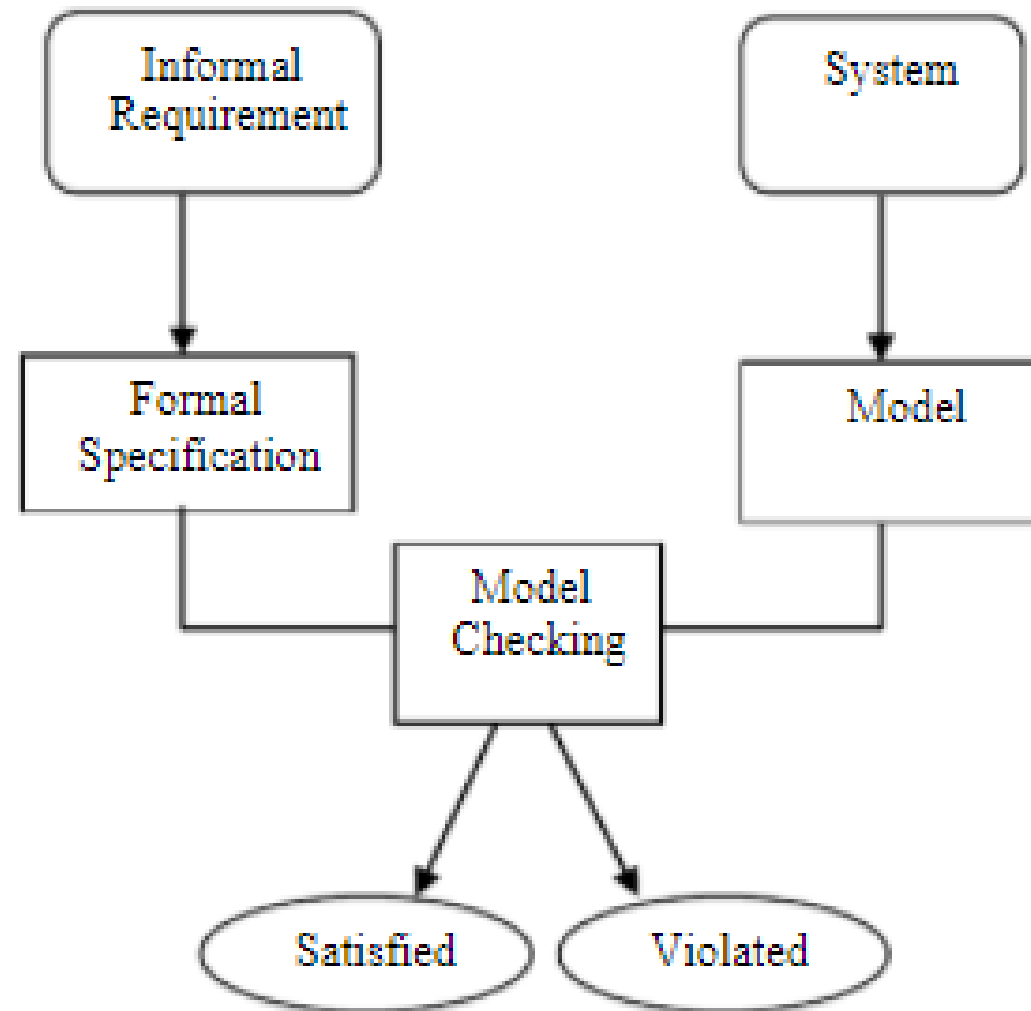
- Methods to ensure that software is 
 - Correct
 - Reliable
- These two attributes deal with the software quality.
- To achieve software quality, we apply different techniques.
 - Testing
 - Verification
 - Validation

Testing

- Black box testing – Test input versus output – Input
 - ❖ Two numbers – Output
 - ❖ average
- White box testing – Test the structure of program.
 - ❖ Loops testing,
 - ❖ condition testing

Formal method steps

- We will define state based model for our computer programs using formal methods.
 1. Define the specifications of the system(Formal specification).
 2. Define abstract model specifications.
 3. Define the states of system (steps of a model)
 4. Define invariant(condition)
 5. Define set of operations for model to function.
 6. System/model operation is associated with two conditions
 7. Pre-condition
 8. Post condition
 9. Model verification and Implementation
 10. Make formal model and use tools to prove mechanically that formal execution model satisfies formal requirements.



Fourth generation model

The term fourth generation techniques (4GT) encompasses a broad array of software tools that have one thing in common:

- each enables the software engineer to specify some characteristic of software at a high level. The tool then automatically generates source code based on the developer's specification.
- The 4GT paradigm for software engineering focuses on the ability to specify software using specialized language forms or a graphic notation that describes the problem to be solved in terms that the customer can understand.
- Implementation using a 4GL enables the software developer to represent desired results in a manner that leads to automatic generation of code to create those results.
- To transform a 4GT implementation into a product, the developer must conduct thorough testing, develop meaningful documentation, and perform all other solution integration activities that are required in other software engineering paradigms.
- In addition, the 4GT developed software must be built in a manner that enables maintenance to be performed expeditiously.