Abstract

The use of formal methods and formal techniques in industry is steadily growing.

- In this survey we shall
  - characterise what we mean by software development;
  - characterise what we mean by a formal method;
  - briefly overview a history of formal specification languages — some of which are:
    - VDM (Vienna Development Method, 1974–...),
    - Z (Z for Zermelo Fraenkel, 1980–...),
    - RAISE (Rigorous Approach to Industrial Softw.Eng., 1987–...)
    - Event B (B for Bourbaki, 1990/2000–...) and
    - Alloy;
  - and outline the basics of a formal development using, for example, RAISE:
    - first developing a domain description $D$,
    - then a requirements prescription $R$,
    - and finally a software design $S$ —
    - showing (arguing or formally proving) that $S$, in the context of $D$ satisfies (is correct with respect to) $R$.

- We shall then
  - mention industries in Japan, Europe and USA which, in a number of projects, uses formal methods;
  - discuss what it takes for an industry to do so;
  - discuss what education candidates for these industries need,
  - that is, which courses must be part of a BSc/MSc Software Engineering curriculum

- Finally we shall comment on
  - distinctions between formal methods and formal techniques;
  - limitations of mono-language formalisations, hence need for multi-language formalisation (Petri Nets, MSC, StateChart, Temporal Logics);
  - the sociology of university and industry acceptance of formal methods;
  - the inevitability of the use of formal software development methods;
  - while referring to seminal monographs and textbooks on formal methods.
Seminal Textbooks

1. **VDM:**


3. **RAISE:** D. Bjørner. *Software Engineering,*
   - Vol.1: *Abstraction and Modelling*,
   - Vol.2: *Specification of Systems and Languages*,
   - Vol.3: *Domains, Requirements and Software Design*.
