

Software Reliability and Safety

CSE 8317 — Fall 2008

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SSE.3: Formal Methods for Safety

- Formal Methods for Specification and Verification
- Axiomatic Approach
- Functional and Other Approaches
- Applications to Safety Problems

FM in SSE

- Leveson approach
 - ▷ Focused verification
 - ▷ Driven by hazard analysis
 - ▷ Distributed over development phases
 - ▷ Which FM? ad hoc

- Specific FM: SQE Ch.15 (slides!)
 - but with a safety focus/perspective

- Other applications
 - ▷ Need automation ⇒ model checking.
 - ▷ Less formality
 - ⇒ Parnas/tabular method & formal insp.
 - ▷ With statistical testing ⇒ Cleanroom
 - ▷ Yih/Tian: PSC (next module)

FM: 7 Myths and 10 Commandments

- Seven myths (Hall, 1990)
 - ▷ FM guarantee that software is perfect
 - ▷ They work by proving correctness
 - ▷ Only highly critical system benefits
 - ▷ FM involve complex mathematics
 - ▷ FM increase cost of development
 - ▷ They are incomprehensible to client
 - ▷ Nobody uses them for real projects

- Refutations and discussions

- However, some validity/quantified

FM: 7 Myths and 10 Commandments

- 10 Commandments ... 10 Years Later
(Bowen and Hinchey, 2006)
 - I. Thou shalt choose
an appropriate notation
 - II. Thou shalt formalize
but not overformalize
 - III. Thou shalt estimate costs
 - IV. Thou shalt have a FM guru on call
 - V. Thou shalt not
abandon thy trad. dev. methods
 - VI. Thou shalt document sufficiently
 - VII. Thou shalt not
compromise thy quality standards
 - VIII. Thou shalt not be dogmatic
 - IX. Thou shalt test, test, and test again
 - X. Thou shalt reuse

- Still valid after 10 years!