3. Modelling

Young W. Lim

2016-03-11 Thr

Outline

Based on

"Software Engineering for Embedded Systems. . .", R Oshana and M Kraeling, 2013

Prototyping decision criteria

when & why system models?

- off-line simulation, initial validation
- basis in the subsequent steps
- reduce mistake, risk, and development time
- easy design evaluation and prediction
- iterative approach enhances peformance and reliability
- cost down (reusability, hardware independence)
- reduce error and overhead (automatic code generation)
- robust design
- time-to-market
- reduced development cost

Modelling

- architecture modeling
- actor description
- function
- entity
- state
- input
- structure
- view

A1

- simulation modeling
- system entity's behavior

A1

- state char diagram
- hierarchy
- concurrency
- communication
- Unified Modelling Language (1990)

A1

= behavioral description

- state
- transition
- super state : history

A1

- simulation model
- VHDL entity
- abstraction
- interface

A1

- Architectural modeling
- Simulation modeling

A1

- design insight
- design and test
- design reuse
- test and debug
- fast and strong integration
- fast iteration of design and implementation

A1

- simulation modeling performed at the initial stage

A1

- software modeling
- visual aid
- behavioral description
- simulation aid
- concurrency offered
- UML

A1

- special situation, environment, problem
- which level of modeling is useful
- small vs large complex embedded systems
- UML,simulation may help or burdensom

A1

- processor based simple embedded system
- FPGA equiped complex embedded system

Modeling Language

- time sequence
- structural actor
- functional actor
- inter-actor relationship

A1

- domain specific modeling language
- model of computation

A1

- graphical
- textural

A1

- graphical modeling language
- symbols
- connect lines
- diagram
- system constraint

A1

-textural modeling language

- standard key words
- parameter

A1

- graphic
- text
- architecture
- implemenation
- document
- simulation
- execution

A1

- document + architecture : UML diagram
- implementation + execution : C, C# ...
- hybrid model : state chart
  - high level architectural view- implementation + (simulation, execution) : data flow

A1

- touch point
- abstraction
- simulation + implementation
- communication, IO

Modeling Language Example

- PID Controller
- time-based simulation
- state chart
- data flow

V Diagram

- software appliation design process
- design cycle
- x: time
- y: abstraction level
- design iteration
- reduce, bridge gap
- design team
- implementation team
- test team

A1

- at the initial phase
- system requirements
- design issues can be handled

When to use system models

- mission critical application DO-254B
- highly complex appliation / systems AGC, Jet, JSF, F-22 Raptor, Car Smart Factory
- large scale development communication, location, language, tools
- no prototype considered new product (non-existent)