ECPS 203
Embedded Systems Modeling and Design
Lecture 5

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Lecture 5: Overview

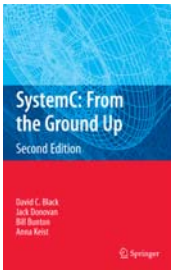
- Introduction to IEEE SystemC
  - Overview
  - Resources
- SystemC: From the Ground Up (Part 1)
  - Introduction to SystemC
  - Core concepts and syntax
- Project Discussion
  - Assignment 2
  - Assignment 3

SystemC Overview

- SystemC System-Level Description Language
  - C++ class library, layered software architecture
  - Discrete event simulation
  - Hierarchy of *modules* connected by *ports*
  - Communication via *interfaces* and *channels*
  - IEEE Standard 1666-2011
- Abstraction Levels, Modeling Methodology
  - Untimed model
  - Transaction-level model
  - Bus-functional model
  - Cycle-accurate model

SystemC Overview

- Online Resources on ECPS 203 course website
  - Accellera Systems Initiative, SystemC standardization body
  - SystemC Standard Language Reference Manual
    - IEEE 1666-2011 (free download)
  - ➢ *SystemC: From the Ground Up (2nd edition)*
    - ➢ Text book (free download from UCI network)
  - SystemC 2.0, SystemC 2.1
    - Various resources about SystemC history
  - SystemC 2.3.1
    - Current version (installed on EECS servers)
  - SystemC TLM-2.0
    - Introduction, whitepaper, and requirements
  - Quick reference
    - SystemC quick-reference card



IEEE SystemC Language

- SystemC: From the Ground Up (Part 1)
  - **`DAC15_SystemC_Training.pdf`**, slides 1 through 33
    by David Black, Doulos
    - SystemC training day at Design Automation Conference 2015

  - *"The Definitive Guide to SystemC: The SystemC Language"*

  - Introduction to SystemC
    - Overview and background
    - Central concepts, SystemC World
  - Core Concepts and Syntax
    - Data
    - Modules and connectivity

ECPS 203 Project

- Application Example: Canny Edge Detector
  - Embedded system model for image processing:
    Automatic edge detection in a digital camera

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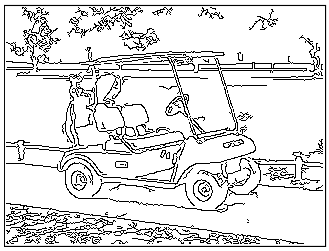

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  - Application source and documentation:
    - http://marathon.csee.usf.edu/edge/edge_detection.html
    - http://en.wikipedia.org/wiki/Canny_edge_detector

Project Assignment 2

- Task: Clean C++ model with static memory allocation
  - Prepare the C++ source code for modeling in SystemC
  - Configure parameters for specific application
  - Apply static memory allocation
- Steps
  1. Fix the off-by-one bug in the **`non_max_supp`** function
  2. Clean-up the code for compilation without warnings
  3. Fix configuration parameters to compile-time constants
  4. Remove or replace dynamic memory allocation
- Deliverables
  - Source code and text file: **`canny.cpp`**, **`canny.txt`**
- Due
  - Wednesday, next week: October 17, 2018, 6pm

Project Assignment 3

- Task: Introduction to SystemC
  - Capture and simulate the introductory example by Doulos
- Steps
  1. Structural model is shown on slide 25
  2. Source file structure is shown on slide 32
  3. Capture the partial source code provided on slides 21-36
  4. Fill in the omitted source code for the monitor module
     - For test cases 1*6, 2*6, ..., 7*6, monitor and validate the output
  5. Simulate the model with Accellera SystemC library
- Deliverables
  - Source files, **`Makefile`**, **`README`** in **`Multiplier.zip`**
- Due
  - Wednesday, next week: October 24, 2018, 6pm