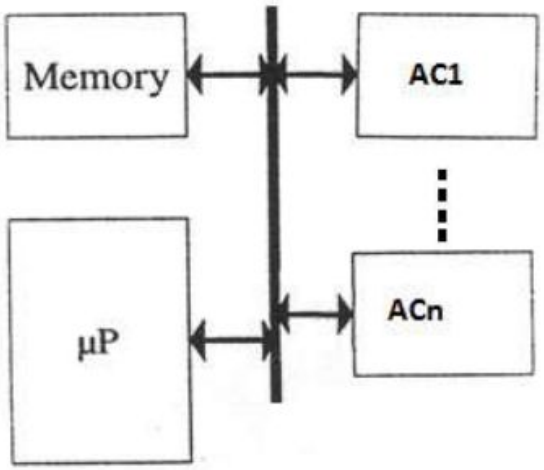
In the name of God

Project Context of Hardware Software Co-Design

Simulating a system contains Microprocessor/Accelerator/Bus and their connection via SystemC



1. Design a cpu (micro-processor) in SystemC language consists of the instructions below:

   - ALU instructions according to the Opselect codes determined below

Operation select					
S_3	S_2	S_1	S_0	Operation	Function
0	0	0	0	F = A	Transfer A
0	0	0	0	F = A+1	Increment A
0	0	0	1	F = A+B	Addition
0	0	0	1	F = A+B+1	Add with carry
0	0	1	0	F = A+B	Subtract with borrow
0	0	1	0	F = A+B+1	Subtraction
0	0	1	1	F = A − 1	Decrement A
0	0	1	1	F = A	Transfer A
0	1	0	0	F = A ∧ B	AND
0	1	0	1	F = A ∨ B	OR
0	1	1	0	F = A ⊕ B	XOR
0	1	1	1	F = A	Complement A
1	0	×	×	F = shr A	Shift right A into F
1	1	×	×	F = shl A	Shift left A into F

- `load` and `store` operations with arbitrary opcodes
- In this cpu, we can also stop the current task after calling an accelerator to do some other task.
  This accelerator can have an internal implemented algorithm (pure c++ code)
  This accelerator is connected to the bus just like the shared memory
  So if we wanna access the accelerator, we need to have an additional signal which we name it `call` signal.

2. This cpu works as a pipeline architecture

3. Implement an 8 KB Memory and connect it to the bus. Each row of the memory is 8 bits.

4. By writing a testbench, simulate a real algorithm.

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