Module-4
CSEN 3104
Lecture 22
29/08/2019

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Data Flow Architecture

Control Flow versus Data Flow

- Control flow is the order in which individual statements, instructions or function calls of a program are executed or evaluated
- Program Counter (PC) holds the address of the next instruction to be executed
- Control-flow computers use shared memory to hold program instructions and data objects
- In a dataflow computer, the execution of an instruction is driven by data (operand) availability instead of being guided by a program counter
- Computational results (data tokens) are passed directly between instructions

Dataflow Graph for finding the roots of a quadratic equation

- Quad(a, b, c)
- t1 = a*c;
- t2 = 4*t1;
- t3 = b*b;
- t4 = t3 - t2;
- t5 = sqrt(t4);
- t6 = -b;
- t7 = t6 - t5;
- t8 = t6 + t5;
- t9 = 2*a;
- r1 = t7/t9;
- r2 = t8/t9;
- Show the data flow graph to find the roots of a quadratic equation

Data Flow Graph (DFG)

- A data-flow graph (DFG) is a graph which represents data dependencies between a number of operations
- It is a directed graph whose nodes correspond to operators and arcs are pointers for forwarding data tokens
- Programs for data-driven computations can be represented by Data Flow Graphs (DFG)
- The graph demonstrates sequencing constraints (consistent with data dependencies) among instructions
- The firing rule of instructions is based on the data availability

- In the above example, t2 can not be computed before t1, but t3 could be computed before t1 or t2
- t1, t3, t6 and t9 can be computed in parallel

Data Flow Graphs (DFG)

- Show the data flow graph to obtain an approximation of cos x by the following power series computation:

  $\cos x \approx 1 - x^2 / 2! + x^4 / 4! - x^6 / 6!$

  $= 1 - x^2 / 2 + x^4 / 24 - x^6 / 720$

- The DFG consists of 9 operators (actors or nodes)
- The edges in the graph interconnect the operator nodes
- The successive powers of x are obtained by repeated multiplications
- The constants (divisors) are fed into the nodes directly
- All intermediate results are forwarded among the nodes

Data Flow Graphs (DFG)

- Show the data flow graph for the following set of instructions

1. P = X + Y
2. Q = P / Y
3. R = X x P
4. S = R – Q
5. T = R X P
6. U = S / T

Thank you