

Program Modeling Concepts:

Lesson-3: Control DATA FLOW

GRAPH MODELS

Examples of data input cases

- (a) An event
- (b) A status flag setting in a device and
- (c) Input as per output condition of the previous process

Control Data Flow Graph (CDFG) Modeling

- A control flow means that specifically *only the program determines* all program execution steps and the flow of a program
- The programmer predetermines these steps

Control Data Flow Graph (CDFG) Modeling

- The steps may have loops or condition statements in-between.
- Data that is input generate the data output after a control data-flow as per controlling conditions.
- Output(s) and paths taken after the steps depends on the control statements for various decisions in a process.

Control Data Flow Graph (CDFG) Modeling

- In the CDFG model, there is a diagram, which graphically represents the conditions and the program flow along a condition dependent path.
- The CDFG diagram also represents the effect of events among the processes and shows which processes are activated on each specific event.

Control Data Flow Graph (CDFG) Modeling

- Here, a variable value changing above a limit or below a limit or falling within a range is also like an event that activates a certain process

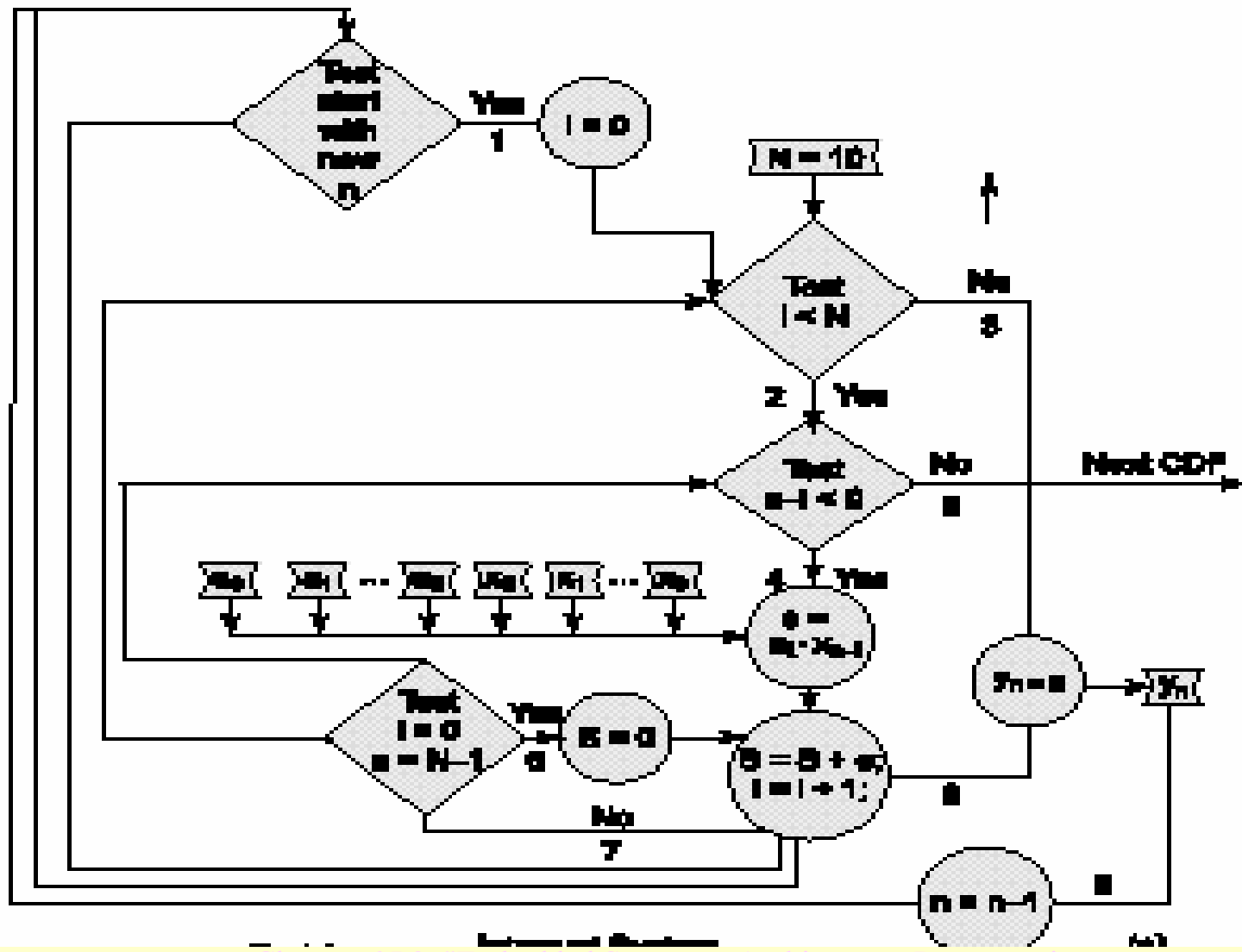
CDFG Modeling

- A circle also represents each process (called node) in a CDFG.
- A directed arrow towards the circle represents the data input (or set of inputs)
- A directed arrow from the circle represents a data output (or a set of outputs).
- A box (square or rectangle with its diagonal axes horizontal and vertical) may represent a condition

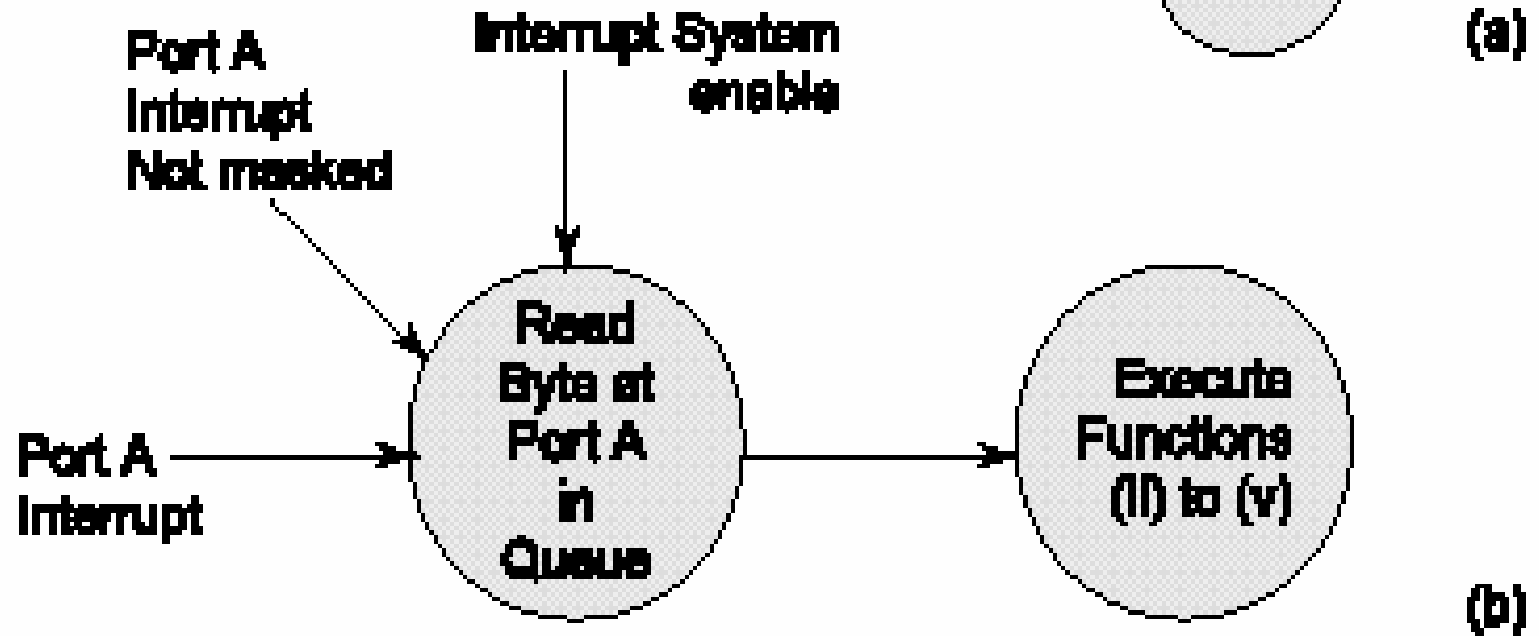
Example 1

Modeling of the steps (a) Data inputs and Controlling input (decision) nodes shown by test boxes in a CDFG for an FIR filter with ten inputs and 10 coefficients

Example 1



Example 2— IN Port A and Out Port B : Instead of box, a condition is marked at the start of an arc



CDFG Modeling

- Helps in understanding all conditions and in determining the number of paths a program may take.

Guides us how software to be tested for each path starting from a decision node

Helps in analyzing the program in terms of complexity

Data Flow Graph Model

Assumptions

- A set of the outputs from a circle showing a set of programming steps will be simultaneously available as the inputs to the next circle (next set of programming steps).
- At each circle computations take same time for each output and there is no delay in any of the inputs.

Summary

We learnt

- There are control conditions within the process in CDFG.
- CDFGs when there are specifications of conditions
- Decision nodes in CDFGs represent the controlled decisions at nodes,
- Program paths (DFGs) that are traversed consequently from nodes after the decisions.

End of Lesson 3 of Chapter 6