

## Classification according to underlying testing approach

- Structural testing
  - Coverage of a particular set of elements in the structure of the program
- Fault-based testing
  - Some measurement of the fault detecting ability of test sets
- Error-based testing
  - Check on some error-prone points

## Structural Testing

- Program-based structural testing

# Structural Testing

- Data-flow based adequacy criteria



## Purpose of Test Oracle

- Sequential Systems

# Parts of an Oracle

- Oracle information
  - Specifies what constitutes correct behavior
    - Examples: input/output pairs, embedded assertions
- Oracle procedure

## Regression Testing

- “Software maintenance task performed on a modified program to instill confidence that changes are correct and have not adversely affected unchanged portions of the program.”

## Regression Testing vs. Development Testing

- During regression testing, an established test set may be available for reuse
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## Formal Definition

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## Regression Testing Steps

3. Retest P' with T'
  - Use expected output of P, if same
4. Create new tests for P', if needed
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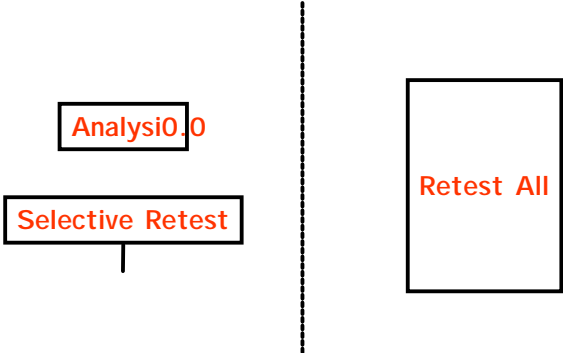


```

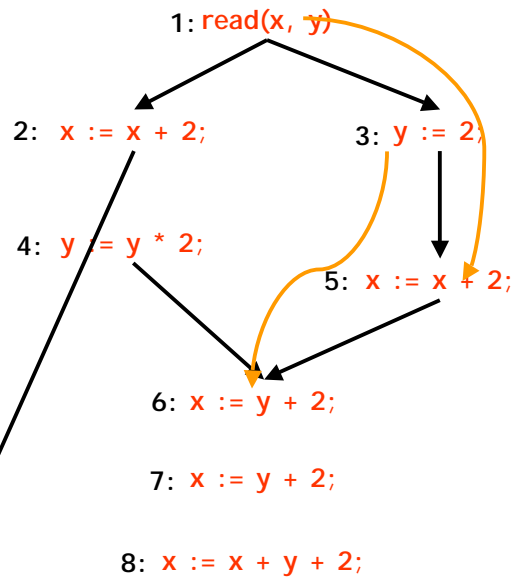
Procedure avg
S1. count = 0
   c = fread(fileptr,n)
do while (not
n<0)
P4. if (
turn(error) S5. re
S6. array[count] = n
   count++ S7. en
dif d(fileptr,n) S8. frea
endwhile
array eqn = c / count
S10. return(avg)

```

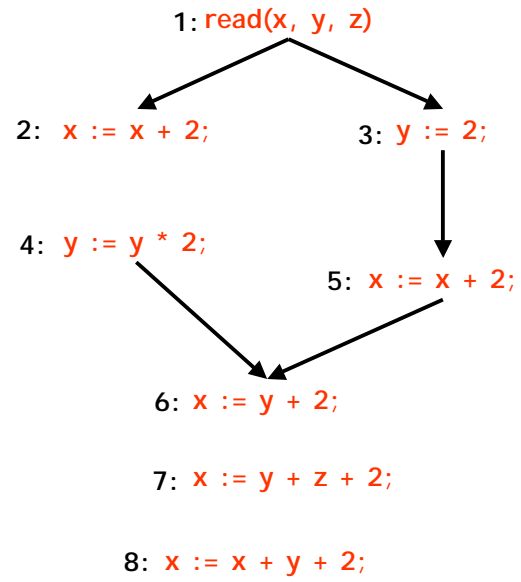
# Cost of Regression Testing



# Data-flow Testing



# All Uses Criterion



## All DU-paths criterion

- A set  $P$  of execution paths satisfies the all-DU paths criterion iff
  - for all definitions of a variable  $x$  and