Model-Based Testing
(DIT848 / DAT260)
Spring 2012

Lecture 7
Graph Theory Techniques in MBT

Gerardo Schneider
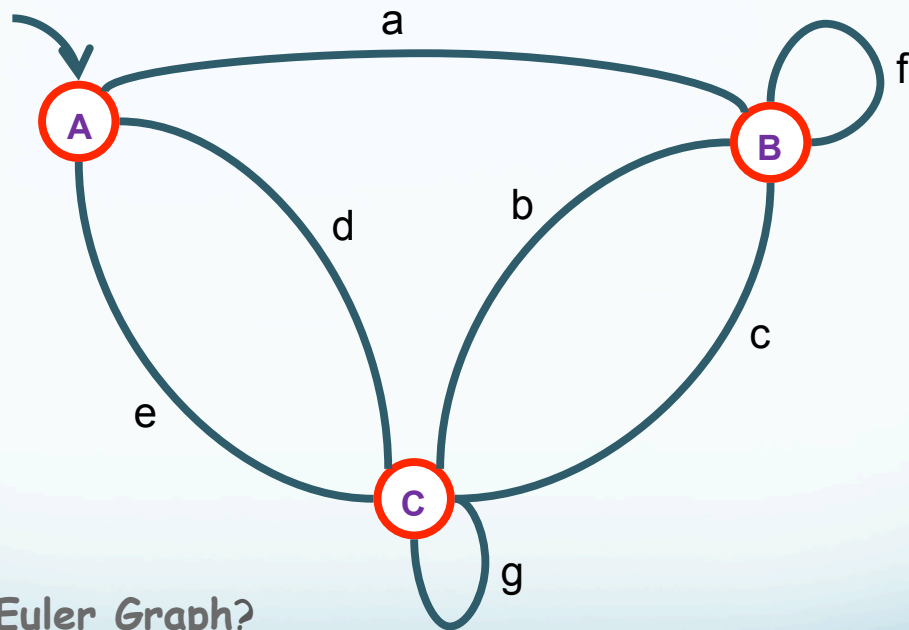Department of Computer Science and Engineering
Chalmers | University of Gothenburg

Outline

- *Graph Theory Techniques in Model-Based Testing*, **by**, Harry Robinson

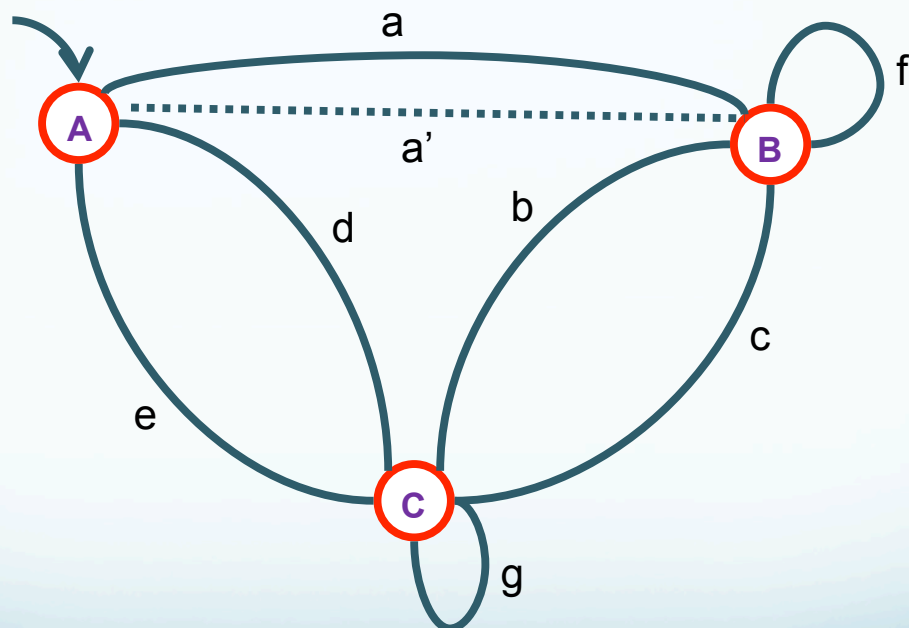- Interactive exercises

Euler Graph

Is it an **Euler Graph?**

Answer: No, not possible to traverse all the edges without repetition (nodes A and B have an odd number of links)

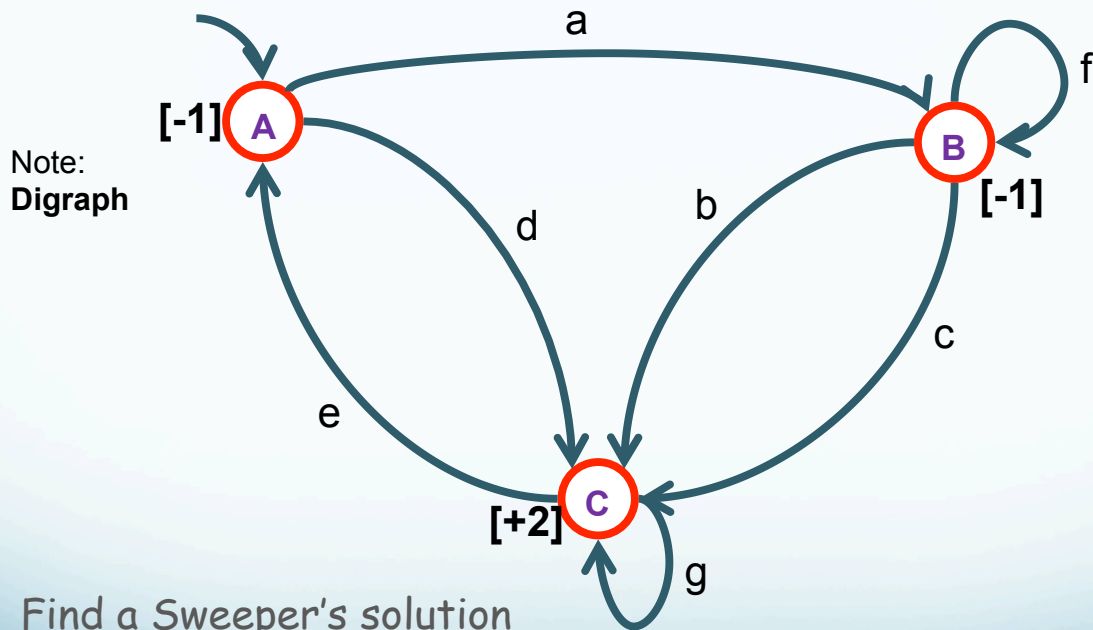Groups 2-5 persons: 5 min

Postman Problem

Find a "Chinese" Postman's solution

Answer: "Eulerize" the graph (**afbgca'de**)
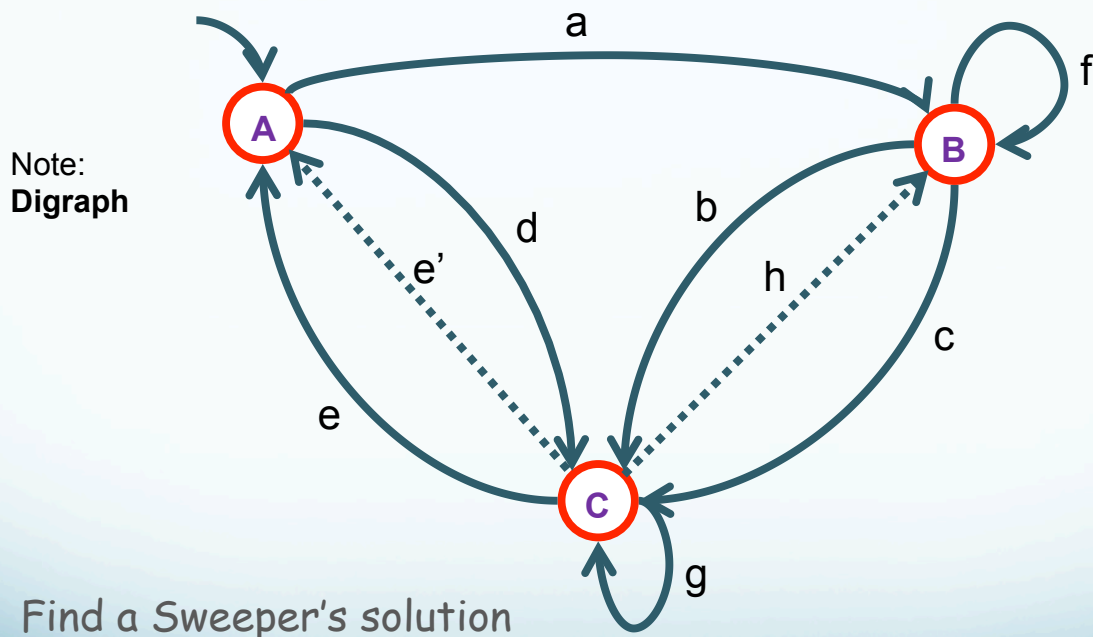
Groups 2-5 persons: 5-7 min

New York Street Sweeper

[-1] **A**

Note:
Digraph

a

B **[-1]**

f

d

b

e

c

[+2] **C**

g

Find a Sweeper's solution

Answer: "Eulerize" the Digraph

Groups 2-5 persons: 10 min

New York Street Sweeper

A

Note:
Digraph

a

B

f

e'

d

b

h

e
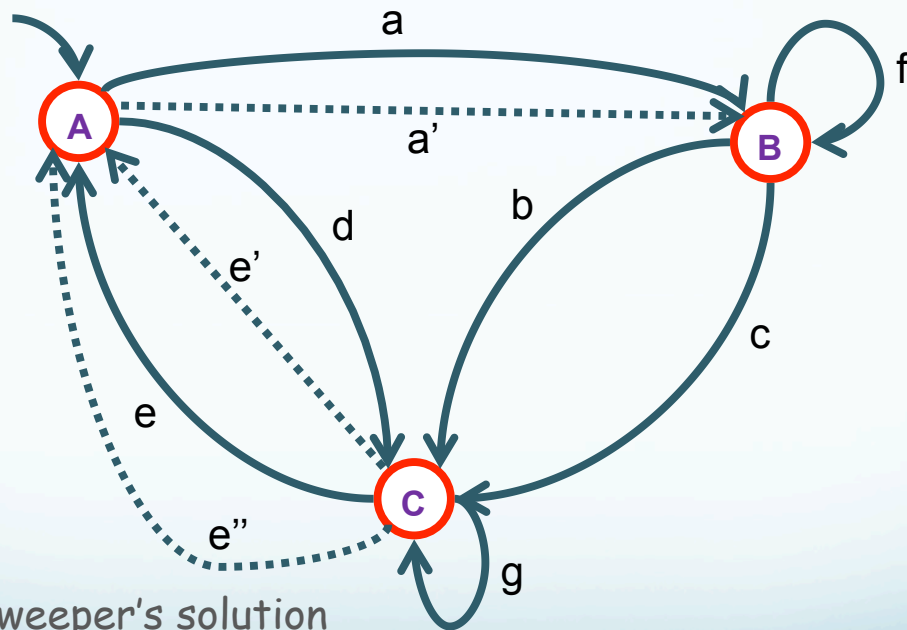
c

C

g

Find a Sweeper's solution

"Solution 1": afbhcgede' (we assume there is another
"street" from C till B –> not realistic)

Groups 2-5 persons: 10 min
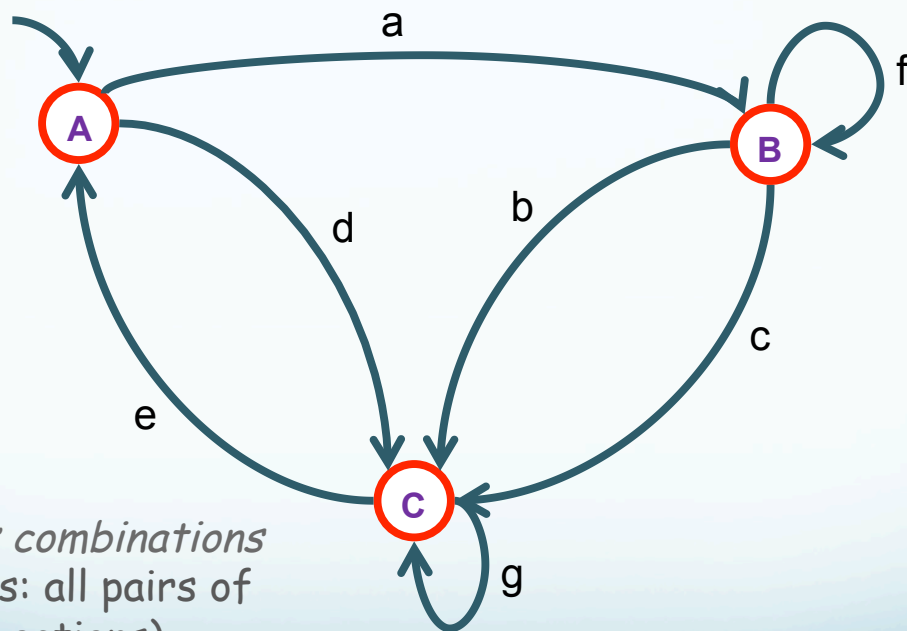
New York Street Sweeper

Note: **Digraph**

Find a Sweeper's solution

Solution 2: afbgea'ce'de'' (we only use existing "streets")

Groups 2-5 persons: 10 min

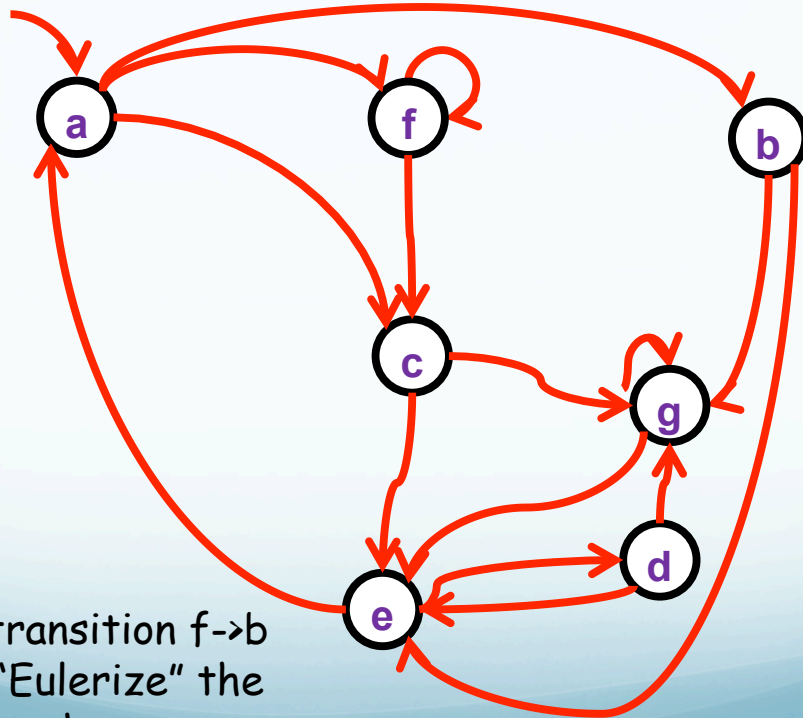# Testing Combination of Actions

Test *link combinations* (2 actions: all pairs of adjacent actions)

Solution: Transform the graph using de Brujin's algorithm (**dual** agraph)

Groups 2-5 persons: 10 min
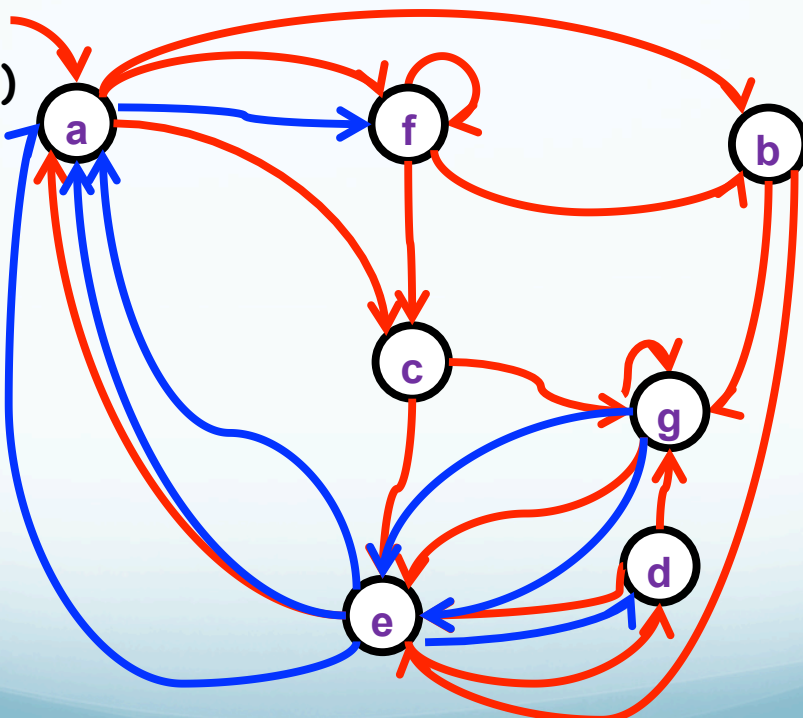
Testing Combination of Actions

Solution

Problems:
- "Forgot" transition f->b
- Need to "Eulerize" the resulting graph
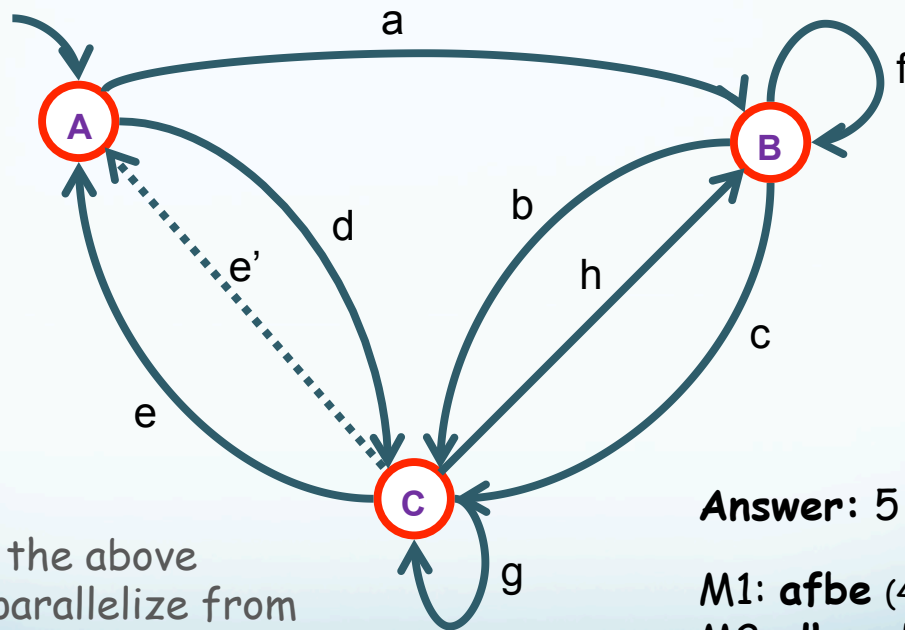
Groups 2-5 persons: 15 min

Testing Combination of Actions

(Complete)

Solution

Groups 2-5 persons: 15 min

Testing under a Time Deadline

Assuming the above
Digraph, parallelize from
initial state

Answer: 5 hs

M1: **afbe** (4 hs)
M2: **dhcge'** (5 hs)

Current minimum time: 9 hs (**afbhcgede'**)

Groups 2-5 persons: 7 min

References

- Recommend to read the paper

  Graph Theory Techniques in Model-Based Testing, by Harry Robinson (Presented at the 1999 International Conference on Testing Computer Software)

- If you are interested you can visit the Chinese Postman Algorithm by Harold Thimbleby homepage. It contains an implementation and a paper describing it