Model-Based Testing

(DIT848 / DAT261)

Spring 2017

Lecture 9

Graph Theory Techniques in MBT

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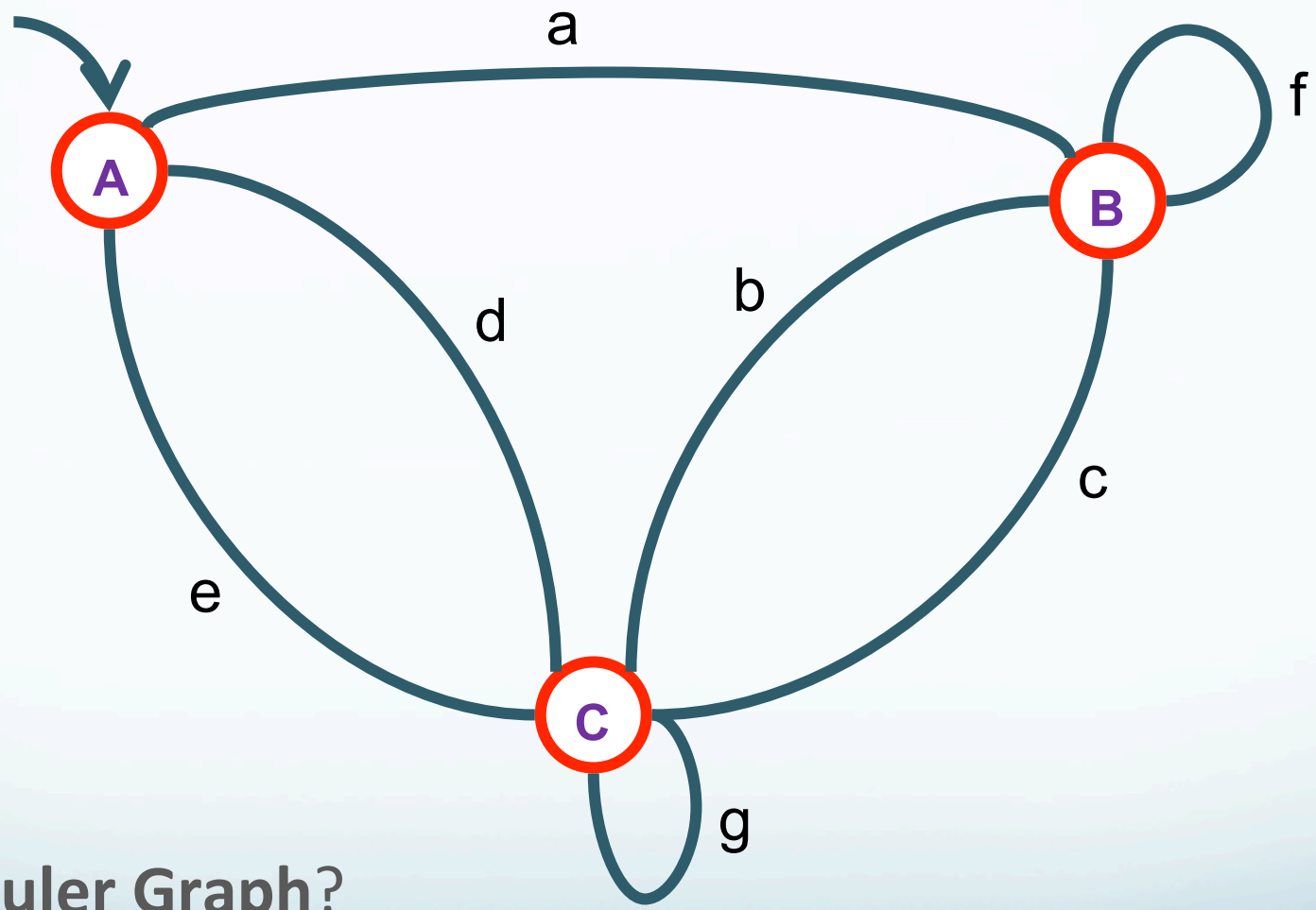
Outline

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

Euler Graph

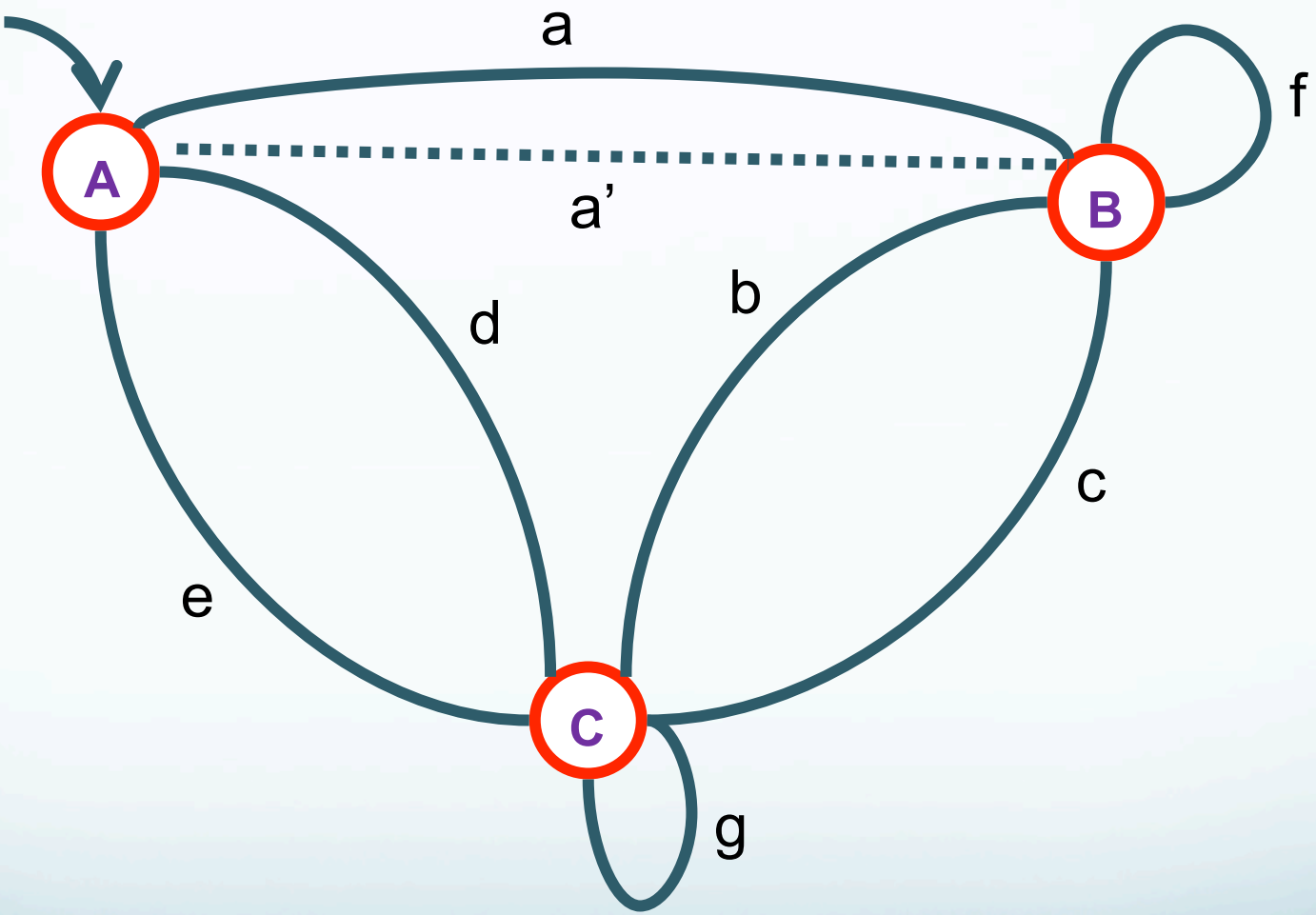


Is it an **Euler Graph**?

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



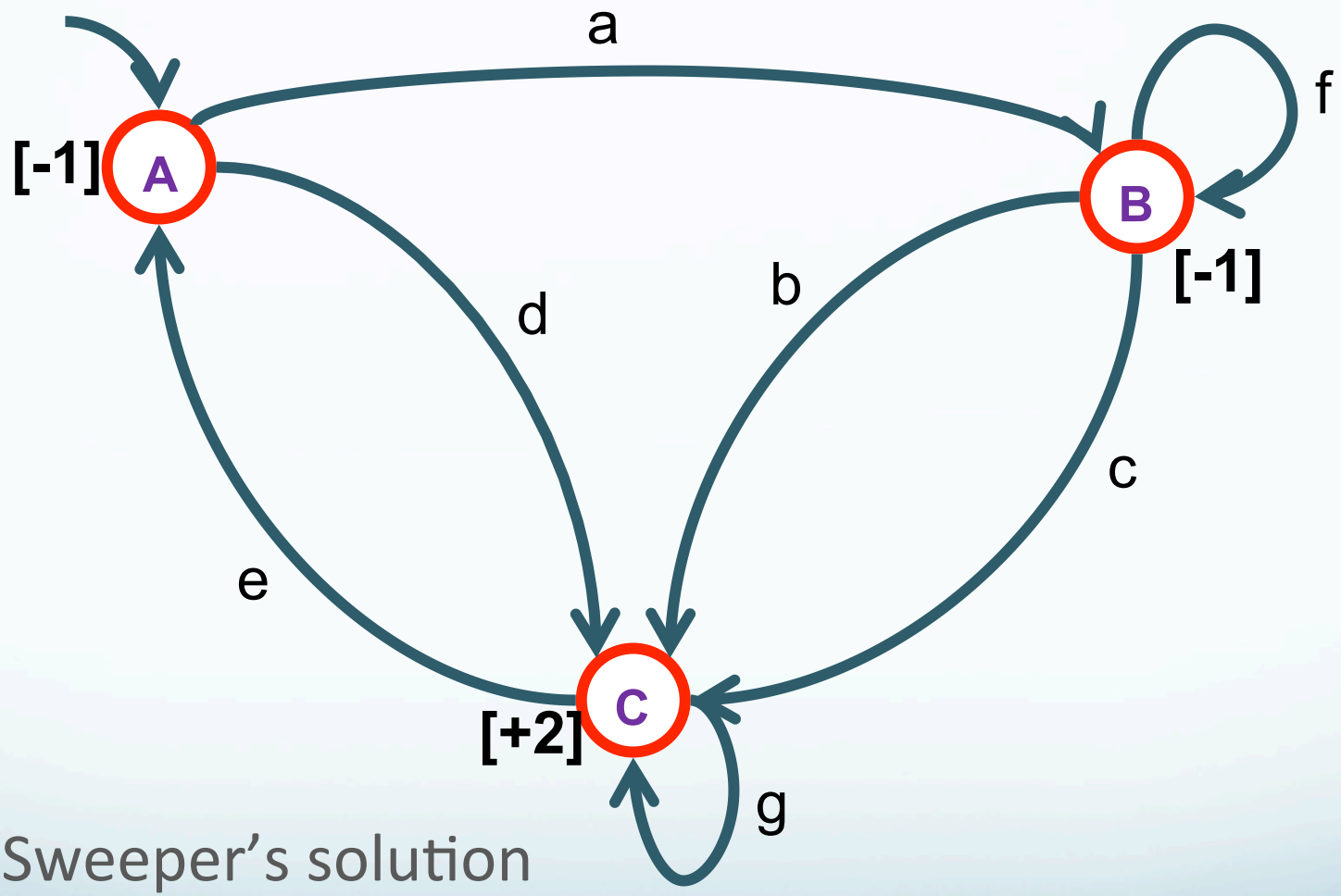
Find a "Chinese" Postman's solution

Answer: "Eulerize" the graph (**afbgca'de**)

Groups 2-5 persons: 5-7 min

New York Street Sweeper

Note:
Digraph



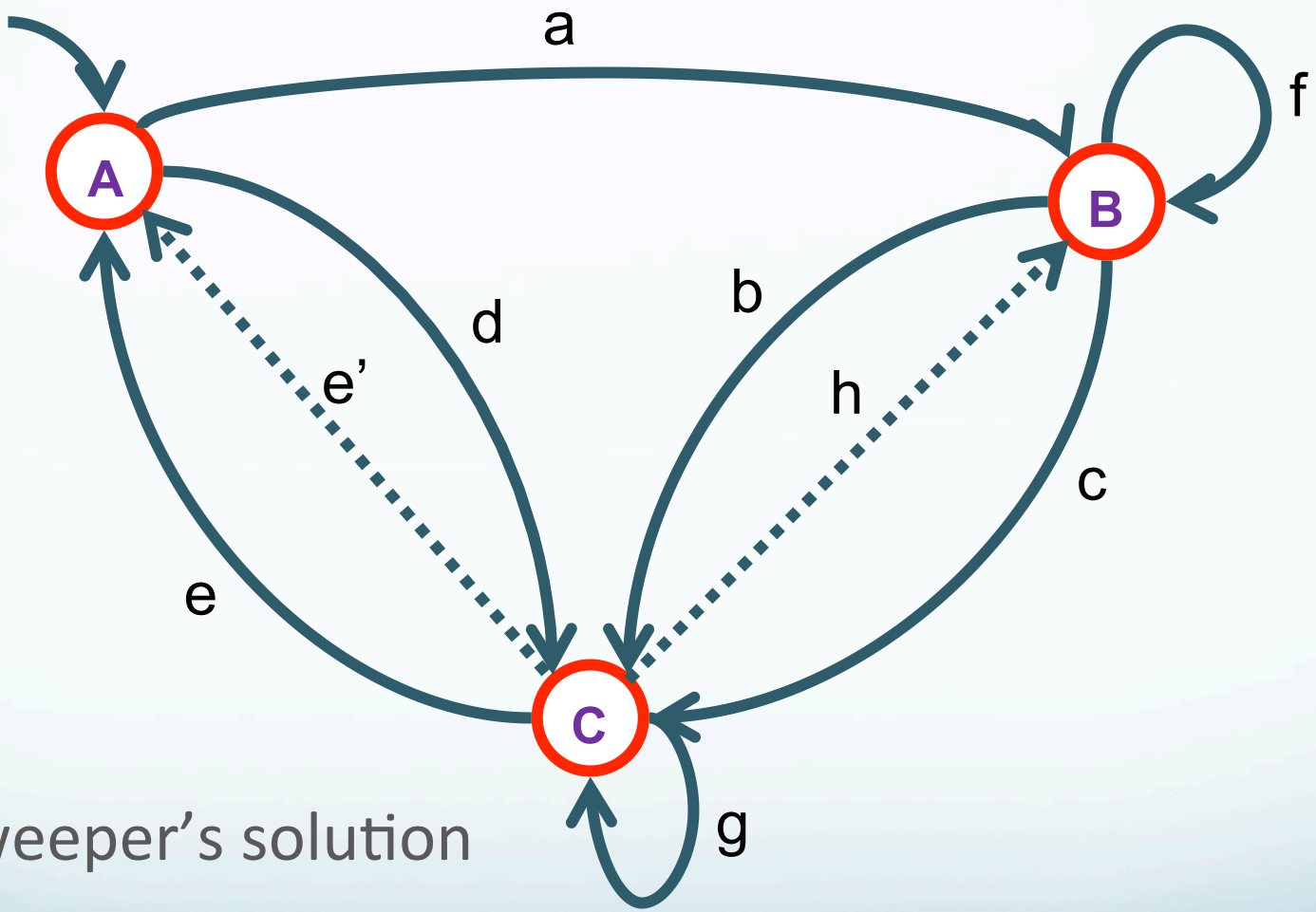
Find a Sweeper's solution

Answer: "Eulerize" the Digraph

Groups 2-5 persons: 10 min

New York Street Sweeper

Note:
Digraph



Find a Sweeper's solution

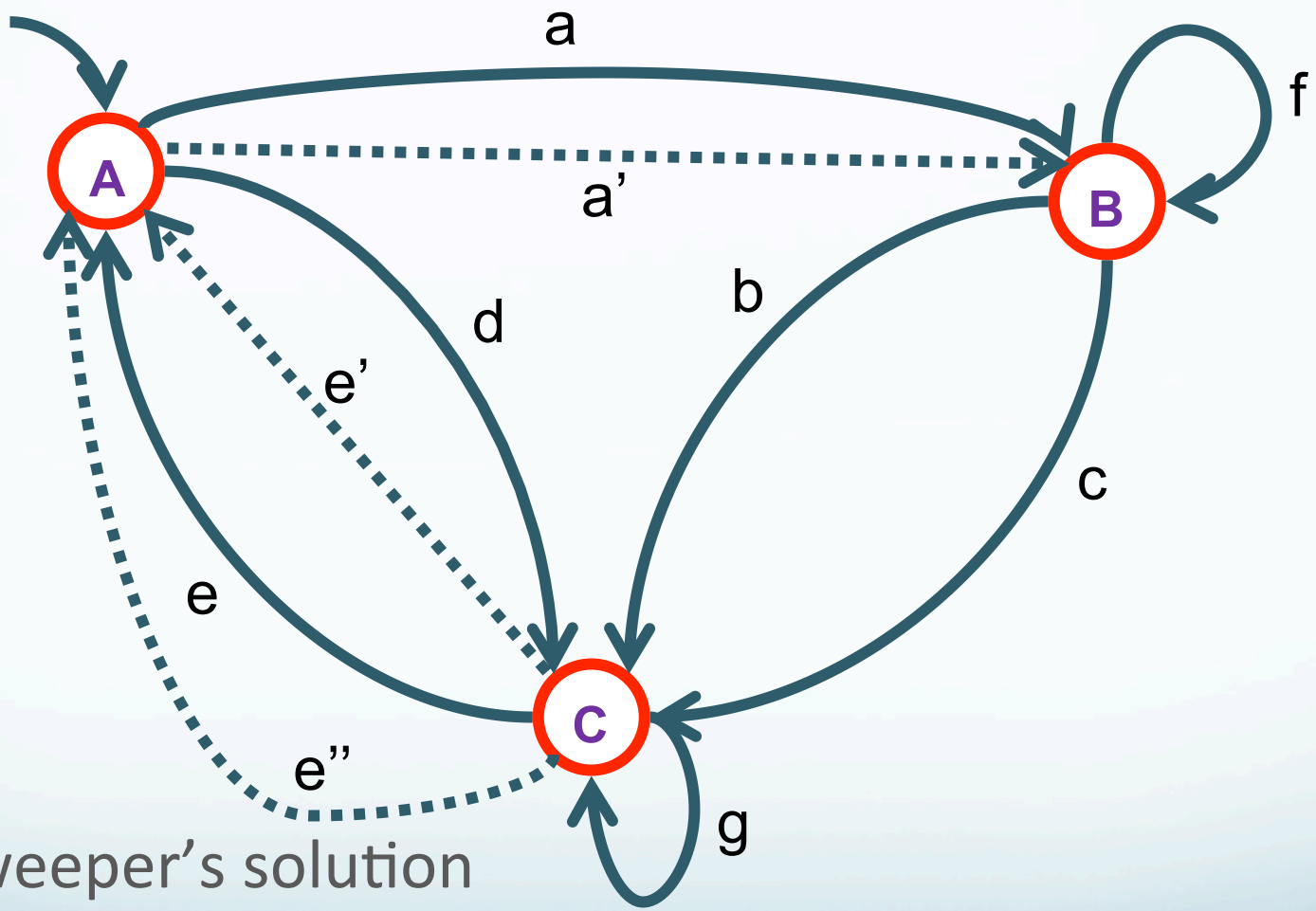
"Proposal 1": afbhcgede'

—> **NOT A SOLUTION!** (we assume there is another "street" from C till B)

Groups 2-5 persons: 10 min

New York Street Sweeper

Note:
Digraph

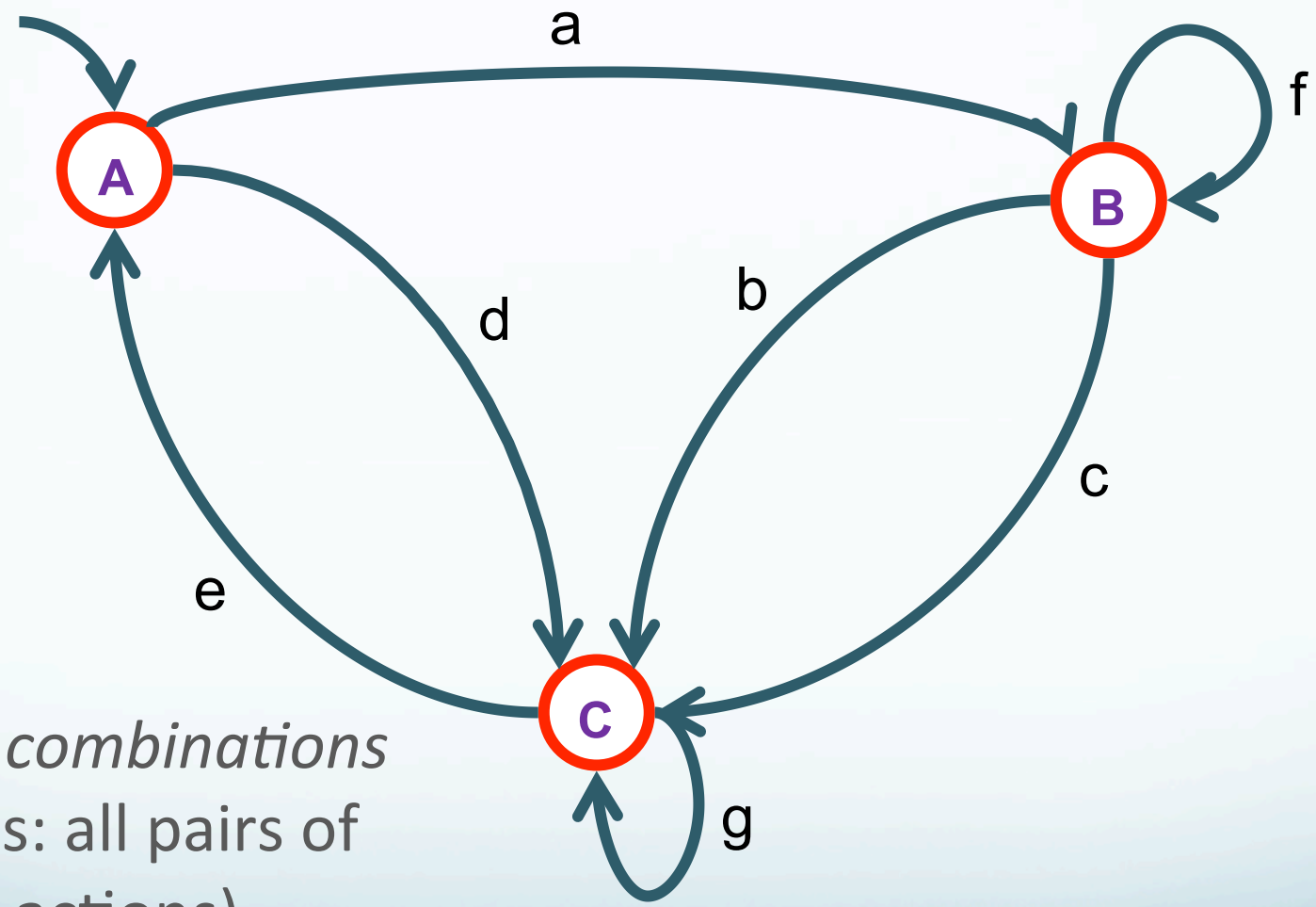


Find a Sweeper's solution

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

Groups 2-5 persons: 10 min

Testing Combination of Actions



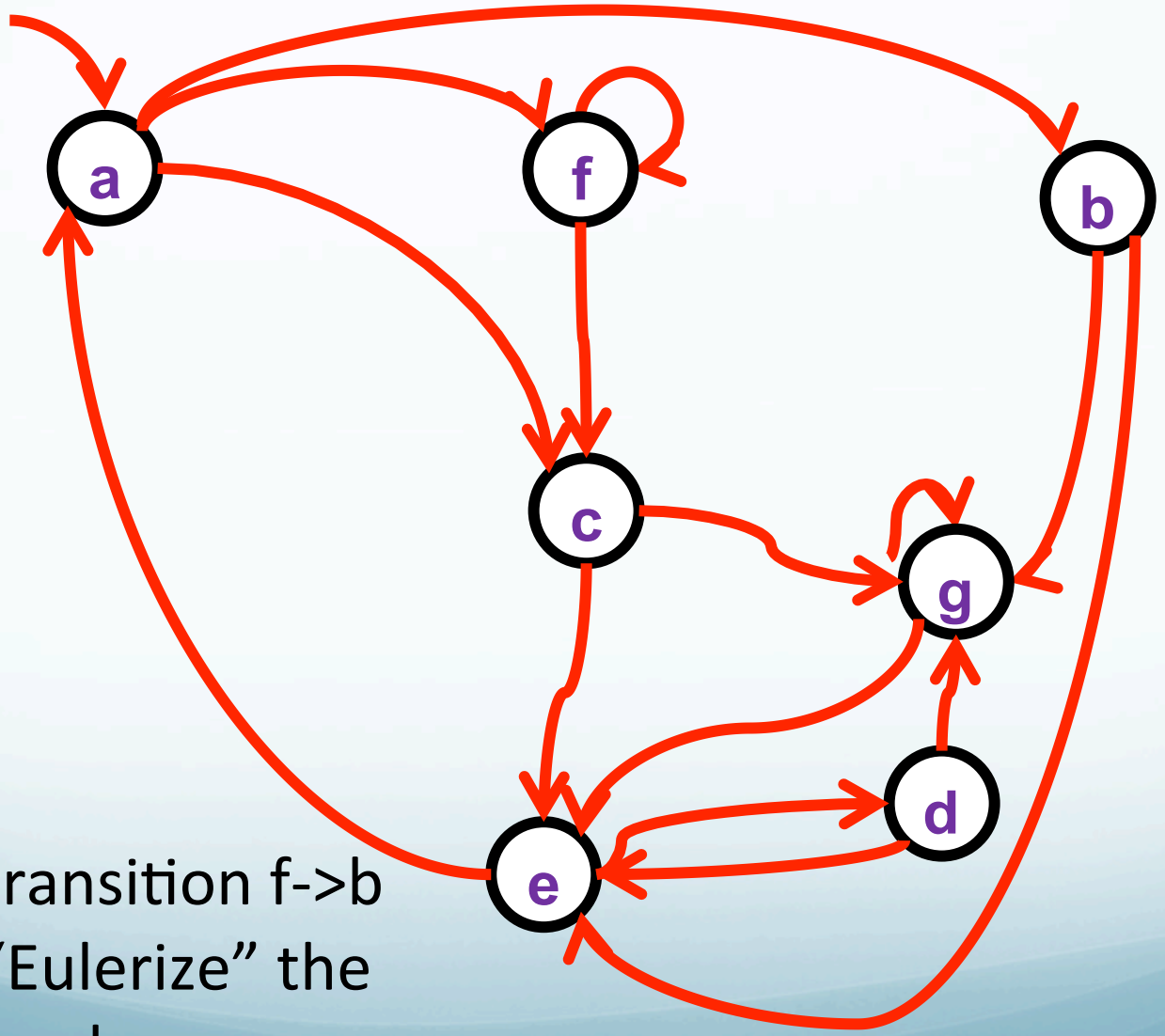
Test *link combinations* (2 actions: all pairs of adjacent actions)

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

Groups 2-5 persons: 10 min

Testing Combination of Actions

Solution



Problems:

-"Forgot" transition f->b

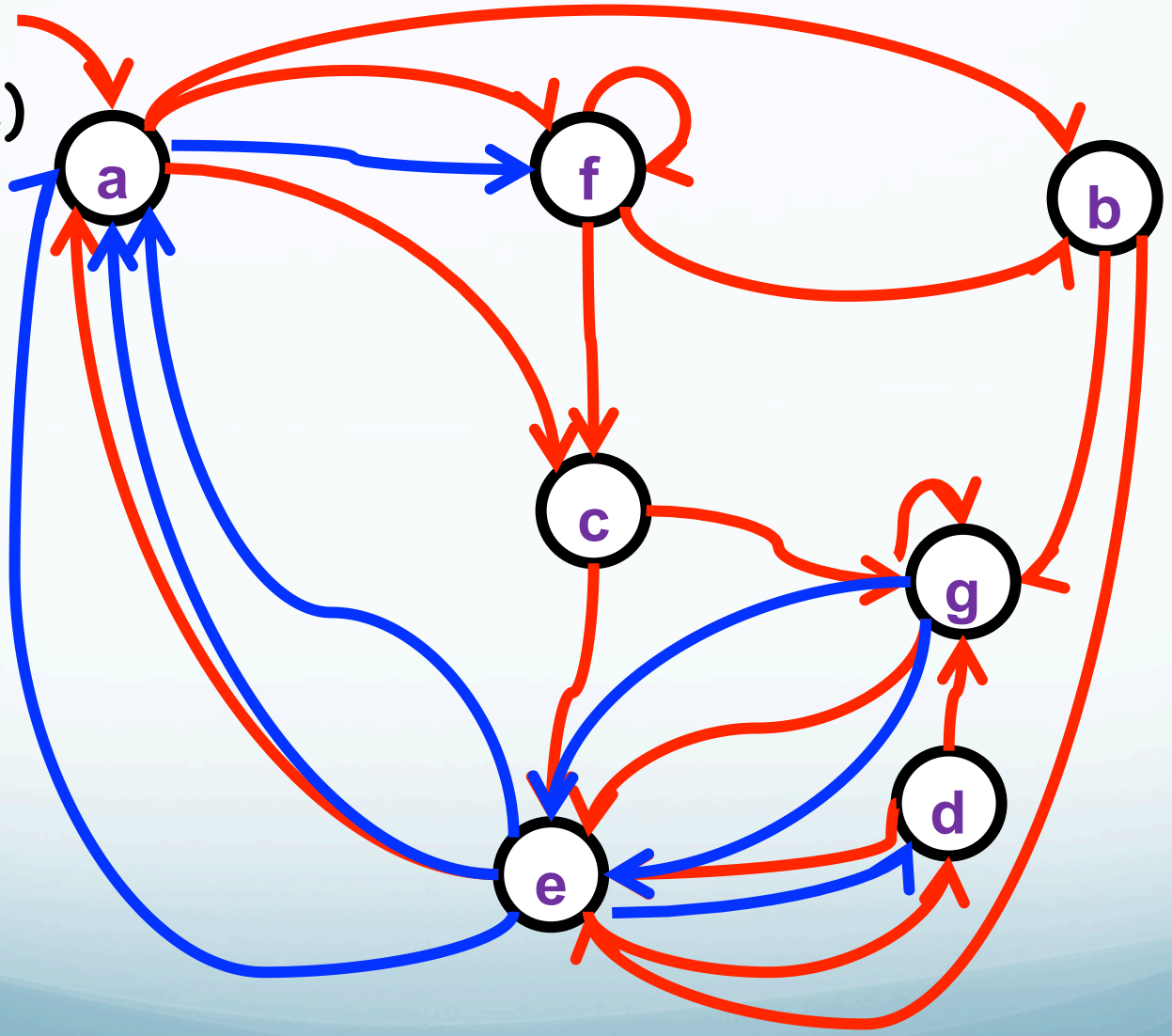
- Need to "Eulerize" the resulting graph

Groups 2-5 persons: 15 min

Testing Combination of Actions

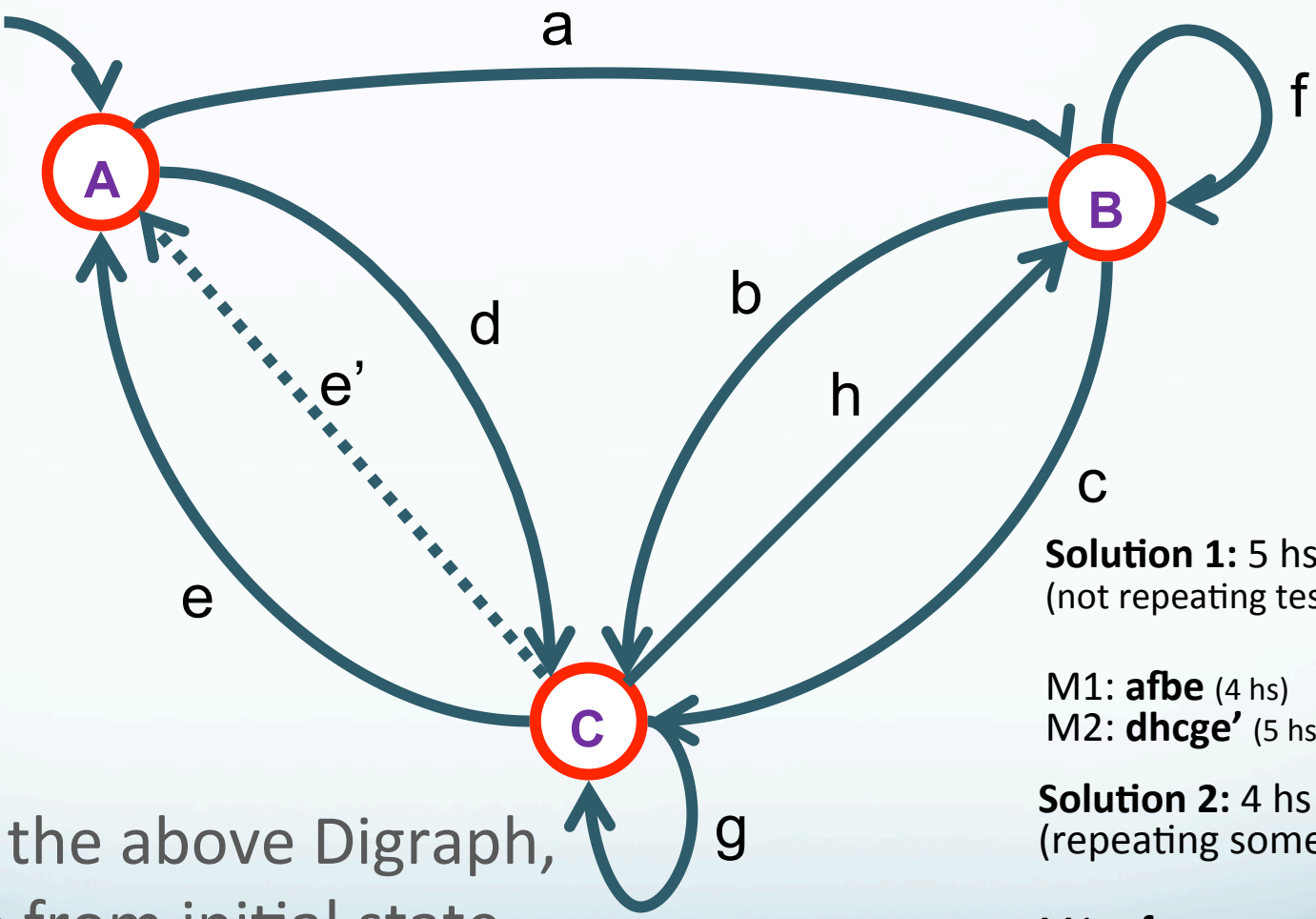
(Complete)

Solution



Groups 2-5 persons: 15 min

Testing under a Time Deadline



Assuming the above Digraph, parallelize from initial state

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

Solution 1: 5 hs
(not repeating tests)

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

Solution 2: 4 hs
(repeating some tests)

M1: **afce** (4 hs)
M2: **acge** (4 hs)
M3: **dhbe** (4 hs)

Groups 2-5 persons: 7 min

References

- 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