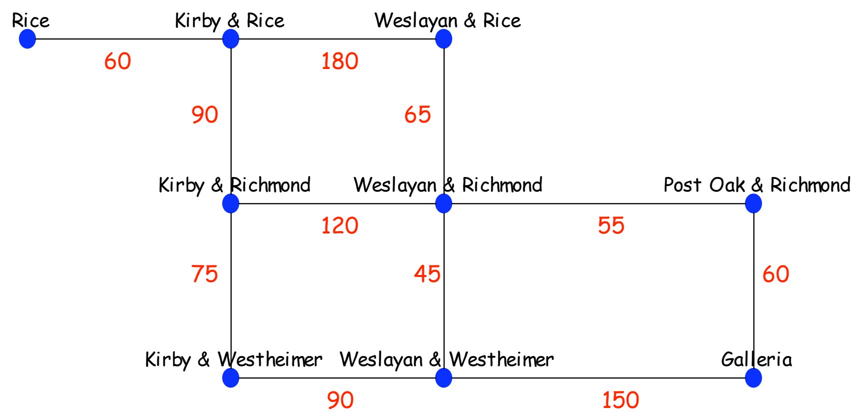
Rice to the Galleria
with dynamic planning

COMP 200, Lecture 19

Rice University

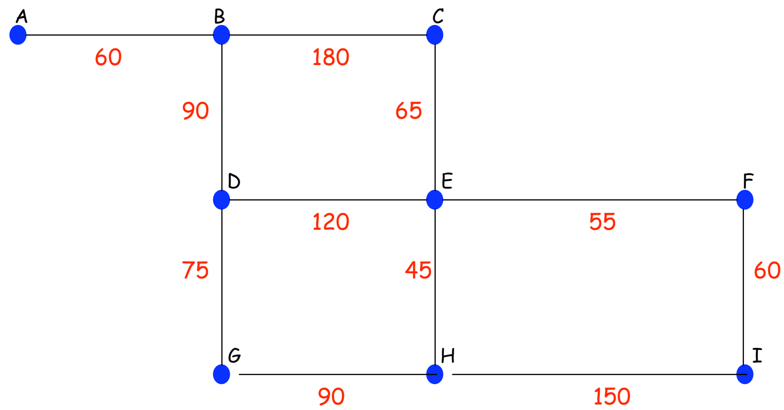
Fall 2004

Rice to Galleria



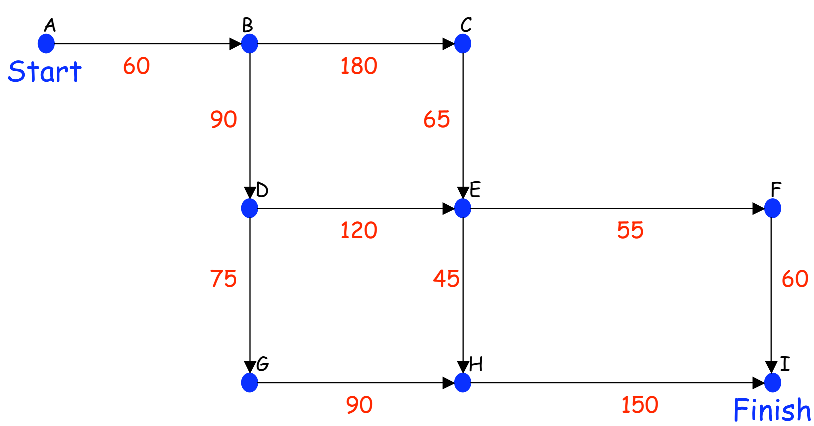
Highly simplified graph of the problem instance

Rice to Galleria



Change the names to protect the innocent

Rice to Galleria



Make all edges directed west or south

(no cycles)

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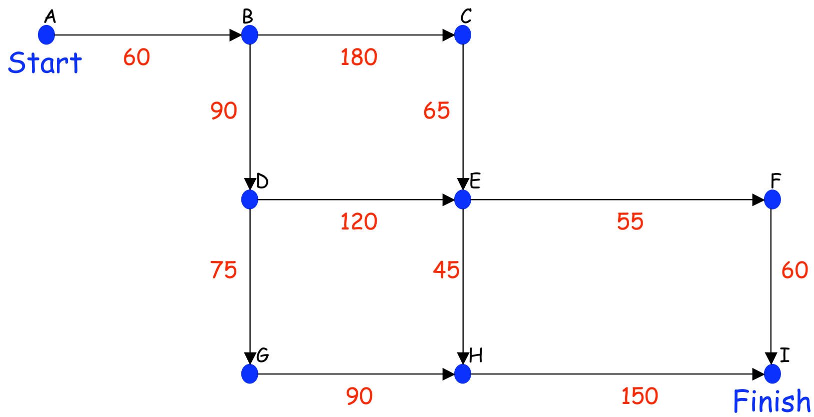

Find the Optimal Path(s)

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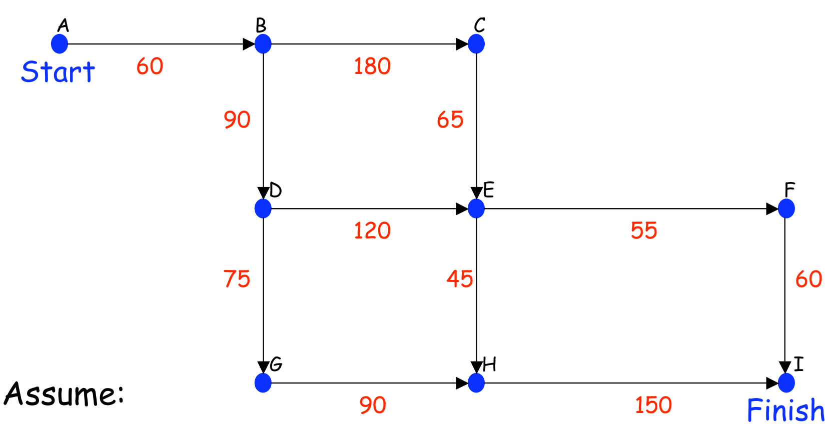

Assume:

- Optimal path can be composed of optimal subpaths
- Compute optimal path from Finish to each node

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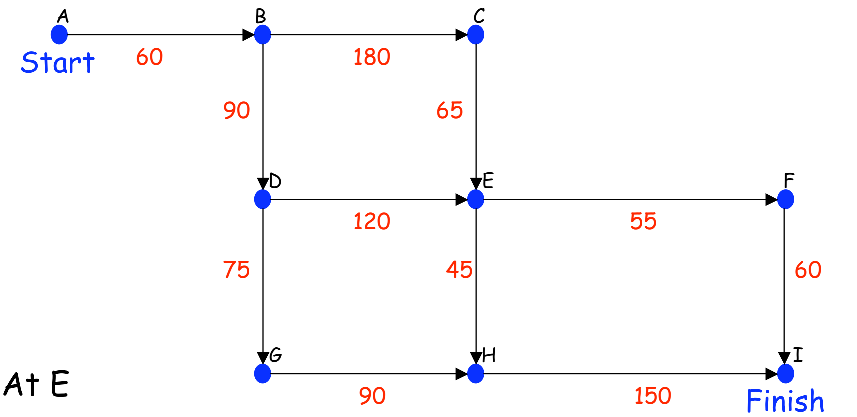

At E

- Optimal path has one of two costs
  - → 45 + cost(H) or 55 + cost(F)
- Given costs for H and F, we can pick optimal path for E

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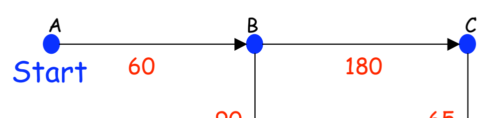

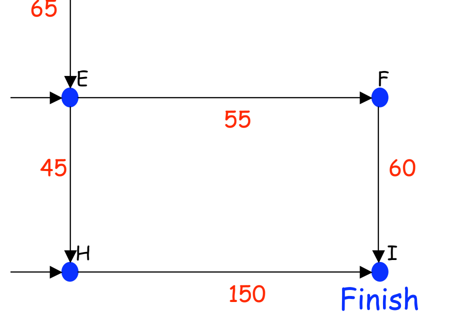

<u>Algorithm is easy</u>

done ← {Finish}

until |done| = nodes in *G*

  for each node *n* in *G*

    if every edge leaving n reaches a node in done, compute *n*'s cost and add *n* to done

cost(Start) is the cost of the optimal path

To get the actual path, just remember it as the algorithm builds the costs

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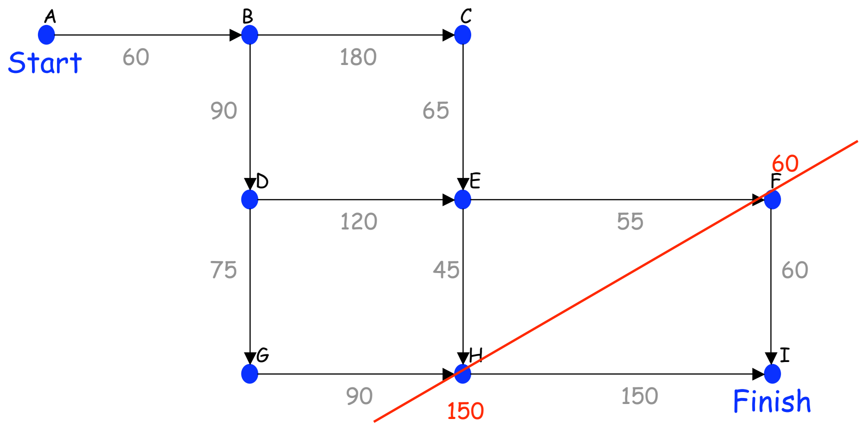

First time through the loop

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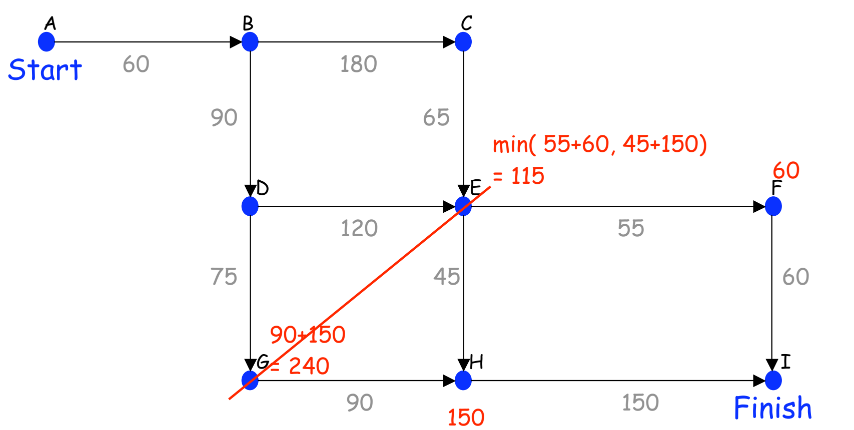

Second iteration

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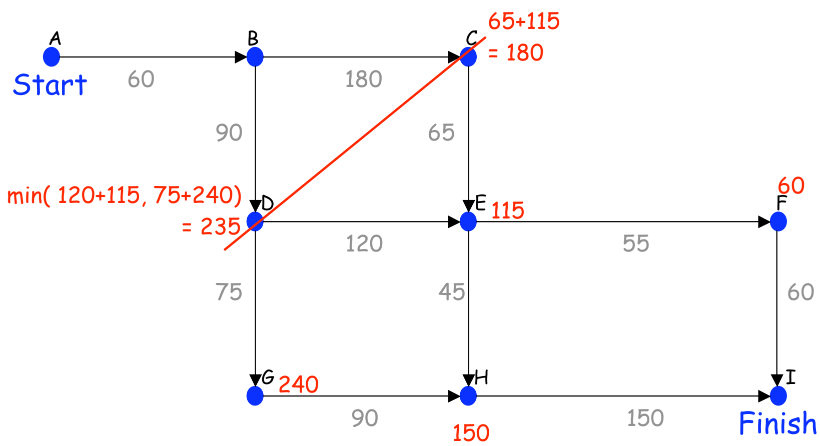

Third iteration

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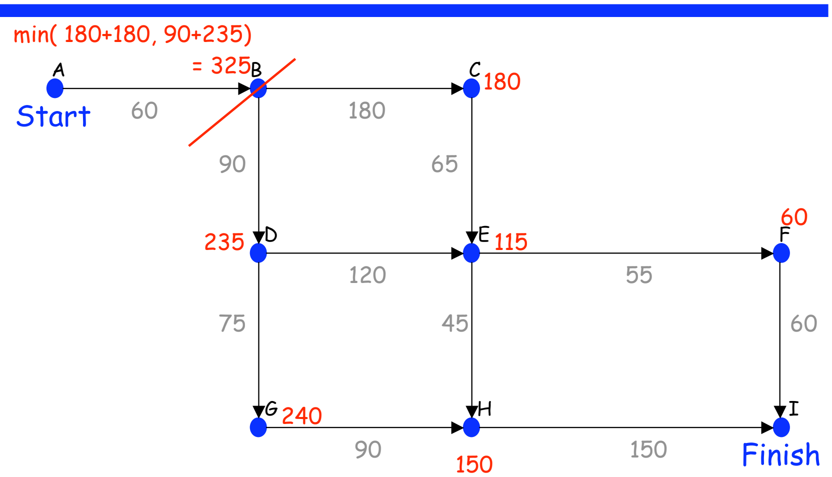

Fourth iteration

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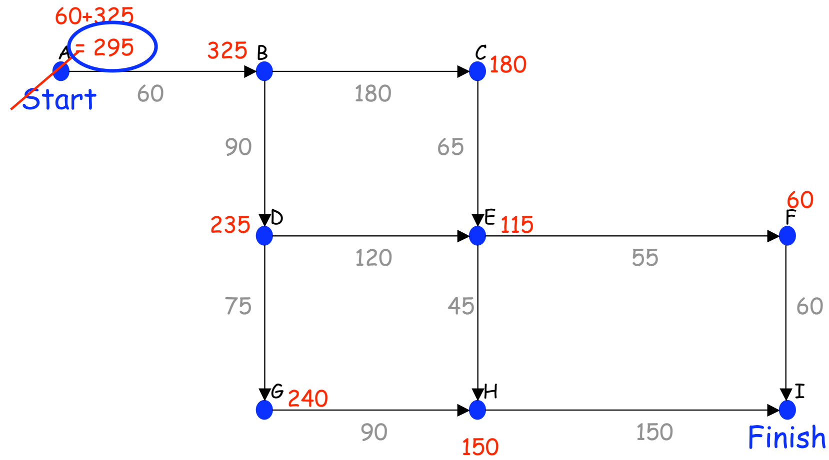

Fifth (& final) iteration

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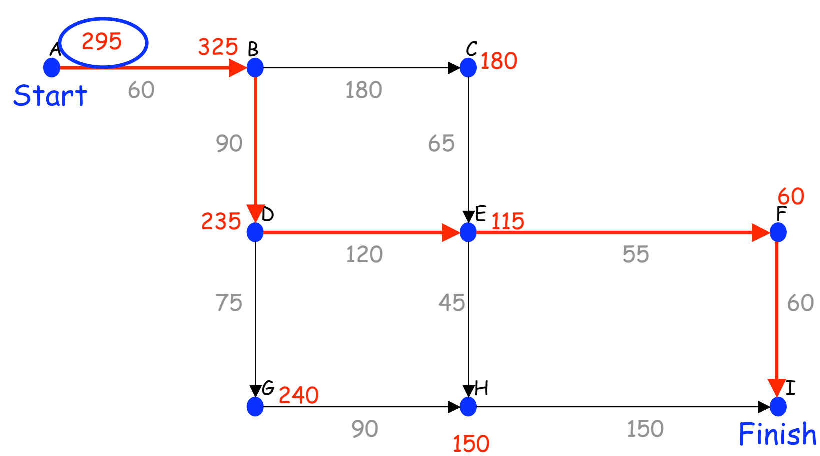

Minimal cost path

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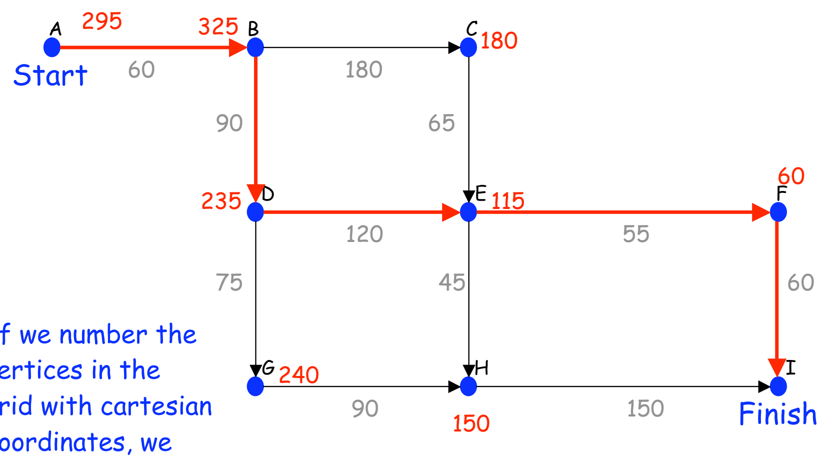

Minimal cost path

If we number the vertices in the grid with cartesian coordinates, we can make the tabulation more systematic.

Generalizing From Our Experience

What makes a problem susceptible to dynamic planning?

- Combination of local optima produces global optimum
- Optimality criteria can be formulated as recurrence
  - → c(i,j) = min(cost(<i,j><i,j+1>) + c(i,j+1), cost(<i,j><i+1,j> + c(i+1,j))

The tabulation process, while more expensive than a simple greedy algorithm, is much less expensive than enumerating all the possibilities