Heuristic Search

What is heuristic search

›› **What is a heuristic search?**

What is heuristic search – 2

» **What is a heuristic search?**

> **Using problem domain information**

Why use heuristic search

» **Why is heuristic search used?**

Why use heuristic search – 2

» **Why is heuristic search used?**

> > **To make searching more efficient by concentrating on the most likely paths**
> > – **Best first paths**

Why use heuristic search – 3

» **Why is heuristic search used?**

> **To make searching more efficient by concentrating on the most likely paths**
– Best first paths

> **As opposed to trying**
– All paths equally
– Random order

Best-first search

» **Best-first search would be based on which basic search method?**

Best-first search – 2

» **Best-first search would be based on which basic search method?**

> **Breadth-first**

Best-first search – 3

» **Best-first search would be based on which basic search method?**

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» **Why?**

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Best-first search – 4

» **Best-first search would be based on which basic search method?**

> **Breadth-first**

» **Why?**

> **Need to have a set of paths from which to select the best path to extend**

Best-first search – 5

» **Best-first search would be based on which basic search method?**

> **Breadth-first**

» **Why?**

> **Need to have a set of paths from which to select the best path to extend**

> **Want to minimize work selecting paths to extend**

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Selecting a path

◊ Given a set of paths P1 .. Pn

  ›› **What do you need to be able to select the best path to extend?**

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Selecting a path – 2

◊ Given a set of paths P1 .. Pn

    » **What do you need to be able to select the best path to extend?**

        > **A cost is associated with each path**

Selecting a path – 3

◊ Given a set of paths P1 .. Pn

  » **What do you need to be able to select the best path to extend?**

    > **A cost is associated with each path**

  » **How do you use the cost to select the best path?**

Selecting a path – 4

◊ Given a set of paths P1 .. Pn

   ›› **What do you need to be able to select the best path to extend?**

      > **A cost is associated with each path**

   ›› **How do you use the cost to select the best path?**

      > **The path with the minimum cost would be the best one to extend**

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Path cost

◊ Given a set of paths P1 .. Pn

   » **How is the cost of a path computed?**

Path cost – 2

◊ Given a set of paths P1 .. Pn

  » **How is the cost of a path computed?**

    > **Each edge has a cost associated with it.**

Path cost – 3

◊ Given a set of paths P1 .. Pn

   » **How is the cost of a path computed?**

     > **Each edge has a cost associated with it.**

     > **The cost of a path is the sum of the costs of the edges in the path**

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Path cost – 4

◊ Given a set of paths P1 .. Pn

» **How would the cost of a path computed?**

> **Each edge has a cost associated with it.**

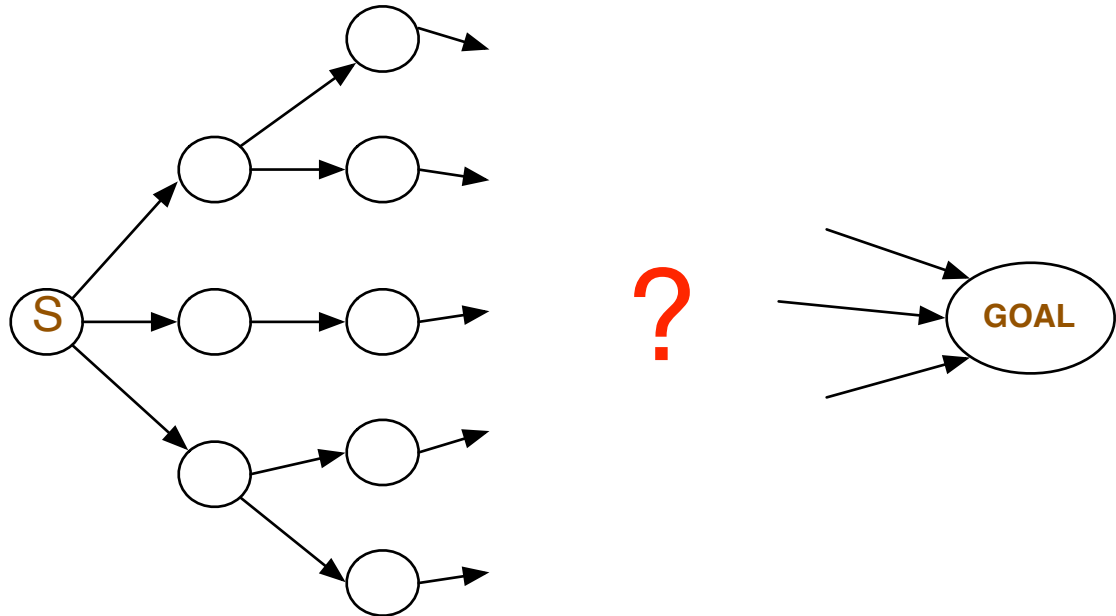> **The cost of a path is the sum of the costs of the edges in the path**

» **What else?**

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Path cost – 5

◊ Given a set of paths P1 .. Pn

 ›› **How would the cost of a path computed?**

 > **Each edge has a cost associated with it.**

 > **The cost of a path is the sum of the costs of the edges in the path**

 ›› **What else?**

Found paths

Path cost – 6

◊ Given a set of paths P1 .. Pn

» **How would the cost of a path computed?**

> **Each edge has a cost associated with it.**

> **The cost of a path is the sum of the costs of the edges in the path**

» **What else?**

> **An estimate of the cost to get to the goal from the vertex at the end of the path**

Types of heuristic searches

» **In the textbook, what types of heuristic searches are discussed?**

Types of heuristic searches – 2

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> **A***

– **One of the best known algorithms in AI**

Types of heuristic searches – 3

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Types of heuristic searches – 4

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> **RBFS**

– **Recursive Best First Search**

Types of heuristic searches – 5

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  > **A***

   – **One of the best known algorithms in AI**

  > **IDA***

   – **Iterative deepening A***

  > **RBFS**

   – **Recursive Best First Search**

  > **RTA***

   – **Real-time A***

Difference between search methods

» **What is the major difference between the different heuristic search methods?**

Difference between search methods – 2

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> **Different ways of trading off space versus time**

– E.g. have linear space vs exponential space at a cost of regenerating paths that were not saved

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Difference between search methods – 3

» **What is the major differences between the different heuristic search methods?**

> **Different ways of trading off space versus time**

– E.g. have linear space vs exponential space at a cost of regenerating paths that were not saved

> **Trading off optimality vs time**

– Minimize computation time at the expense of quality of solution