




# COMP 472 A2 DEMO

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# Heuristic Comparison

- H1: Sum of Euclidean distances of all tiles
- H2: Number of mismatched columns
- Properties
  - *H1: Non-monotonic, more informed*
  - *H2: Monotonic, less informed*
- Success rate: “No solution”
  - *H1 < H2*
  - *H1 is more time-consuming (more timeout)*
- Execution time
  - *H1 < H2*
  - *H1: more informed => shorter search path => shorter time & “average”*

GBFS-h1 Number of no solution: 49

A\*-h1 Number of no solution: 44

GBFS-h2 Number of no solution: 38

A\*-h2 Number of no solution: 45

GBFS-h1 Average time: 0.3189995288848877

A\*-h1 Average time: 6.313175360361735

GBFS-h2 Average time: 7.227139949798584

A\*-h2 Average time: 11.100868844985962

# Heuristic Comparison

## ■ Length of search path

- $H1 > H2$
- *H1: more informed  $\Rightarrow$  shorter search path*

GBFS-h1 Average length of search paths: 4.0

A\*-h1 Average length of search paths: 395.6666666666667

GBFS-h2 Average length of search paths: 310.5833333333333

A\*-h2 Average length of search paths: 634.4

## ■ Cost

- $H1 < H2$
- *Depends more on algorithm than heuristic*

GBFS-h1 Average cost: 7.0

A\*-h1 Average cost: 8.666666666666666

GBFS-h2 Average cost: 45.083333333333336

A\*-h2 Average cost: 8.6

# Algorithm Comparison

## ■ Optimality of solution paths

- *UCS: optimal*
- *GBFS: NOT optimal*
- *A\*: optimal*

## ■ Cost

- $UCS \approx A^* > GBFS$

UCS Total cost: 7

GBFS-h1 Average cost: 7.0

GBFS-h2 Average cost: 45.083333333333336

A\*-h1 Average cost: 8.666666666666666

A\*-h2 Average cost: 8.6

## ■ Length of search paths

- $UCS > GBFS > A^*$

UCS Average length of search paths: 1746.0

GBFS-h1 Average length of search paths: 4.0

GBFS-h2 Average length of search paths: 310.5833333333333

A\*-h1 Average length of search paths: 395.6666666666667

A\*-h2 Average length of search paths: 634.4

# Algorithm Comparison

## ■ Execution time

- $GBFS > A^* > UCS$
- *GBFS: not aiming for optimal search path (less back-trace)*

UCS Average time: 35.0490927696228

GBFS-h1 Average cost: 7.0

A\*-h1 Average cost: 8.666666666666666

GBFS-h2 Average cost: 45.083333333333336

A\*-h2 Average cost: 8.6

## ■ “No solution”

- $GBFS \approx A^* > UCS$
- *UCS: informed search => too slow*

UCS Number of no solution: 49

GBFS-h1 Number of no solution: 49

A\*-h1 Number of no solution: 44

GBFS-h2 Number of no solution: 38

A\*-h2 Number of no solution: 45

# Scale up - GBFS(h2)

- GBFS(h2): with least “No solution” (timeout)
- Random shape: 3\*4 puzzle
- Input size: 5 random generated puzzles
- Timeout = 600s (10min)

```
Scaled GBFS Total length of search paths: 0
Scaled GBFS Average length of search paths: 0.0
Scaled GBFS Total time: 0
Scaled GBFS Average time: 0.0
Scaled GBFS Total length of solution paths: 0
Scaled GBFS Average length of solution paths: 0.0
Scaled GBFS Total cost: 0
Scaled GBFS Average cost: 0.0
Scaled GBFS Number of no solution: 5
```