Higher-Dimensional Potential Heuristics: Lower Bound Criterion and Connection to Correlation Complexity

Simon Dold and Malte Helmert
University of Basel

The macro consists of a set-up, a main execution and a tear-down

The set-up and tear-down have to be inverse of each other. They can be n-times folded macros themselves. If they are, then the macro is folded n+1 times.

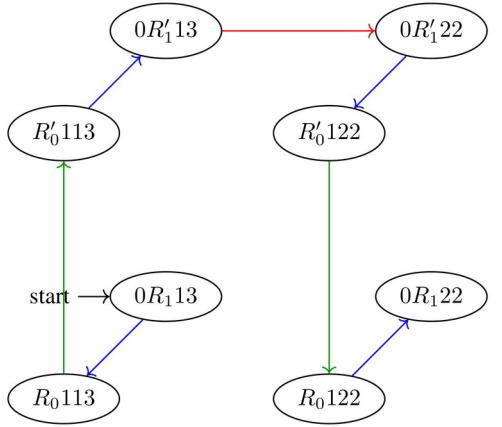
Each plan contains the macro

A sequence of actions

Critical, Folded Macros cause large Correlation Complexity

2 times folded macro in Termes

```
    move-down pos-2 n1 pos-1 n0
  create-block pos-1
    move-up pos-1 n0 pos-2 n1
place-block pos-2 pos-3 n1 n2
move-up pos-2 n1 pos-3 n2
remove-block pos-3 pos-4 n3 n2
move-down pos-3 n2 pos-2 n1
    move-down pos-2 n1 pos-1 n0
  destroy-block pos-1
    move-up pos-1 n0 pos-2 n1
```



Dimension required for descending and dead-end avoiding potential heuristic

Each solvable + reachable state has an improving successor. Such improving successors are solvable.

Computed with a weighted count of the partial states that agree with the given state

$$h(s) = \sum_{p \in P} w(p) \cdot [p \subseteq s]$$

Theorem: If a macro is critical in a planning task and folded n times, then the task has correlation complexity of at least n+1.