Résolution de niveaux du Sokoban

PoulpoGaz, darth-mole

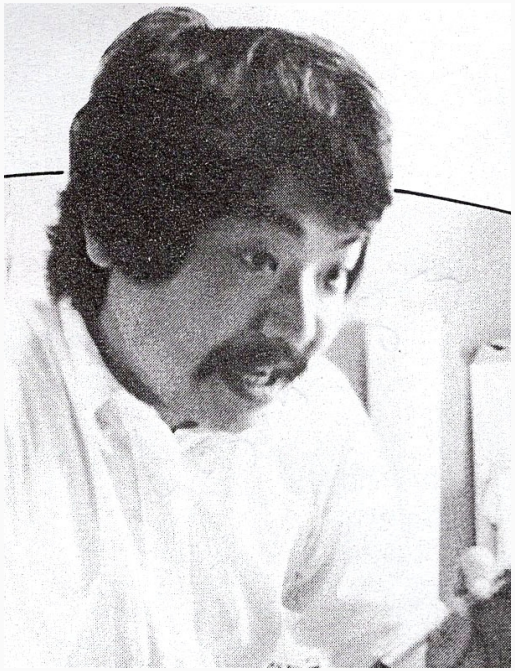
16 mai 2023

Candidat n° 012345

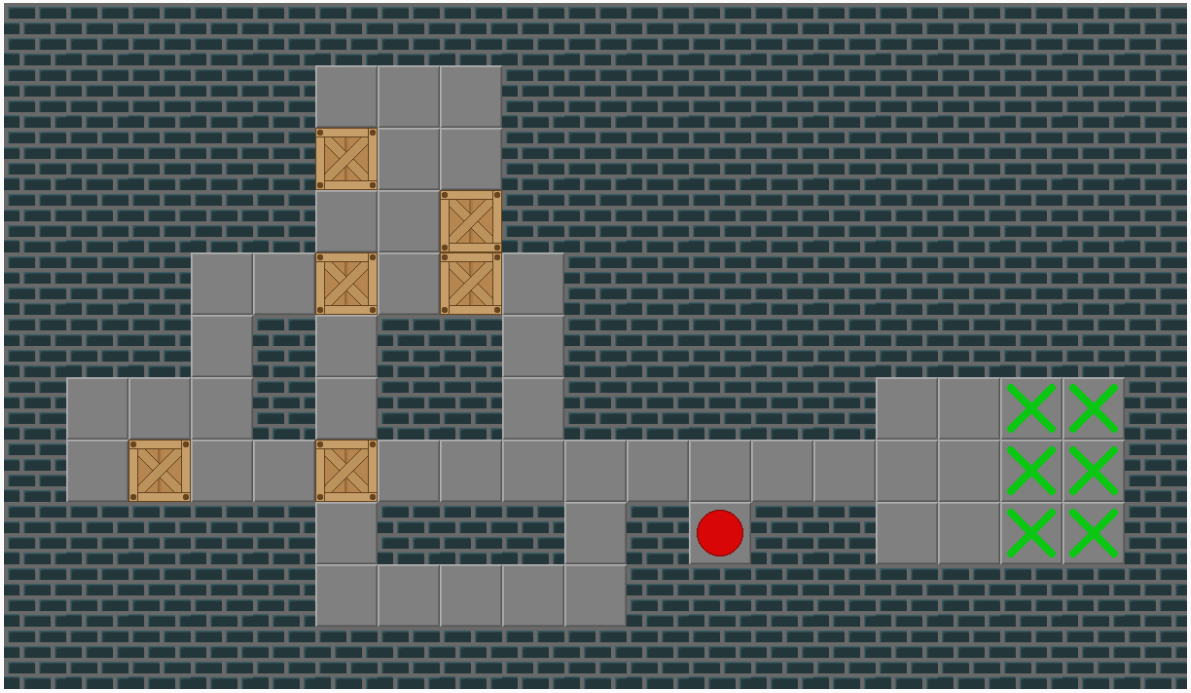
Plan

Le jeu du Sokoban

Le jeu du Sokoban



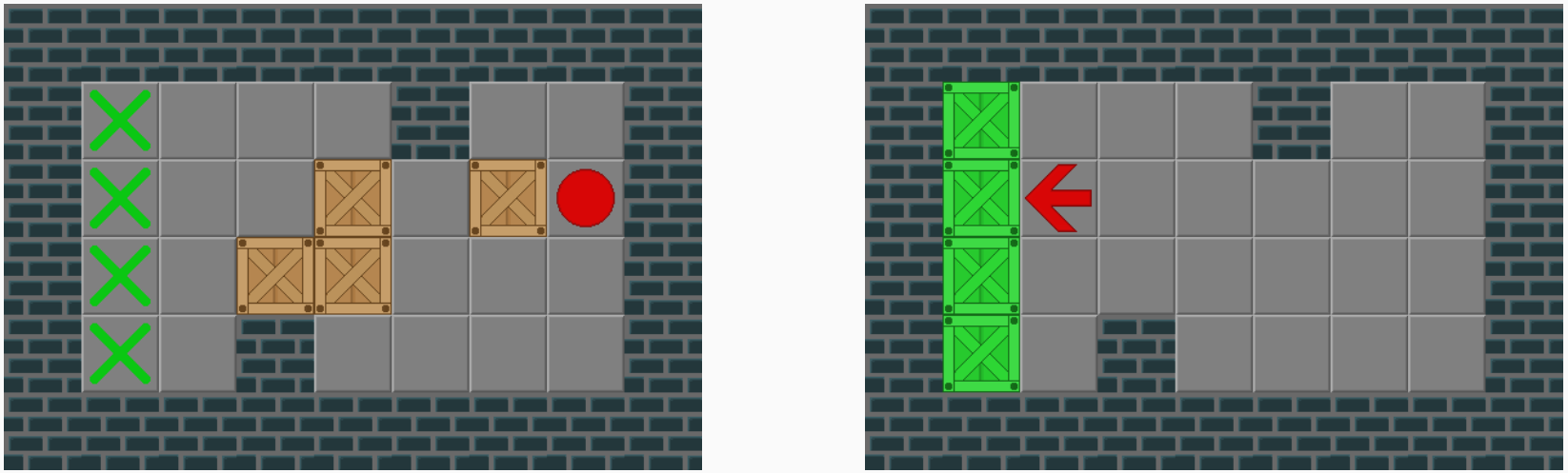
Hiroyuki Imabayashi



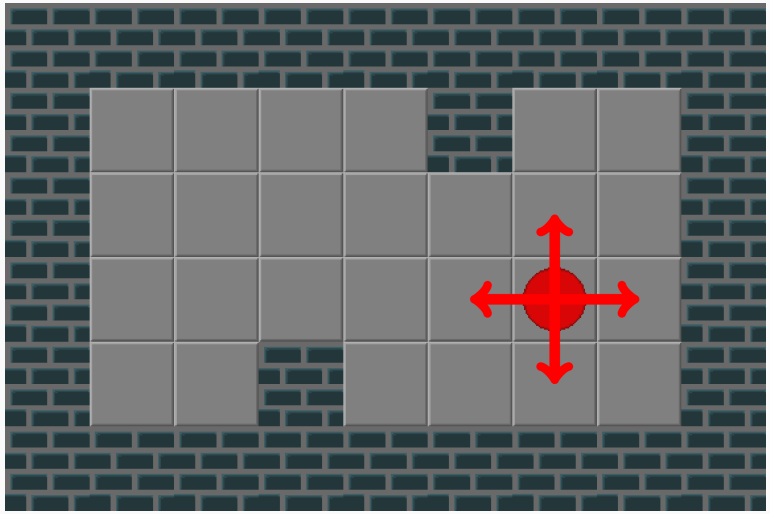
XSokoban

But du jeu

Déplacements

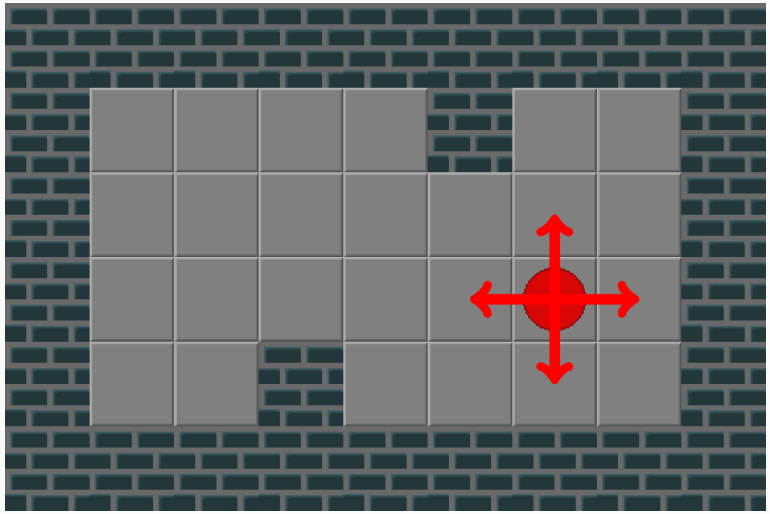


Règles

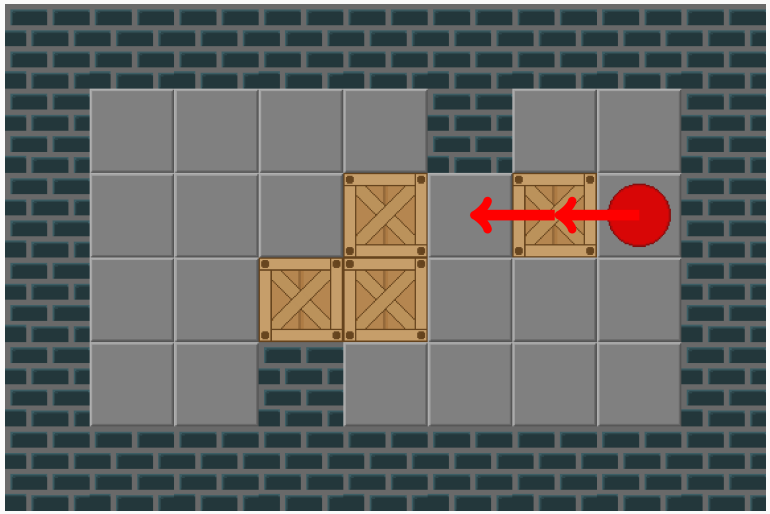


Déplacements autorisés

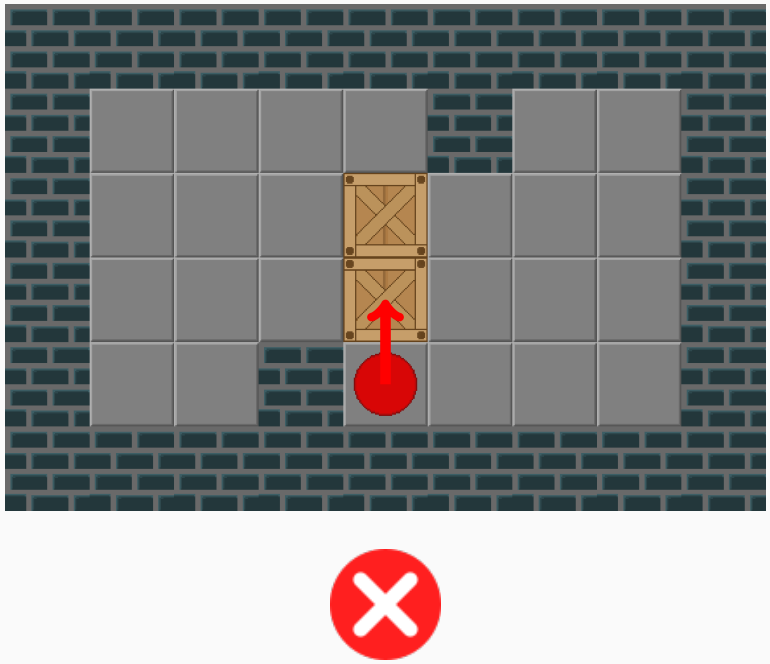
Règles

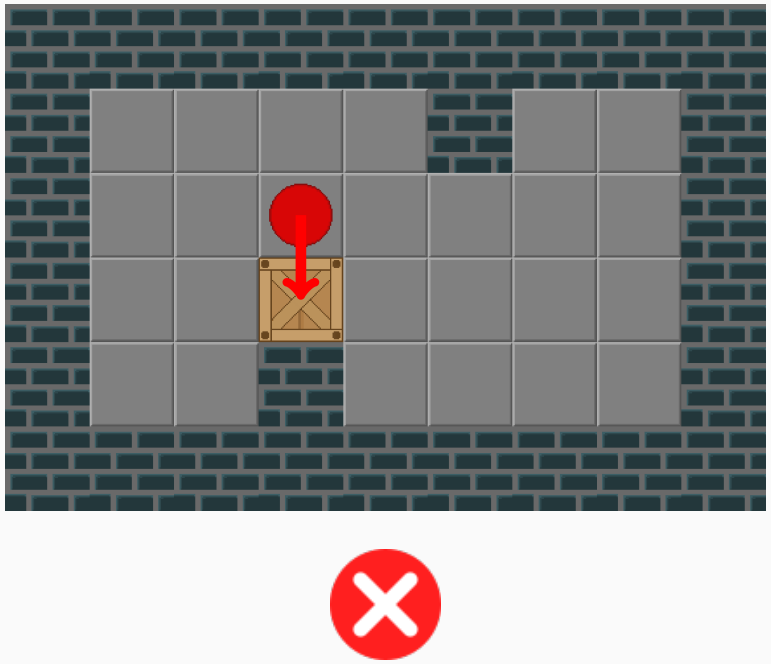


Déplacements autorisés

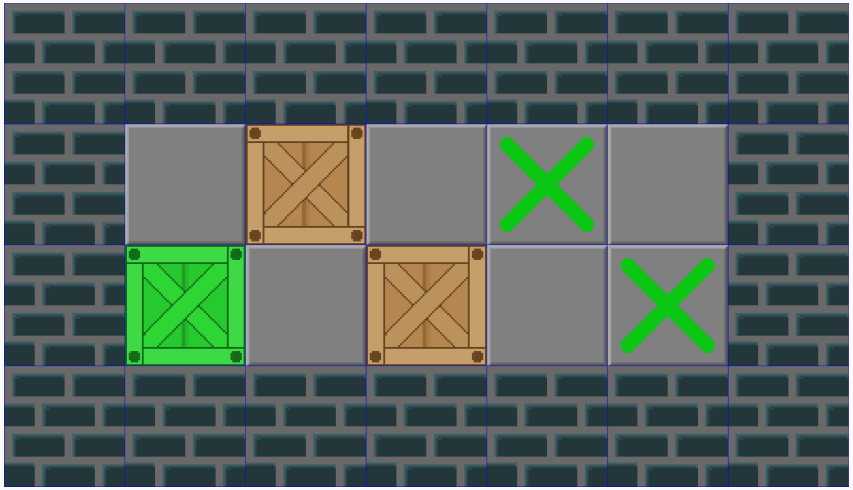


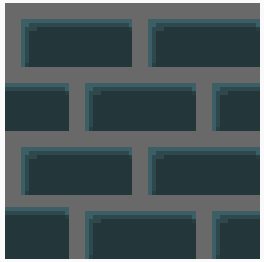
Règles





Tuiles





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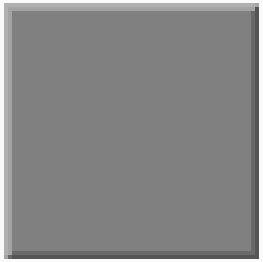
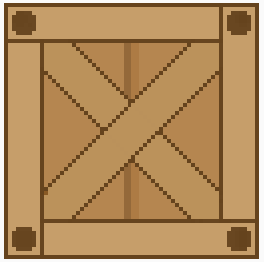
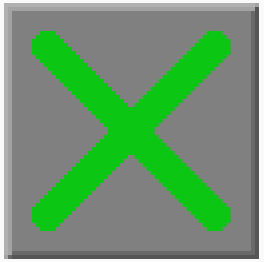


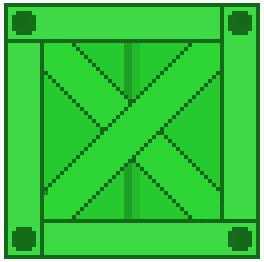
Sol



Caisse

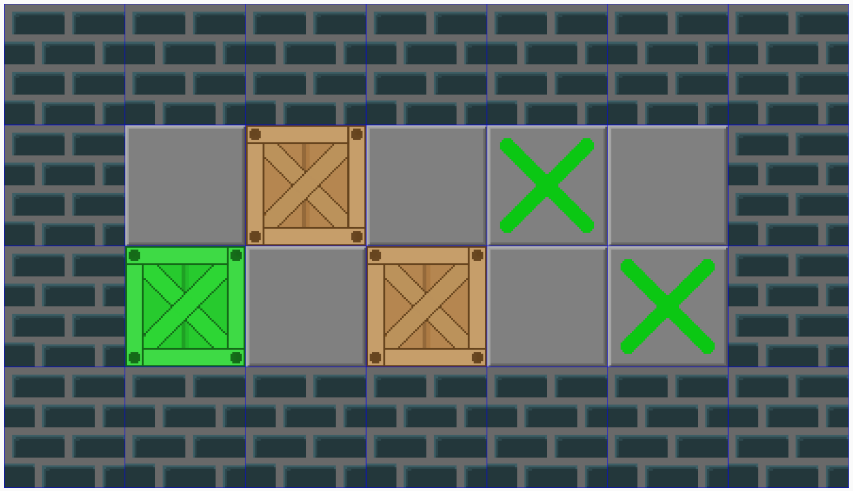


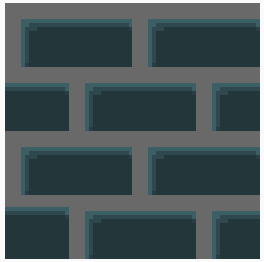
Cible



Caisse sur une cible

Tuiles





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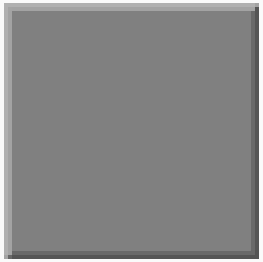
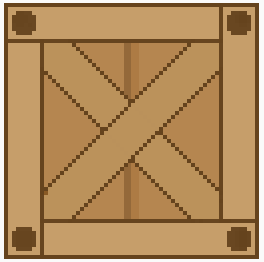
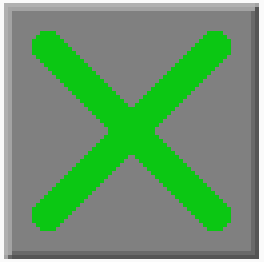


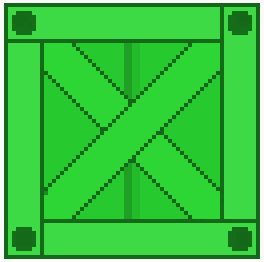
Sol



Caisse



Cible



Caisse sur une cible

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enum Tile {WALL, FLOOR, CRATE, TARGET, CRATE_ON_TARGET};

Tile[][] map = new Tile[height][width];
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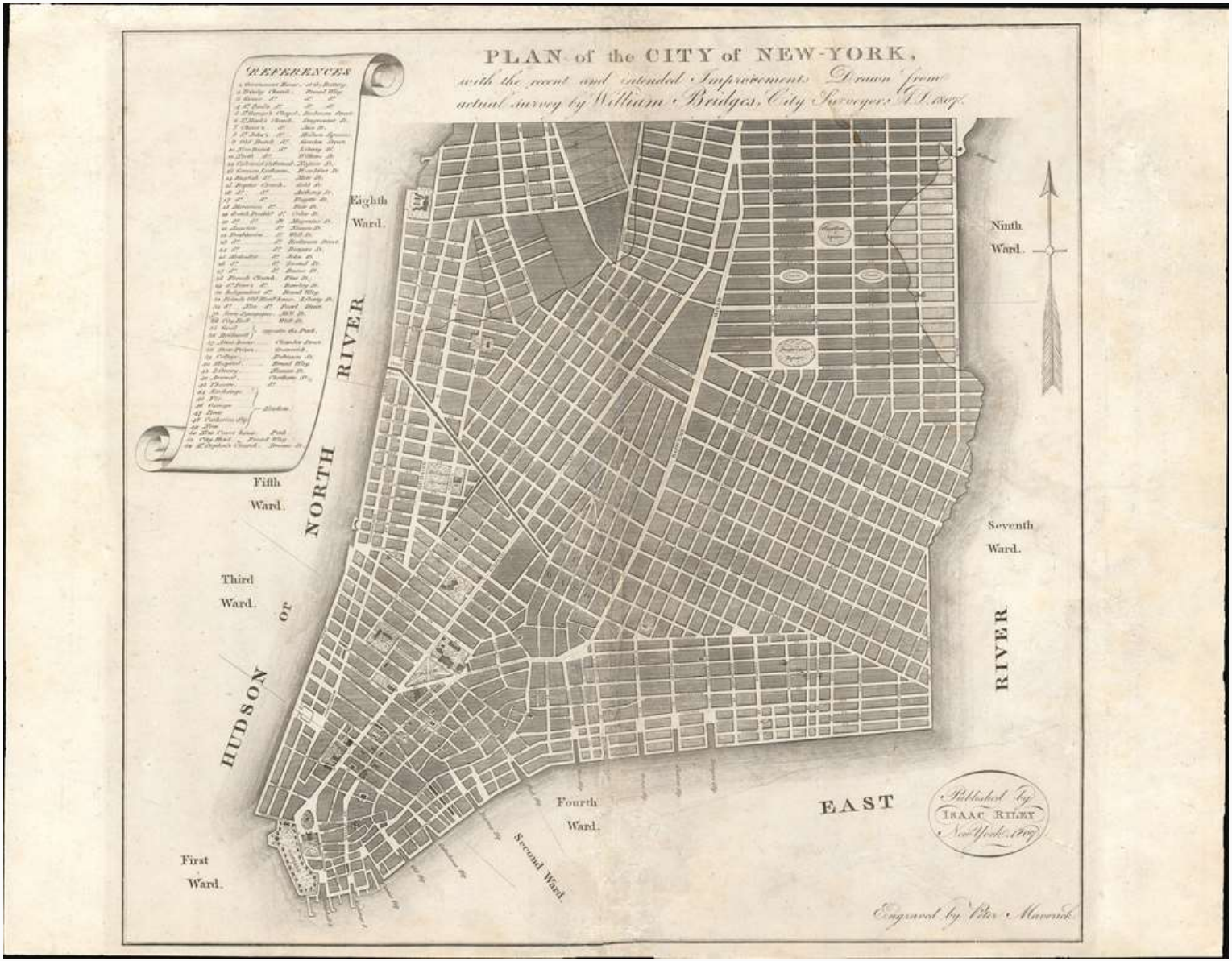
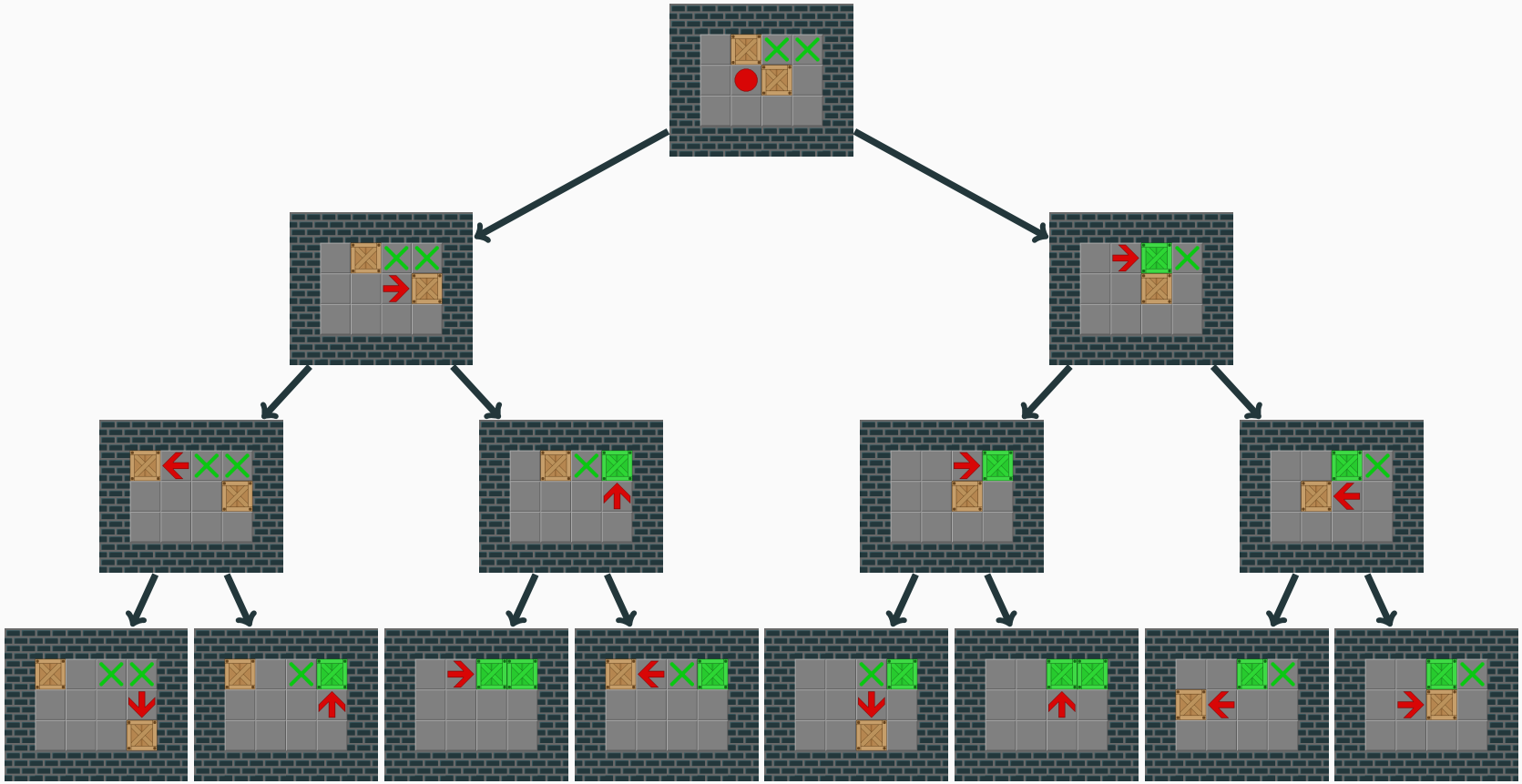
Lien avec le thème de l'année

Lien avec le thème de l'année

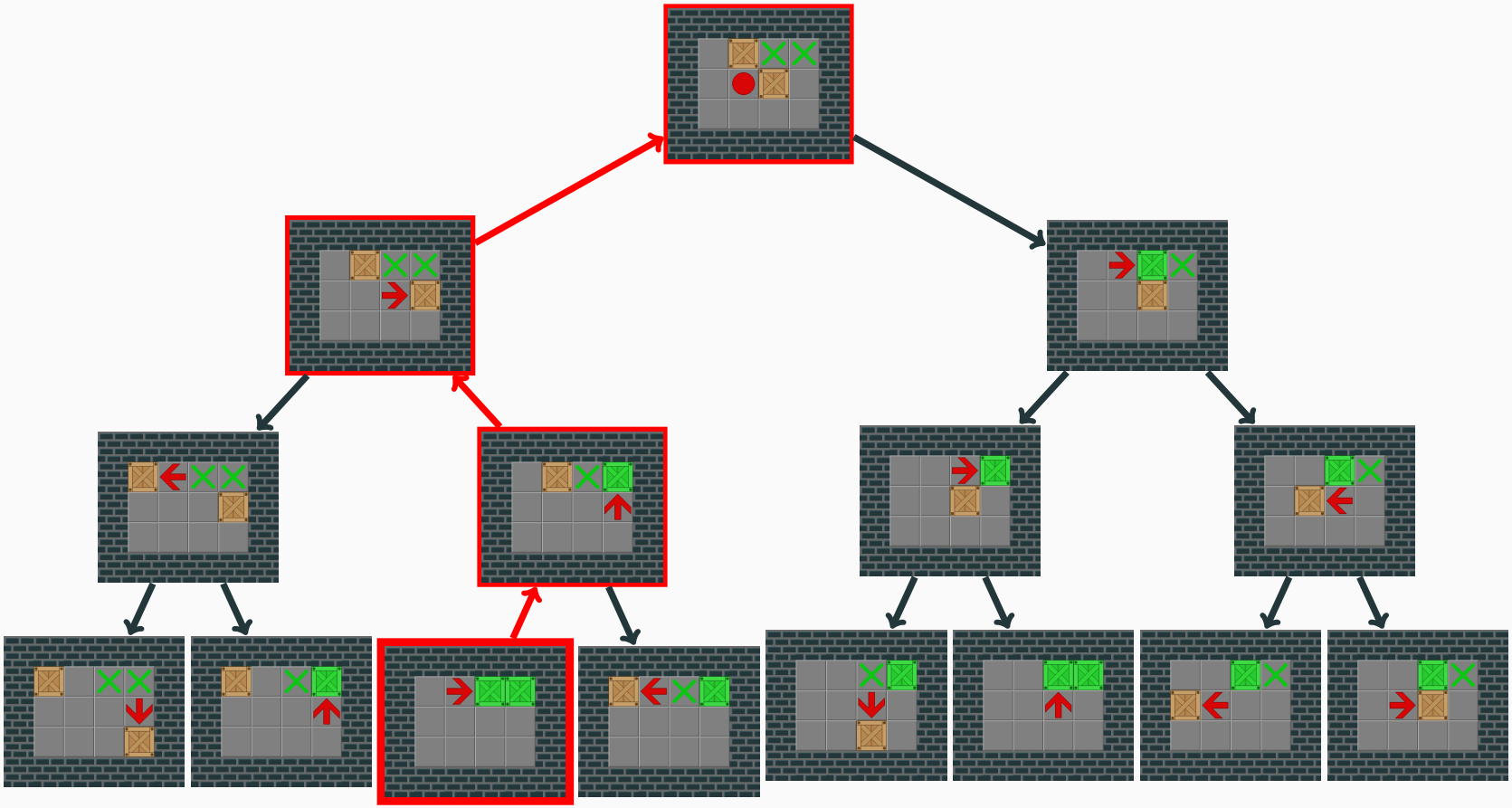


Principe de résolution

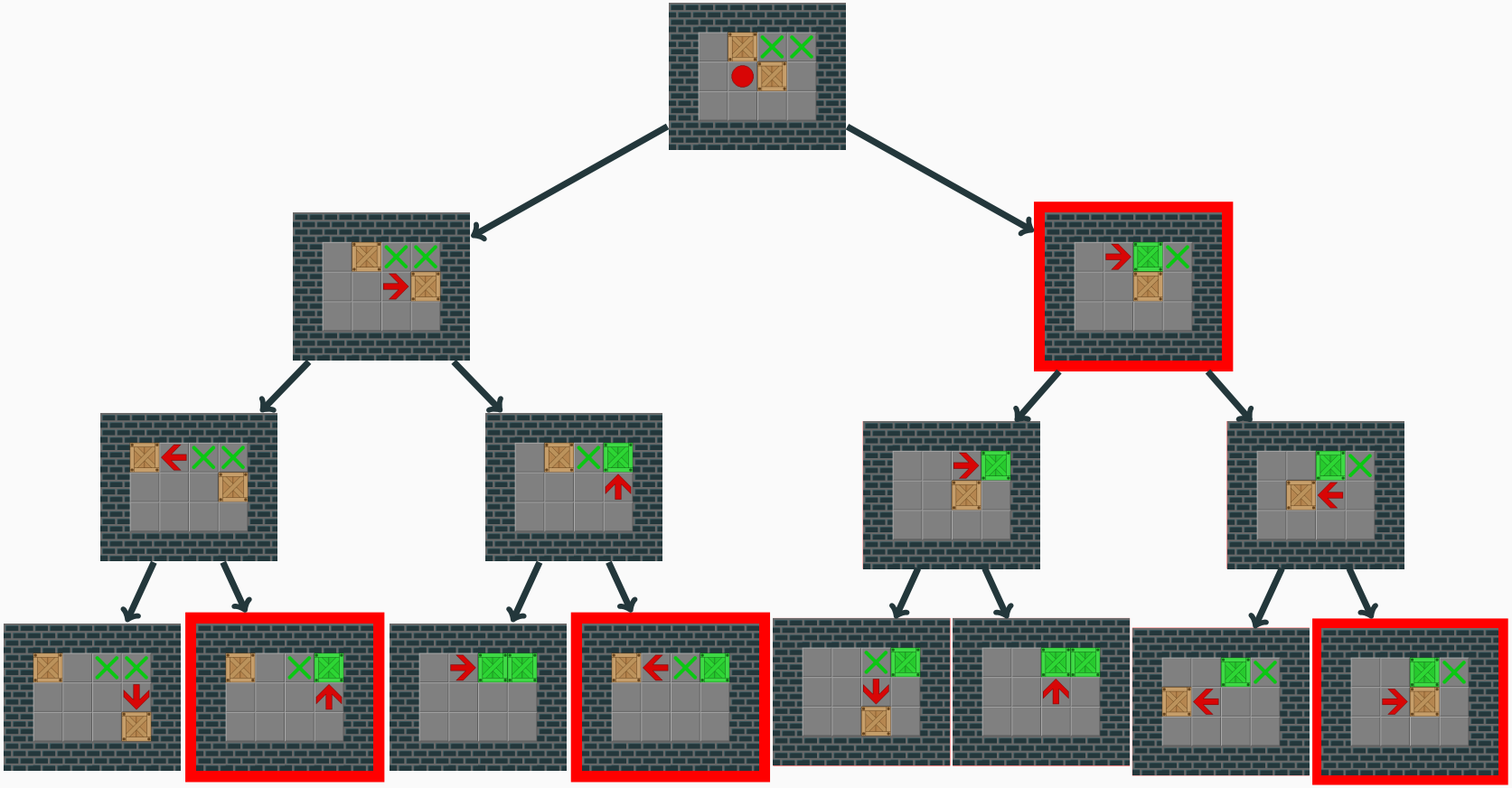
Arbre des états



Arbre des états



Arbre des états



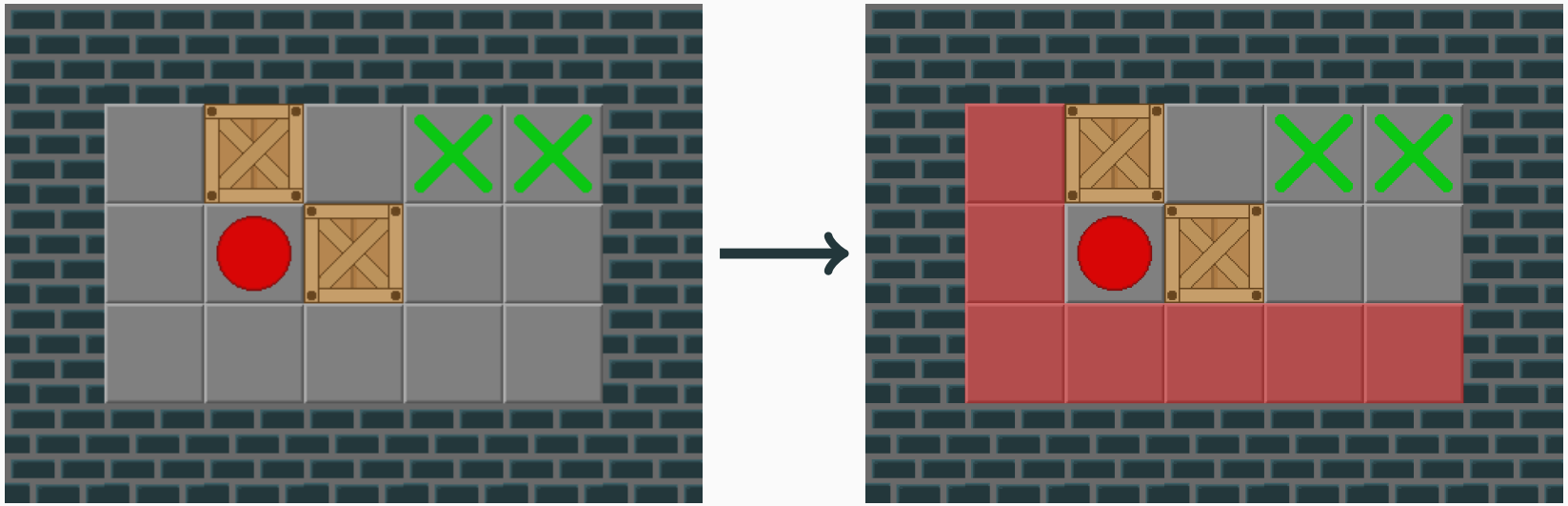
Calcul du *hash* d'un état

Réduction de l'espace de recherche

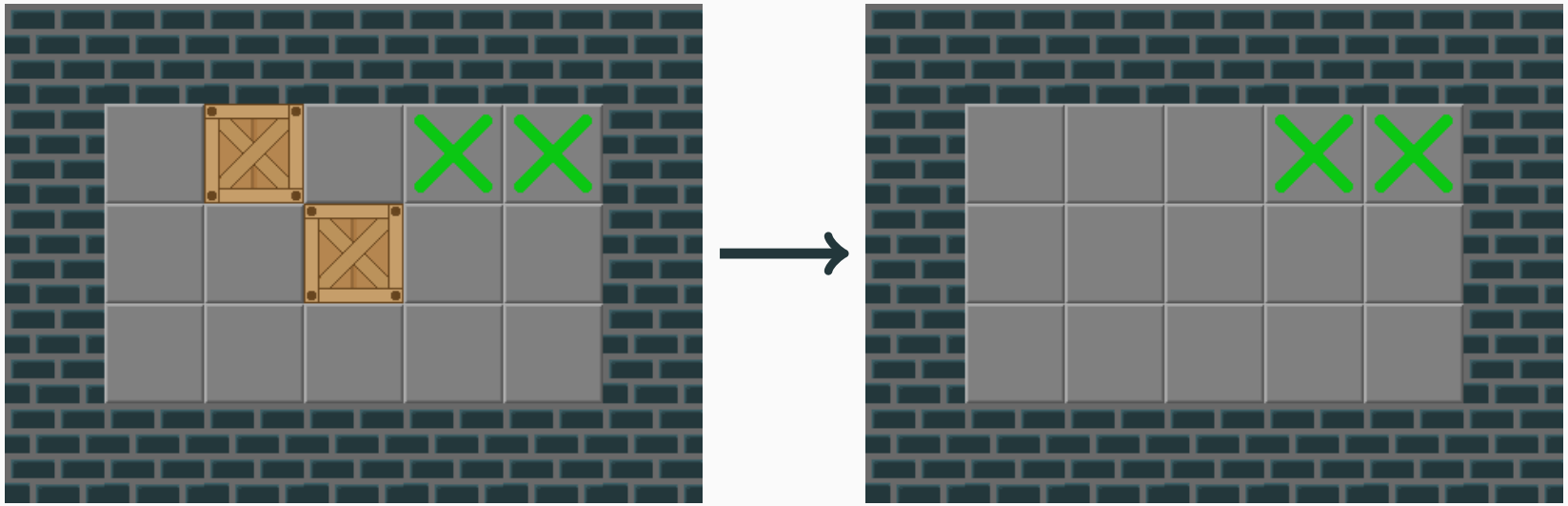
Réduction de l'espace de recherche

Analyse statique

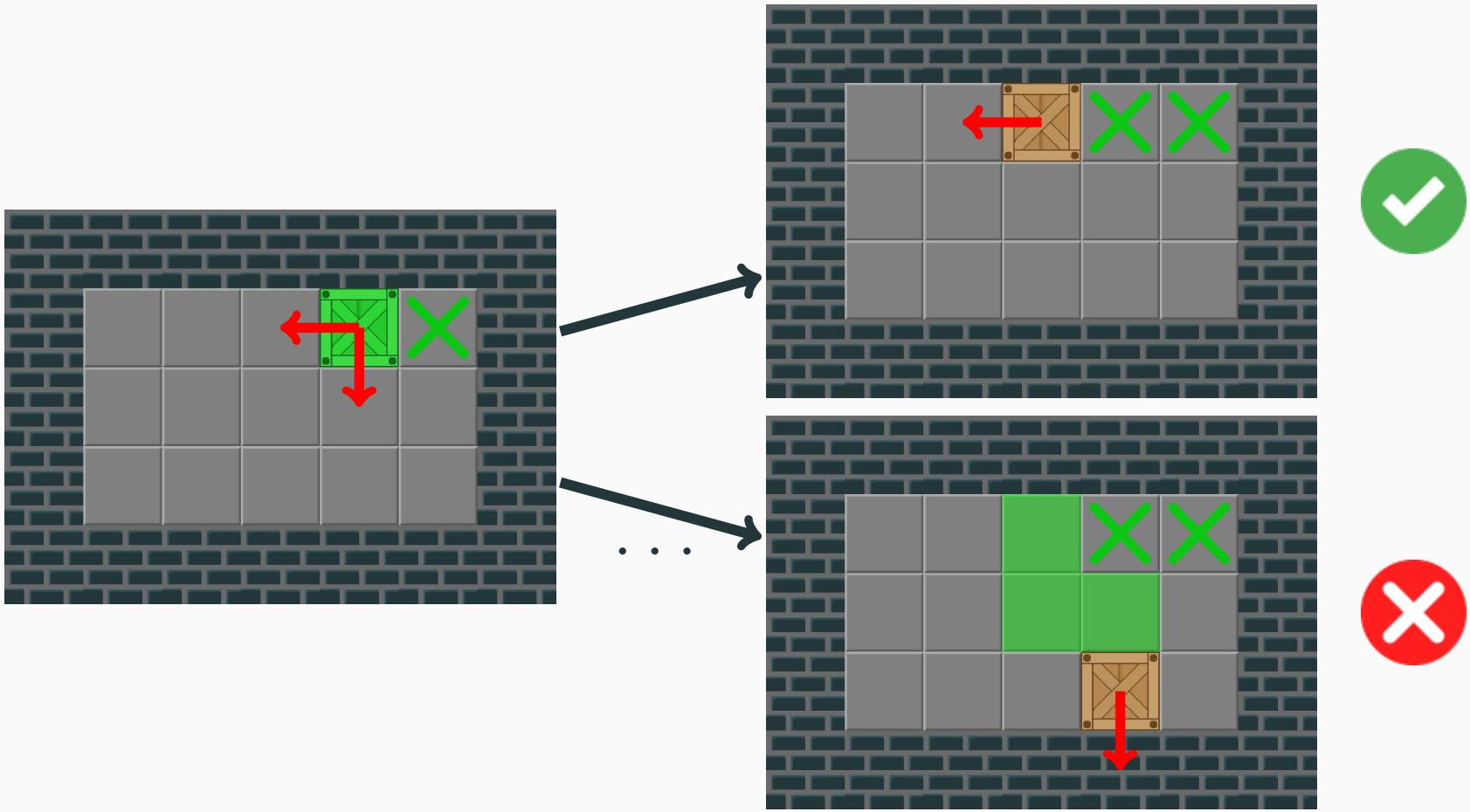
Détection des positions mortes *(dead positions)*



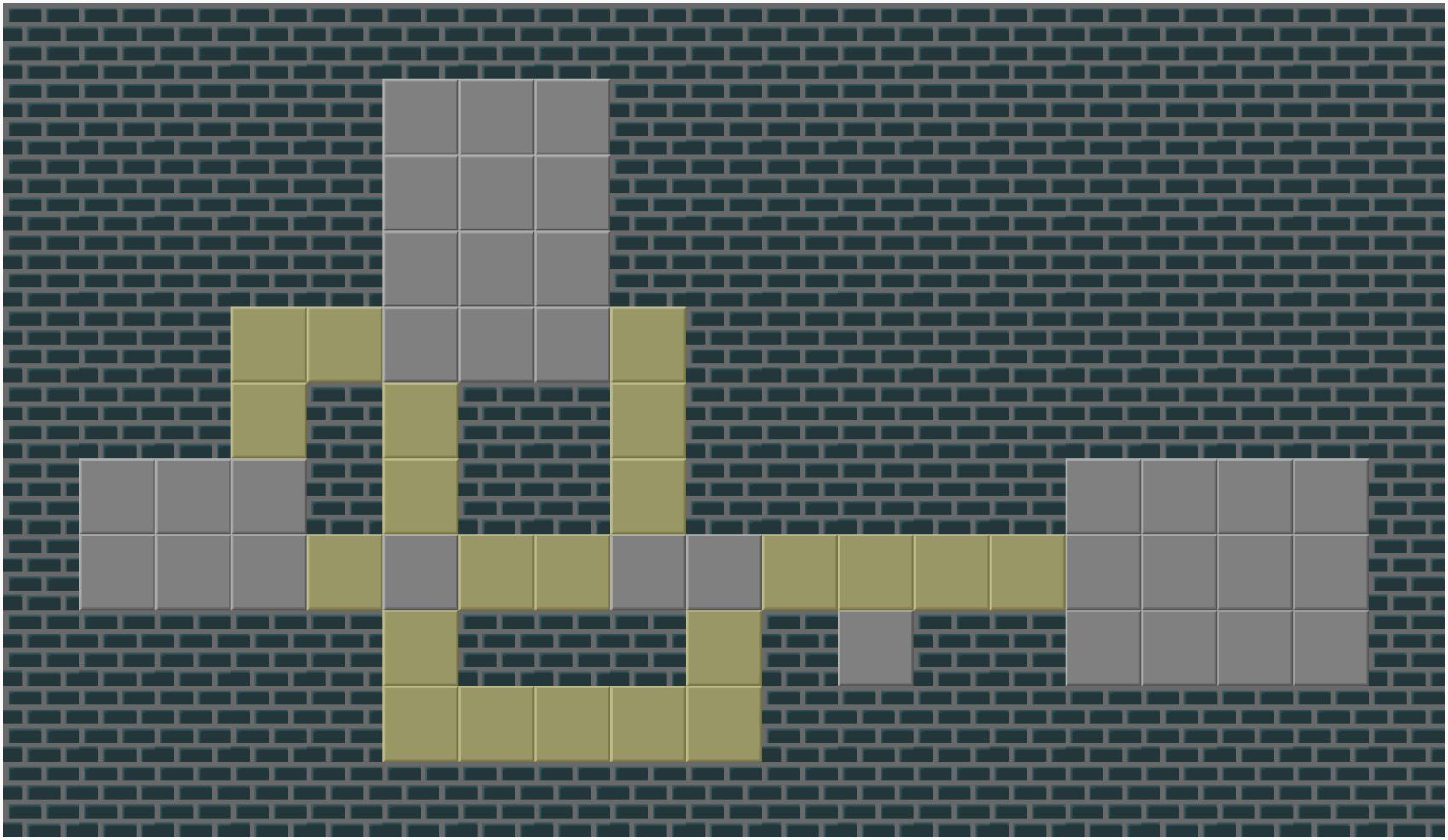
Détection des positions mortes *(dead positions)*



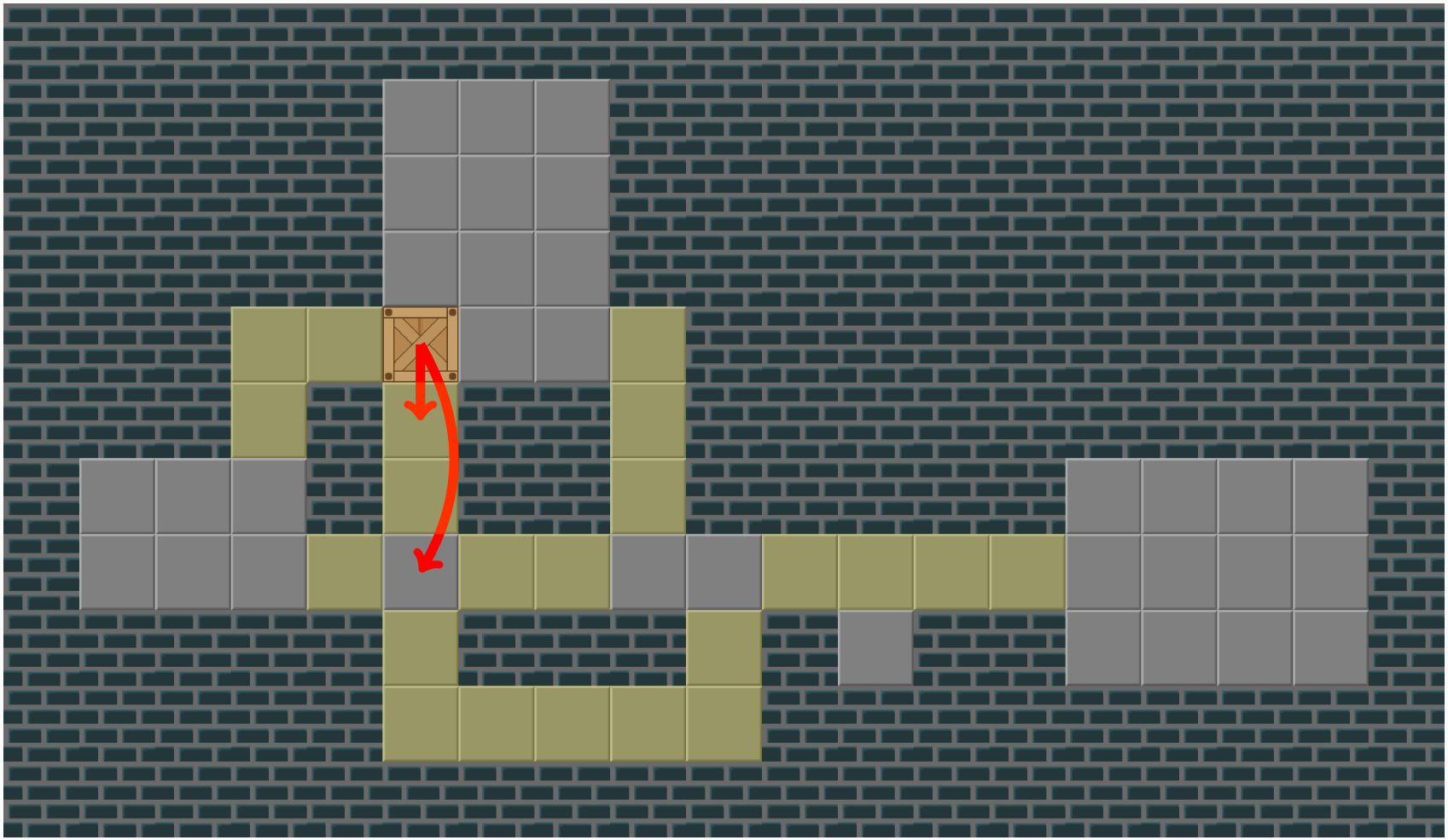
Détection des positions mortes *(dead positions)*



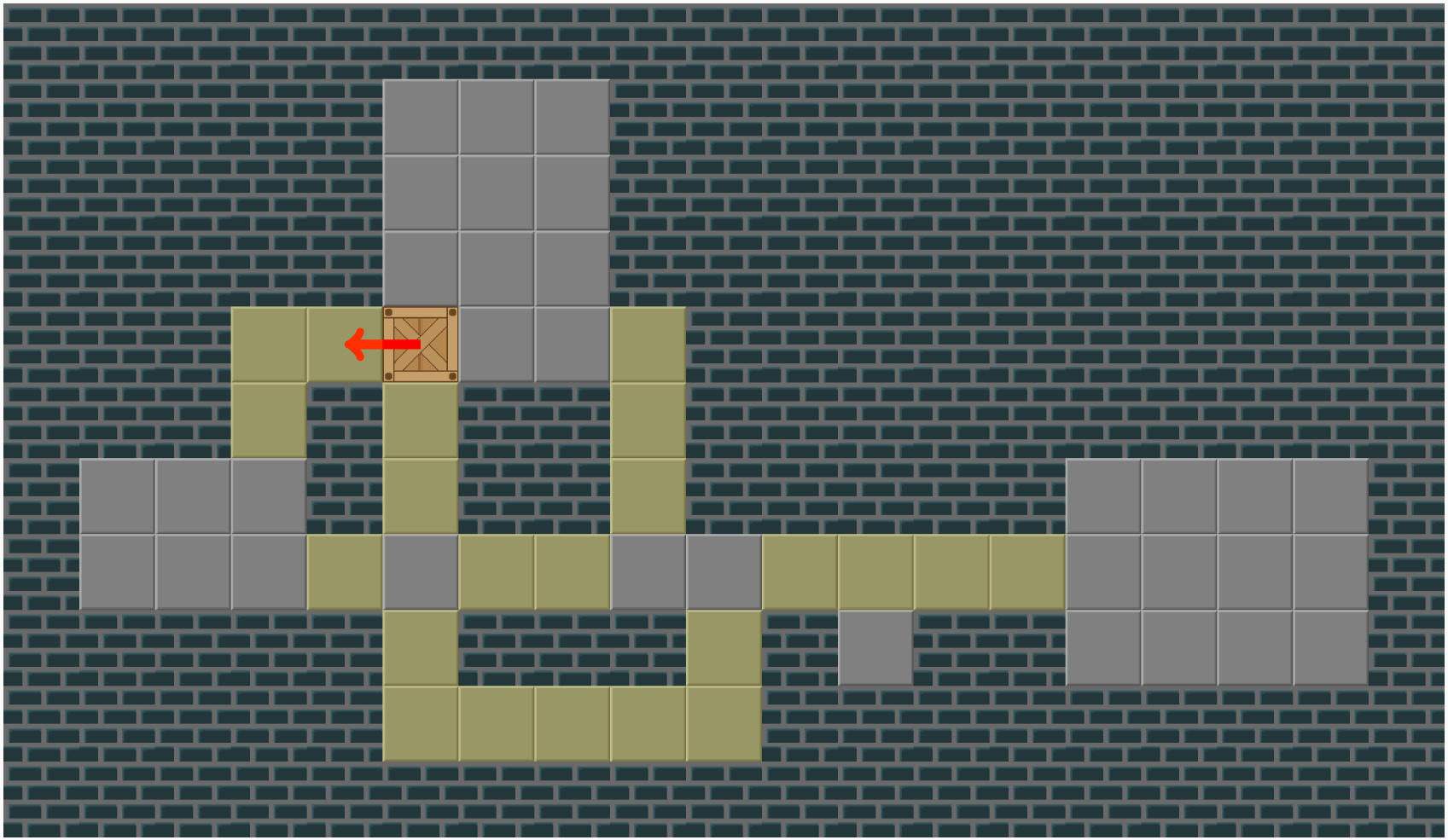
Détection de tunnels



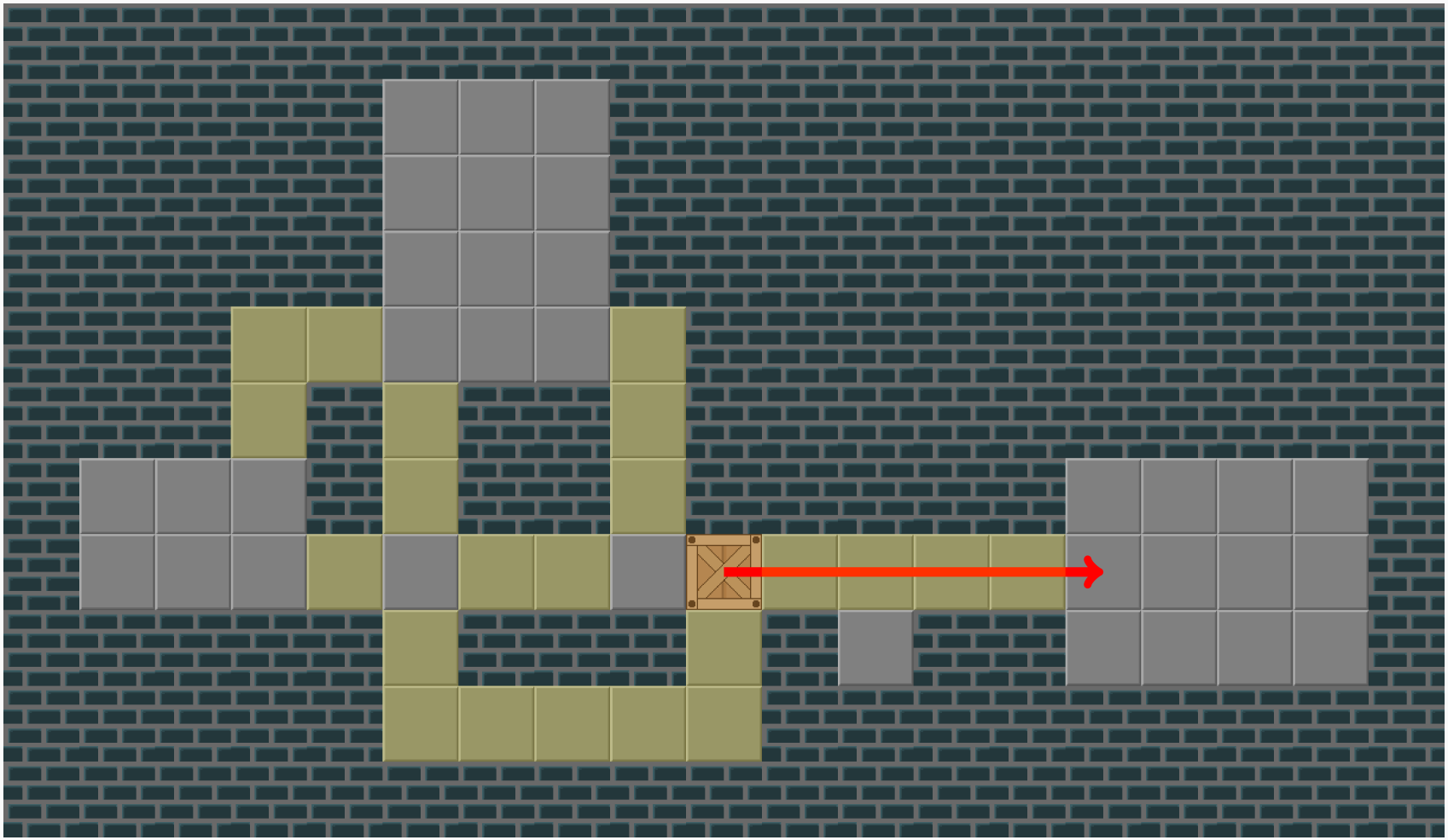
Détection de tunnels



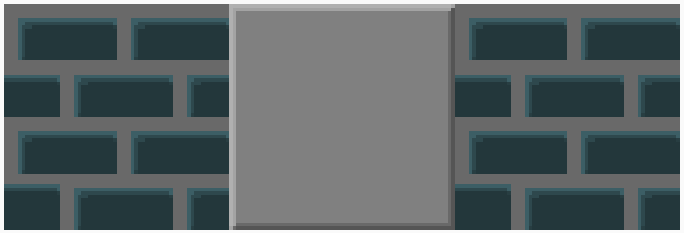
Détection de tunnels

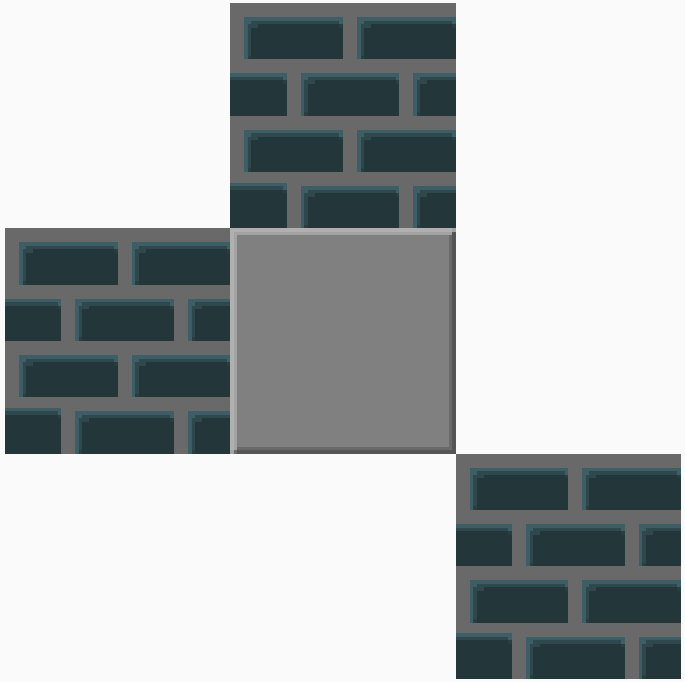


Détection de tunnels



Détection de tunnels



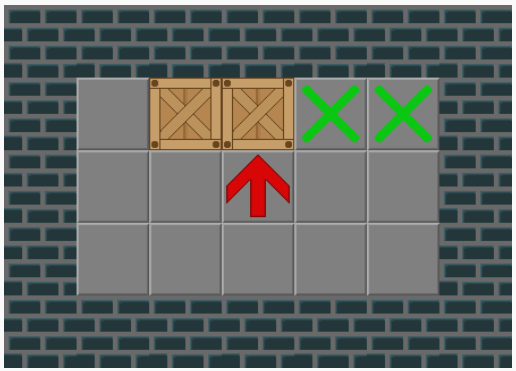


Calcul d'un ordre de rangement *(packing order)*

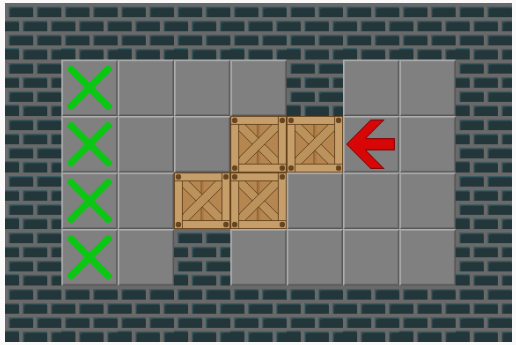
Réduction de l'espace de recherche

Analyse dynamique

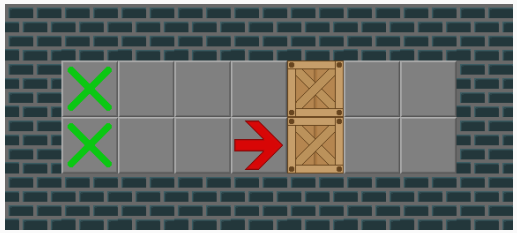
Détection d'impasses *(deadlocks)*



(a) *Freeze deadlock n°1*



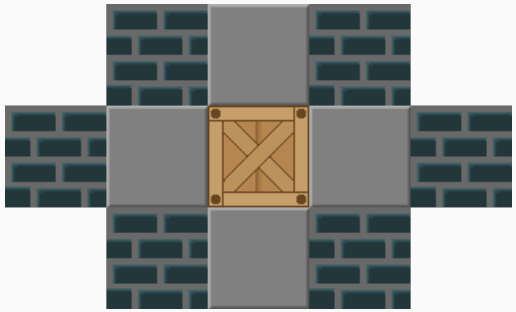
(b) *Freeze deadlock n°2*



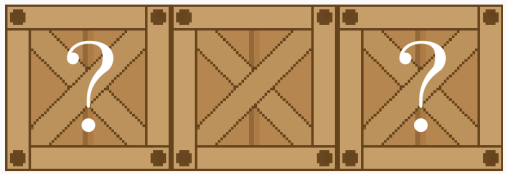
(c) *PI Corral deadlock*

Détection de *freeze deadlocks*

(a) *Règle n°1*

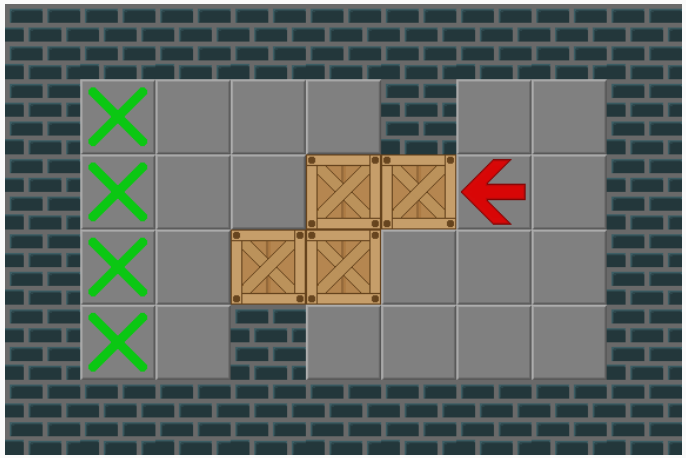


(b) *Règle n°2*

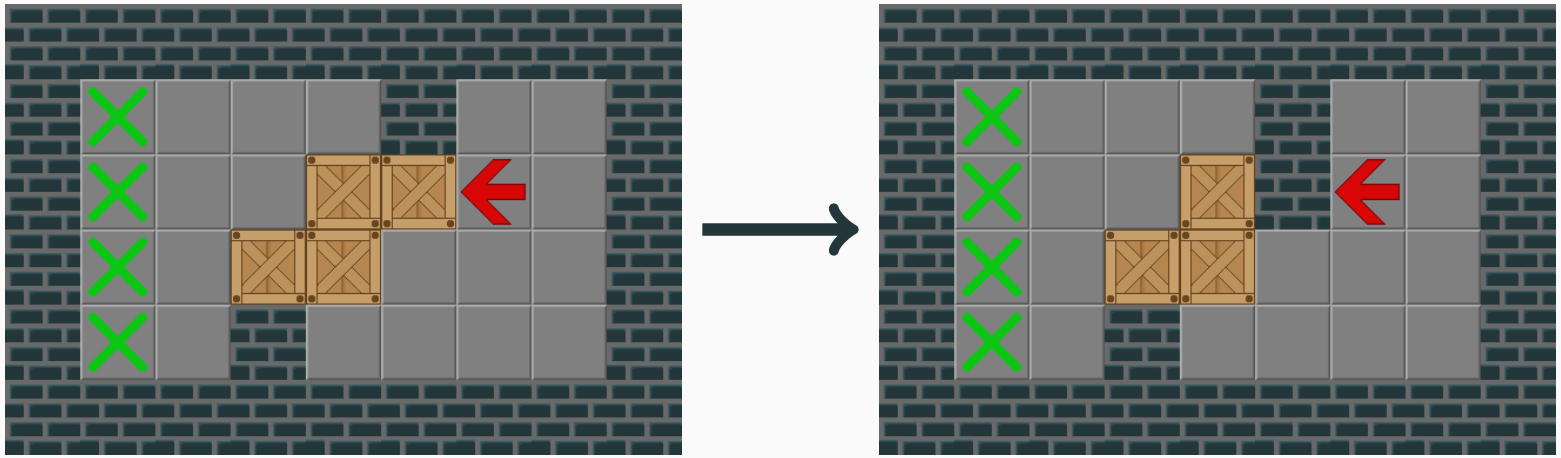


(c) *Règle n°3*

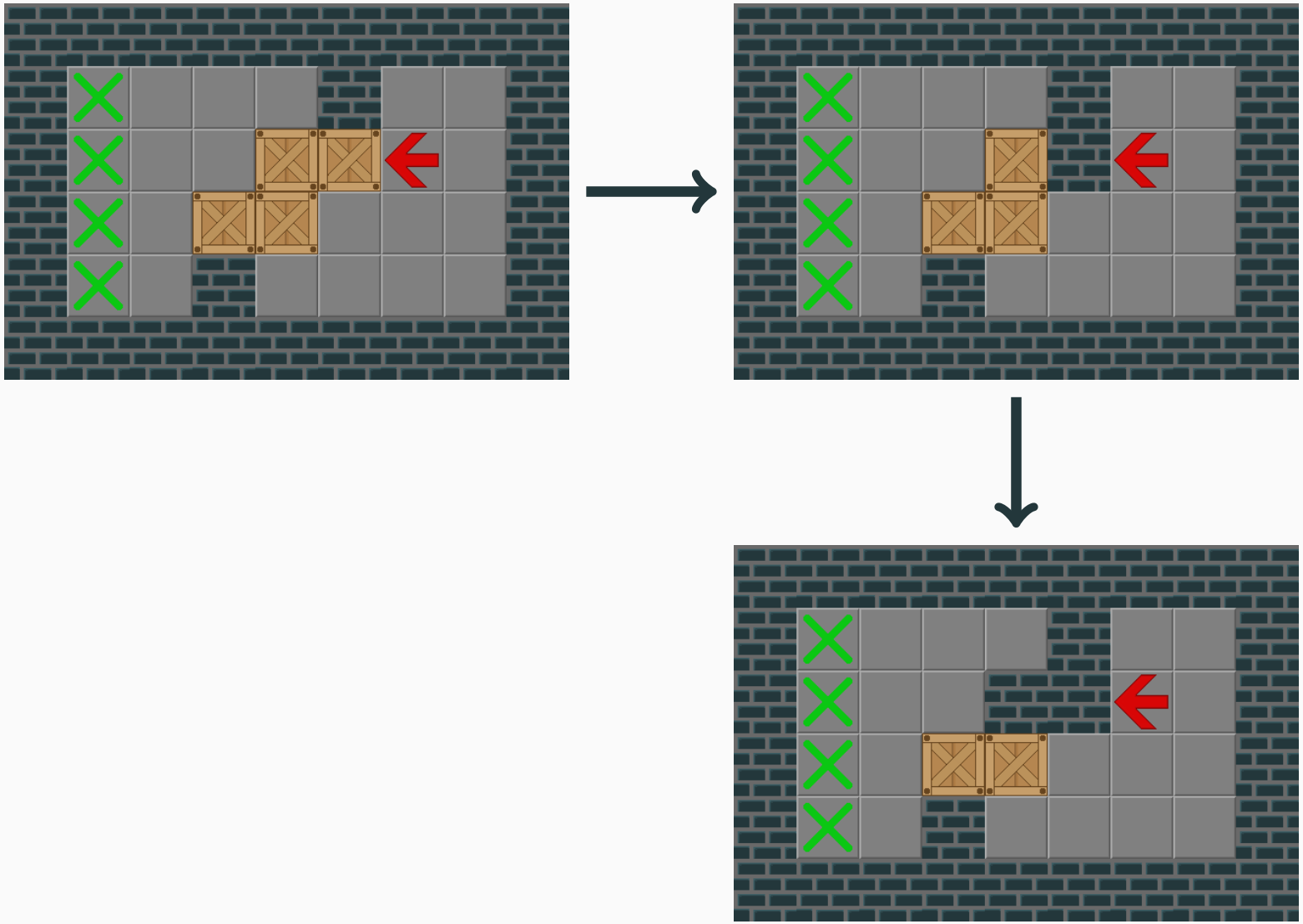
Détection de *freeze deadlocks*



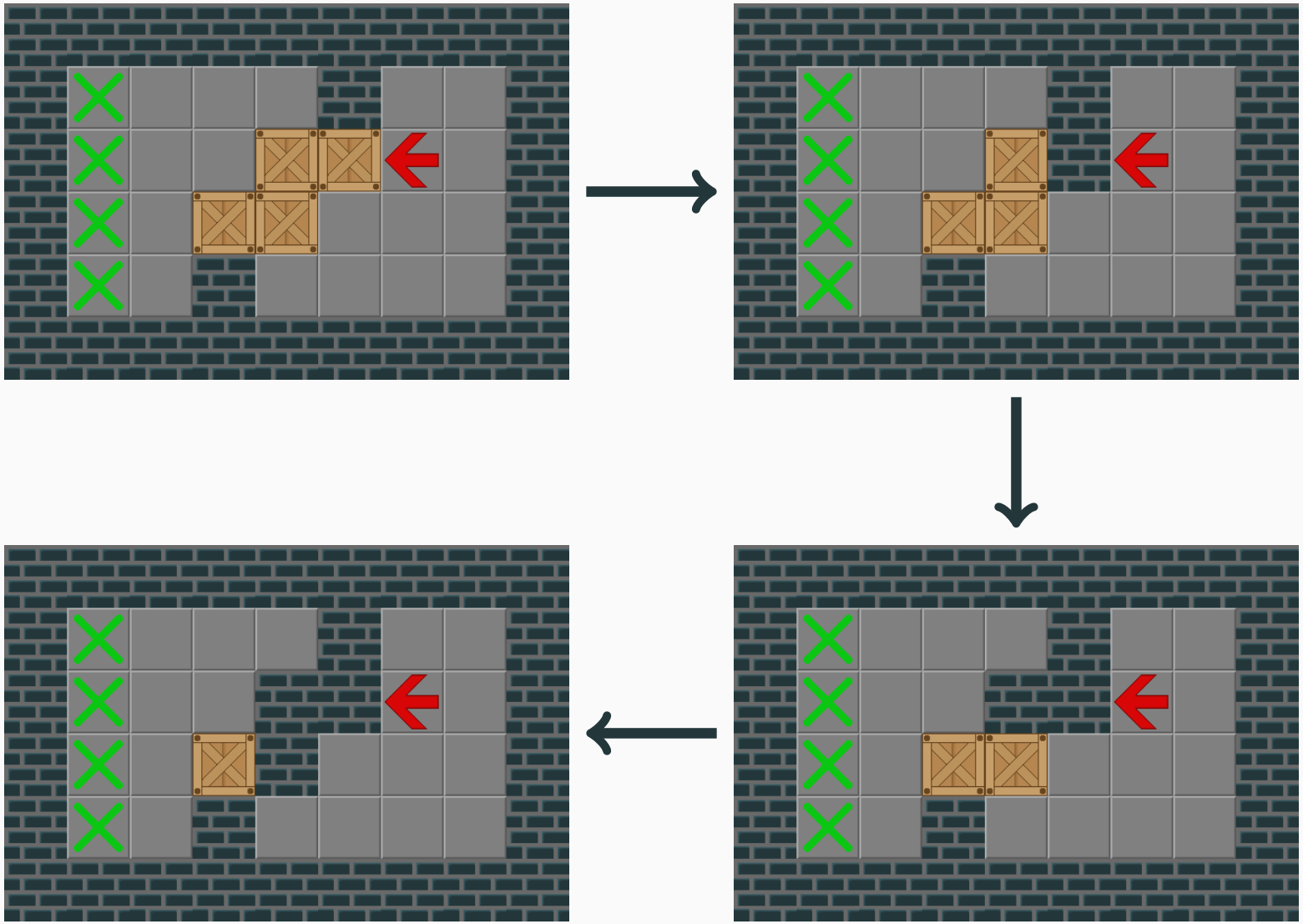
Détection de *freeze deadlocks*



Détection de *freeze deadlocks*



Détection de *freeze deadlocks*



Gelée!

Détection de *PI Corral deadlocks*

Table de *deadlocks*

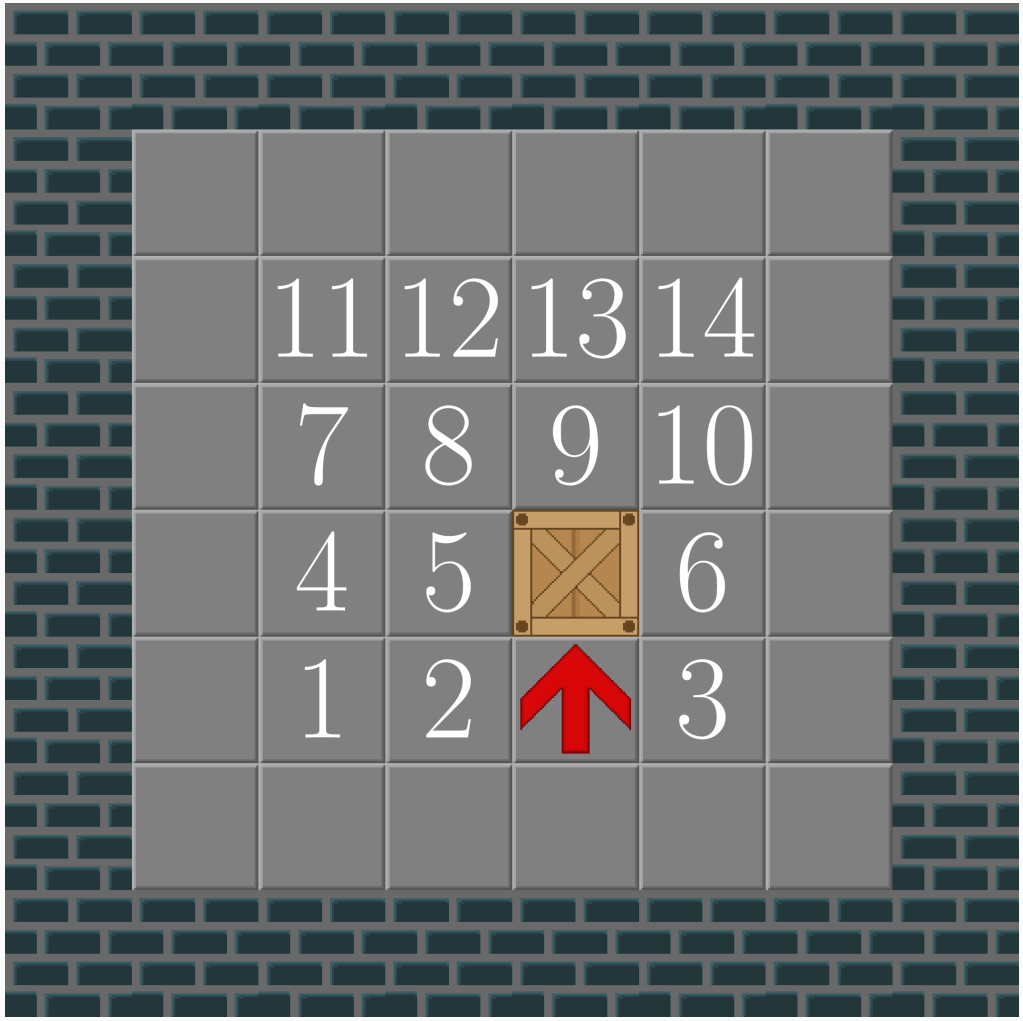
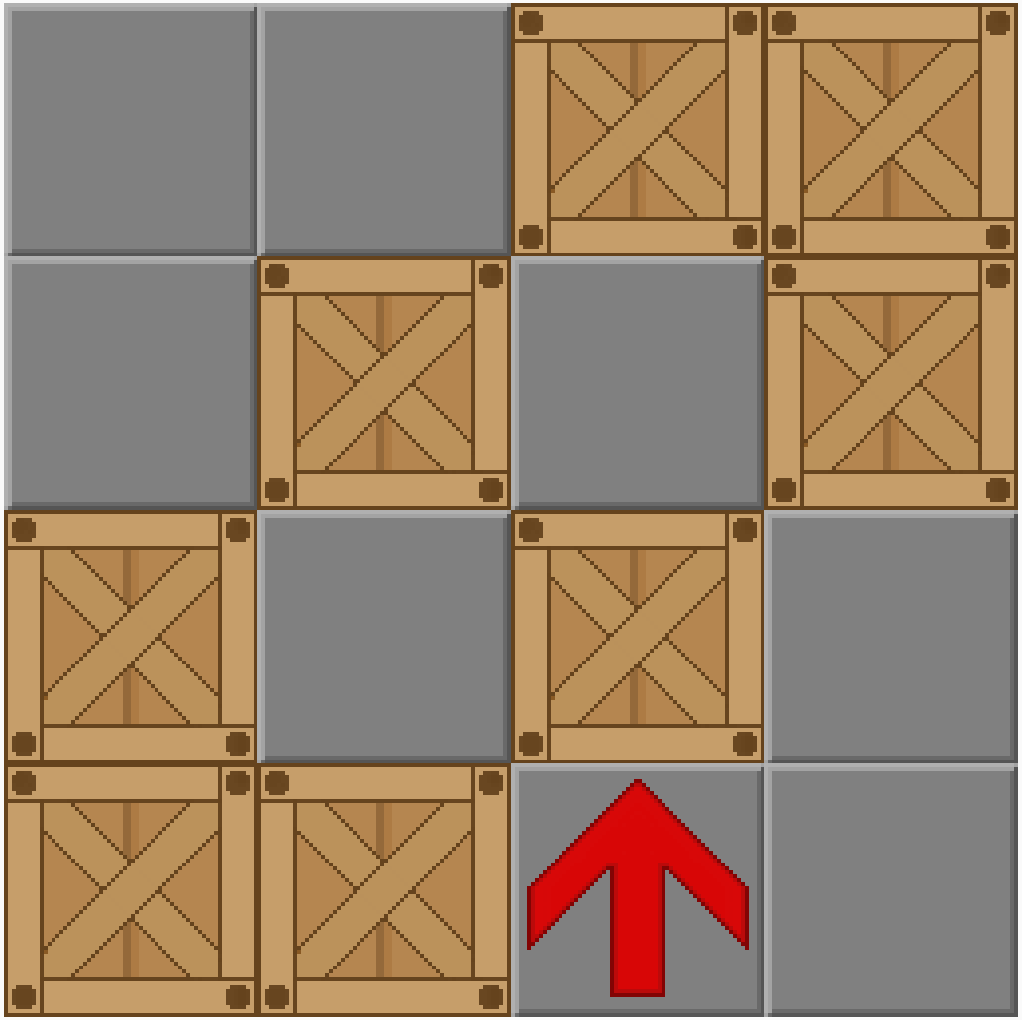
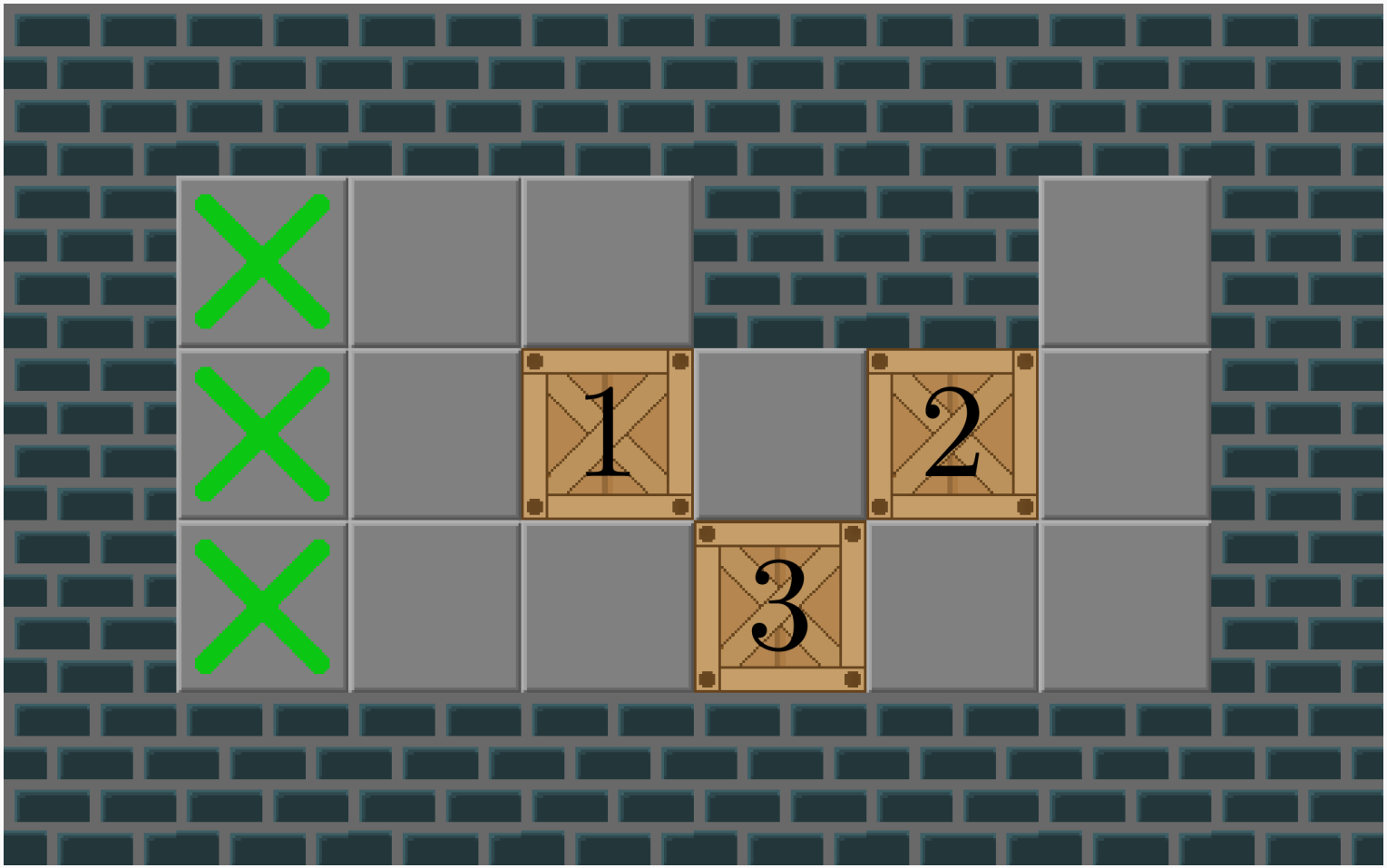


Table de *deadlocks*

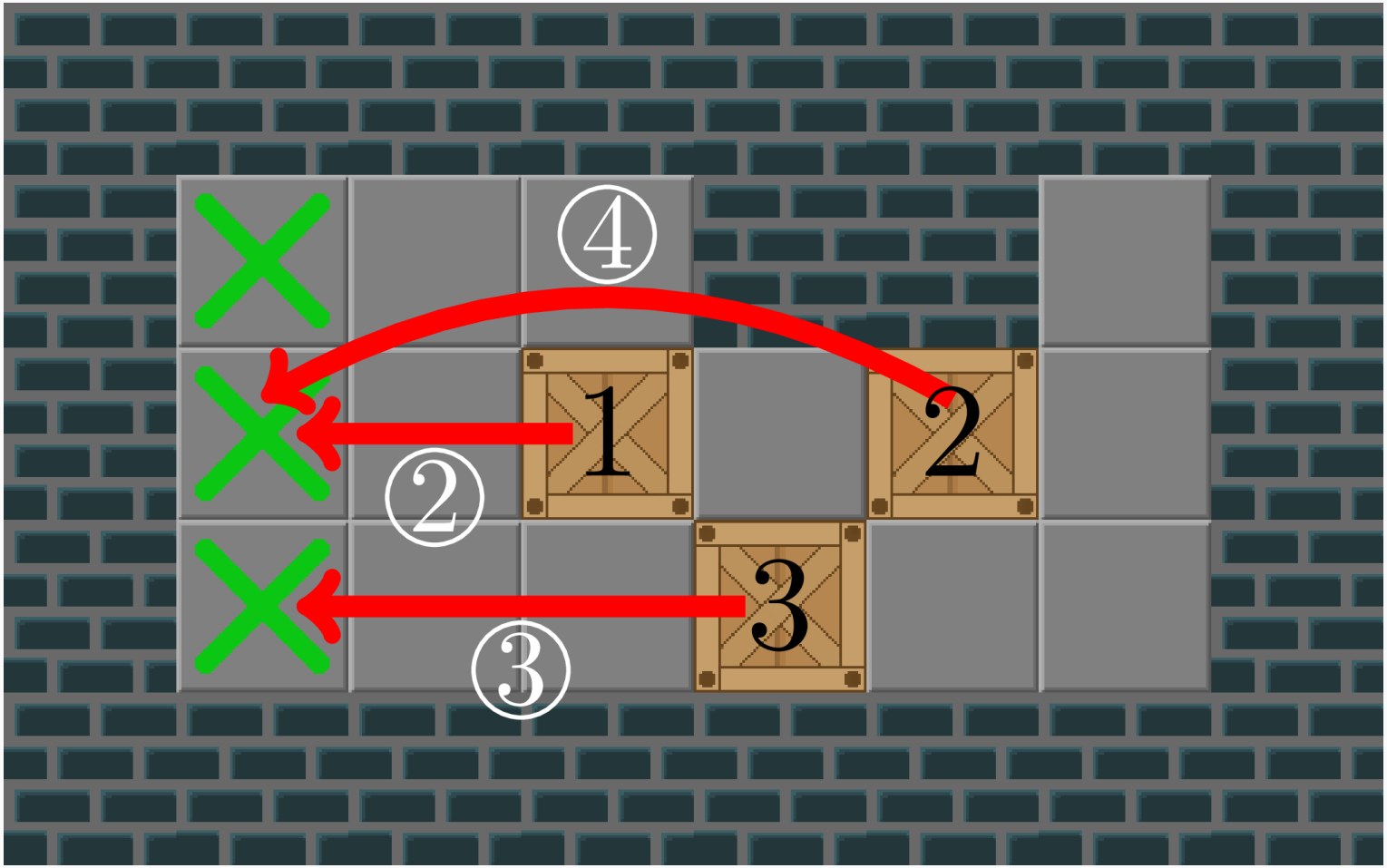


Recherche dirigée par une heuristique

Heuristique simple *(Simple Lower Bound)*

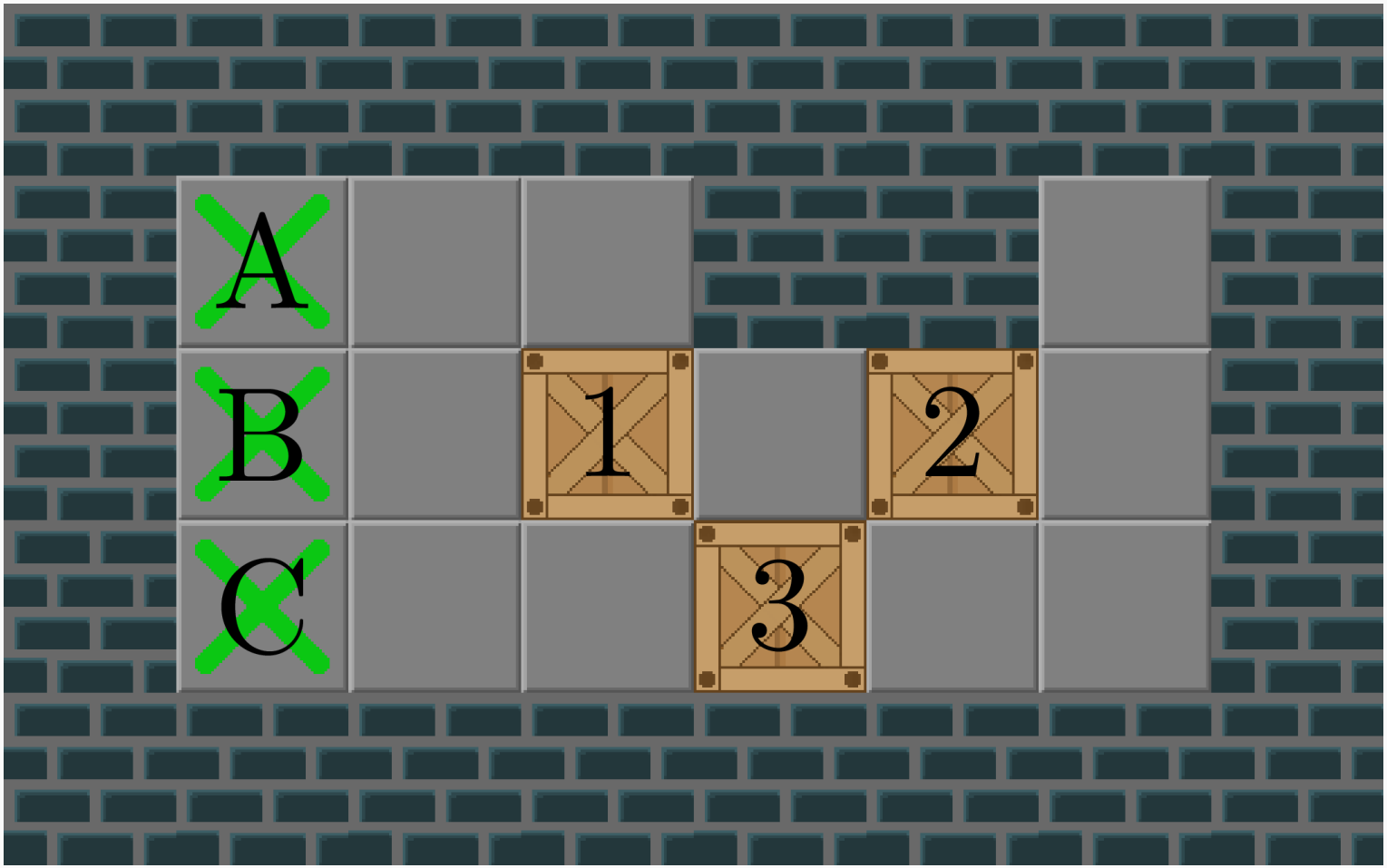


Heuristique simple *(Simple Lower Bound)*

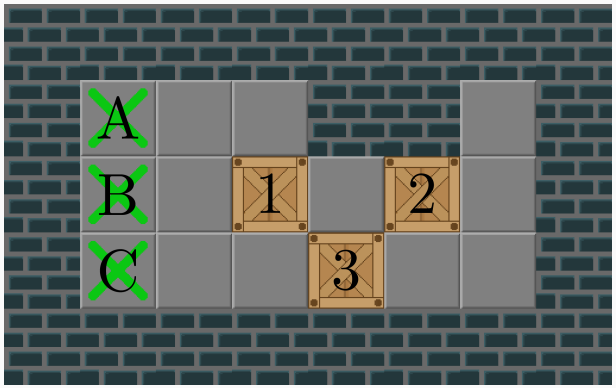


$$\boxed{2 + 4 + 3 = \mathbf{9}}$$

Heuristique gloutonne *(Greedy Lower Bound)*



Heuristique gloutonne *(Greedy Lower Bound)*

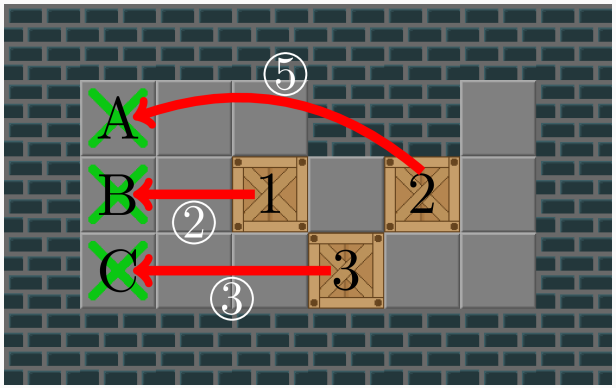


$1 \to A$	3
$1 \to B$	2
$1 \to C$	3
$2 \to A$	4
$2 \to B$	4
$2 \to C$	5
$3 \to A$	5
$3 \to B$	4
$3 \to C$	3

Tri →

$1 \to B$	**2**
$1 \to A$	3
$1 \to C$	3
$3 \to C$	**3**
$2 \to B$	4
$3 \to B$	4
$2 \to A$	5
$2 \to C$	5
$3 \to A$	**5**

Heuristique gloutonne *(Greedy Lower Bound)*



$$2 + 3 + 5 = \mathbf{10}$$

$1 \to A$	3
$1 \to B$	2
$1 \to C$	3
$2 \to A$	4
$2 \to B$	4
$2 \to C$	5
$3 \to A$	5
$3 \to B$	4
$3 \to C$	3

Tri →

$\mathbf{1 \to B}$	**2**
$1 \to A$	3
$1 \to C$	3
$\mathbf{3 \to C}$	**3**
$2 \to B$	4
$3 \to B$	4
$2 \to A$	5
$2 \to C$	5
$\mathbf{3 \to A}$	**5**

Optimisations

Résultats