

Algorithm Finder Lite

Links

Algorithm Finder Lite – Related Links

Orbit Cube

http://www.randelshofer.ch/rubik/virtual_cubes/vcube7/picture_cubes/pdf/OrbitCube_24072010.pdf

Commutators

<http://www.mementoslangues.fr/CubeDesign/CubeTheory/CommutatorSubgroup.pdf>

Cube Symmetry

<http://www.mementoslangues.fr/CubeDesign/CubeTheory/CubeSymmetry.pdf>

Overview

Algorithm Finder Lite is an on-line tool that can be used to search for *structured* cube algorithms. In this context, a sequence of moves is said to be structured if the ordering of moves can be predicted in some way. For example, commutator $[X, Y Z P Q] = X Y Z P Q X' Q' P' Z' Y'$ is structured because half of the sequence can be predicted from the other half. By imposing a structure to a sequence and searching for all possible occurrences of the structured sequence, short algorithms can generally be found.

Shift, symmetry, inversion and conjugation can be applied to structured sequences to increase the odds of finding algorithms, but at the expense of an increase in computing time. Reducing the number of faces from 6 down to 2 and selecting quarter-turns instead of quarter-turns + half-turns may alleviate the problem though.

If algorithms are to be searched for *cycles* of corners, midges, edges, corner-centers, midge-centers, edge-centers or true centers, it is sometimes faster to search first for *seed* algorithms and then apply shift, symmetry, inversion and conjugation to the *seeds* found to get solution algorithms.

In cases where short algorithms are already known for cube positions that are *close* to the goal position, shift, symmetry, inversion and conjugation can also be applied to the list of algorithms. By increasing the number of setup moves, algorithms may eventually be found that will solve that position.

Notice that the program is actually *not* a cube solver, but only a tool that can be useful for solving some parts of a cube or designing parts of pretty patterns. For a *full* cube solver, see [Super Cube Solver](#).

Limitations

A [brute force search](#) method is applied by the Finder to search for algorithms. The maximum number of variables that can be used in a structured sequence depends on the number of basic moves in the selected set and is limited by the [combinatorial explosion](#) phenomena. Care must then be taken to insure that the number of variables is not too high to save on computation time. For example, if we consider the case of 5 variables X,Y,Z,P,Q and edge-centers with a set of 54 basic moves, the number of checked combinations will be:

- $54^5 = 459\,165\,024 \approx 459\text{ M}$ (Algorithm Finder)
- $6 \cdot (54 - 3)^4 = 40\,591\,206 \approx 40\text{ M}$ (Seed Finder)

Notice that if shift, symmetry, inversion or conjugation were applied to these cases, the actual number of checked combinations would have been far greater than that. As a rule of thumb, it is preferable to keep the total number of checked combinations below 100 M to keep computing time within reasonable limits, although overnight computing might be of help...

The program is written in JavaScript, which is an interpreted language, and therefore may take long to execute in some cases. It is recommended to use [Google Chrome](#) to launch the program, because it is presently the fastest available browser.

Templates

A *template* is a way of representing structured sequences of moves. The shortest template is represented by a single *variable* X, which means *any* move from a set of quarter-turns or quarter-turns + half-turns.

If we consider outer layer turns, X may take values in set:

$$\{F, F', F2, R, R', R2, U, U', U2, L, L', L2, D, D', D2, B, B', B2\}$$

(18 basic moves)

If we consider outer layer turns + first inner layer turns, X may take values in set:

$$\{F, F', F2, R, R', R2, U, U', U2, L, L', L2, D, D', D2, B, B', B2, \\ NF, NF', NF2, NR, NR', NR2, NU, NU', NU2, NL, NL', NL2, ND, ND', ND2, NB, NB', NB2\}$$

(36 basic moves)

If we consider outer layer turns + first inner layer turns + second inner layer turns, X will may take values in set:

$$\{F, F', F2, R, R', R2, U, U', U2, L, L', L2, D, D', D2, B, B', B2, \\ NF, NF', NF2, NR, NR', NR2, NU, NU', NU2, NL, NL', NL2, ND, ND', ND2, NB, NB', NB2, \\ N3F, N3F', N3F2, N3R, N3R', N3R2, N3U, N3U', N3U2, N3L, N3L', N3L2, N3D, N3D', N3D2, N3B, N3B', N3B2\}$$

(54 basic moves)

Templates are built by concatenating variables and basic moves:

$$\begin{aligned} &[X, Y] \text{ (or } X Y X' Y') \\ &X Y Z P \\ &[X, Y Z Y'] \\ &[X, NR Y Z P N3U] \\ &]X Y, Z P Q A[\end{aligned}$$

By using nested *for* loops to sweep variables, *all* occurrences of a given template are then executed and each final cube state compared to a goal cube state. If there is a match between the two, then an algorithm has been found that will change the cube state from initial to goal.

This is better shown on an exemple. Let's select template $[X, Y Z Y']$, which is a Niklas commutator:

$$[X, Y Z Y'] = X Y Z Y' X' Y Z' Y'$$

There are three *independent* variables in this template, namely X, Y and Z. Each variable is swept independently. This means that there are three nested *for* loops for sweeping all 3 variables. The search is exhaustive because *all* combinations represented by the template are checked.

Variables

There is a maximum of 8 variables that can be used in Algorithm Finder Lite (AFL):

X, Y, Z, P, Q, A, E, G

Variables are of 3 types:

- 1- Basic moves: X, X', Y, Y', Z, Z', P, P', Q, Q', A, A', E, E', G, G'
Examples:
 $X = R \rightarrow X' = R'$
 $Y = NU' \rightarrow Y' = NU$
 $Z = N3F2 \rightarrow Z' = N3F2$
- 2- Opposed moves: Xo, Xo', Yo, Yo', Zo, Zo', Po, Po', Qo, Qo', Ao, Ao', Eo, Eo', Go, Go'
Examples:
 $X = R \rightarrow Xo = L, Xo' = L'$
 $Y = NU' \rightarrow Yo = ND', Yo' = ND$
 $Z = N3F2 \rightarrow Zo = N3B2, Zo' = N3B2$
- 3- Symmetric moves: Xs, Xs', Ys, Ys', Zs, Zs', Ps, Ps', Qs, Qs', As, As', Es, Es', Gs, Gs'
Examples:
Symmetry: F – B Axis (CF2)
 $X = R \rightarrow Xs = L, Xs' = L'$
 $Y = NU' \rightarrow Ys = ND', Ys' = ND$
 $Z = N3F2 \rightarrow Zs = N3F2, Zs' = N3F2$

Using variables of opposed moves or symmetric moves together with variables of basic moves will save much computation time, because they do not need additional *for* loops.

Semi-Commutators

Semi-commutators are commutator-like expressions where the ordering of moves has been reversed, depending on the direction of the closing bracket(s):

$$\begin{aligned}[XY, ZP] &= XY \cdot ZP \cdot Y'X' \cdot P'Z' \text{ (commutator)} \\ [XY, ZP[&= XY \cdot ZP \cdot Y'X' \cdot Z'P' \text{ (semi-commutator)} \\]XY, ZP] &= XY \cdot ZP \cdot X'Y' \cdot P'Z' \text{ (semi-commutator)} \\]XY, ZP[&= XY \cdot ZP \cdot X'Y' \cdot Z'P' \text{ (semi-commutator)}\end{aligned}$$

For a given number of variables, semi-commutators may give solutions where commutators would give none.

Symmetric Commutators

Knowing that a cube has a set of 48 symmetries, we can further expand the concept of 'plain' commutator [A, B] to the 'symmetric' commutator, where the inverses of A and B are replaced with As and Bs, being the inverses of their respective transformations by any of the 48 cube symmetries, that is:

$$[A, B]_s = [X Y, Z P Q]_s = X Y \cdot Z P Q \cdot Ys' Xs' \cdot Qs' Ps' Zs' = (X Y) \cdot (Z P Q) \cdot (Xs Ys)' \cdot (Zs Ps Qs)' = A \cdot B \cdot As' \cdot Bs'$$

In this notation, subscript 's' indicates that symmetry has been applied to the the second half of the expression.

A plain commutator is then just a particular case of a symmetric commutator, for which the applied symmetry is simply the 'Identity' symmetry:

F→F
R→R
U→U
L→L
D→D
B→B

The concept of symmetric commutators can even be further expanded to symmetric *semi*-commutators as follows:

$$\begin{aligned}]X Y, Z P Q]s &= X Y \cdot Z P Q \cdot Xs' Ys' \cdot Zs' Ps' Qs' \\]X Y, Z P Q]s &= X Y \cdot Z P Q \cdot Xs' Ys' \cdot Qs' Ps' Zs' \\ [X Y, Z P Q]s &= X Y \cdot Z P Q \cdot Ys' Xs' \cdot Qs' Ps' Zs' \end{aligned}$$

It is already known that plain commutators work well in cases where only a few cube pieces are permuted. They are generally of less practical use for solving cube positions with many permuted pieces, though. But, if a scrambled cube shows a symmetric pattern, chances are good that a symmetric commutator could be found that may eventually solve it.

Interface

The Algorithm Finder Lite program includes 2 Finders:

- 1- Algorithm Finder
This Finder will search for algorithms from a list of templates and a pre-defined goal cube state.
The goal cube state can be set either indirectly from a 'generator' algorithm or directly from a 'mask' of permuted stickers.
- 2- Seed Finder
This Finder will search for 'seed' algorithms from a list of templates and cube states where all stickers of a selected orbit of pieces have been set to -1 (don't care value). The Finder will then check all permutations and extract seeds showing a given permutation order for a given number of permuted pieces.

The cube applet interface (I/F) must provide a number of variables to the Finder:

- 1- Common to both Finders:
 - AFL.finderType_IF
 - AFL.cubeOrder_IF
 - AFL.faceIndex_IF
 - AFL.turnIndex_IF
 - AFL.templateSymmetryIndex_IF
 - AFL.insertAlgorithmTemplate_IF
 - AFL.algorithmTemplateArray_IF
- 2- Specific to Algorithm Finder:
 - AFL.isOnSuperCubeMode_IF
 - AFL.isOnShiftMode_IF
 - AFL.isOnInversionMode_IF
 - AFL.isOnRotationSymmetryMode_IF
 - AFL.isOnReflectionSymmetryMode_IF
 - AFL.isOnFindNearestPositionMode_IF
 - AFL.setupIndex_IF
 - AFL.generatorAlgorithm_IF
 - AFL.locationMaskArray_IF
 - AFL.centerOrientationMaskArray_IF
- 3- Specific to Seed Finder:
 - AFL.isOnSearchForNCyclesMode_IF
 - AFL.isOnSearchForAllCyclesMode_IF
 - AFL.pieceType_IF
 - AFL.permutationOrder_Goal_IF
 - AFL.numberOfPermutedPieces_Goal_IF
 - AFL.numberOfTwistedCorners_Goal_IF
 - AFL.numberOfFlippedMidges_Goal_IF

In return, the Finder will provide 3 variables to the cube applet interface (I/F):

- AFL.algorithm_IF
- AFL.algorithmArray_IF
- AFL.errorMessage_IF

Example A1

Niklas commutator applied to 3-cycles of corners (7x7x7 cube)

Form A1

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

7

Face index:

6

Turn index:

2

Symmetry index:

0

'Insert' template:



Template(s):



Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

0

Generator:



Seed Finder settings:

- N-cycles
- All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:



Flipped midges:



Result A1

Elapsed Time (Hours:Minutes:Seconds) = 00:00:00

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues

1 algorithm(s) found --- 5832 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 7

isOnSuperCubeMode: true

isOnShiftMode: false

isOnInversionMode: false

isOnRotationSymmetryMode: false

isOnReflectionSymmetryMode: false

isOnFindNearestPositionMode: false

Generator algorithm: R U L U' R' U L' U'

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

0 setup move(s)

Template symmetry index: 0

1 Template(s):

X Y Z Y' X' Y Z' Y'

1 Algorithm(s):

R U L U' R' U L' U' (8 moves) (9 solved stickers) (Order: 3)

Example A2

Hardest distance-20 position (3x3x3 cube)

Form A2

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

3

Face index:

6

Turn index:

2

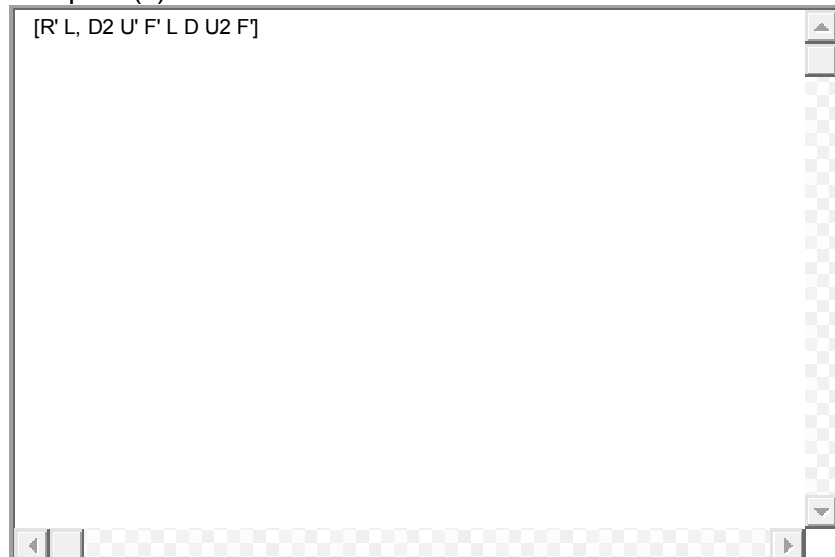
Symmetry index:

2

'Insert' template:



Template(s):



Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

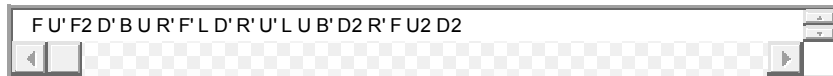
Reflection symmetry

Find nearest position

Setup index:

1

Generator:



Seed Finder settings:

- N-cycles
- All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:



Flipped midges:



Result A2

Elapsed Time (Hours:Minutes:Seconds) = 00:00:01

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues

8 algorithm(s) found --- 31104 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 3

isOnSuperCubeMode: false

isOnShiftMode: true

isOnInversionMode: true

isOnRotationSymmetryMode: true

isOnReflectionSymmetryMode: true

isOnFindNearestPositionMode: false

Generator algorithm: F U' F2 D' B U R' F' L D' R' U' L U B' D2 R' F U2 D2

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

1 setup move(s)

Template symmetry index: 2

1 Template(s):

X R' L D2 U' F' L D U2 F' R' L F D2 U' R' F D U2 X'

8 Algorithm(s):

B D' L2 R F D' L' R2 F SU F' L2 R U F' L' R2 U B' (19 moves) (48 solved stickers) (Order: 12)

F L' U2 D F L' U' D2 F SR F' U2 D R F' U' D2 R F' (19 moves) (48 solved stickers) (Order: 12)

F D' R2 L B D' R' L2 B SU B' R2 L U B' R' L2 U F' (19 moves) (48 solved stickers) (Order: 12)

B R' U2 D B R' U' D2 B SR' B' U2 D L B' U' D2 L B' (19 moves) (48 solved stickers) (Order: 12)

F' U R2 L' B' U R L2 B' SU B R2 L' D' B R L2 D' F (19 moves) (48 solved stickers) (Order: 12)

B' R D2 U' B' R D U2 B' SR B D2 U' L' B D U2 L' B (19 moves) (48 solved stickers) (Order: 12)

B' U L2 R' F' U L R2 F' SU F L2 R' D' F L R2 D' B (19 moves) (48 solved stickers) (Order: 12)

F' L D2 U' F' L D U2 F' SR' F D2 U' R' F D U2 R' F (19 moves) (48 solved stickers) (Order: 12)

Example A3

Semi-commutator applied to 2 3-cycles of corner-centers (7x7x7 cube)

Form A3

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

7

Face index:

6

Turn index:

2

Symmetry index:

0

'Insert' template:



Template(s):



Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

1

Generator:



Seed Finder settings:

- N-cycles
- All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:



Flipped midges:



Result A3

Elapsed Time (Hours:Minutes:Seconds) = 00:00:00

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues

1 algorithm(s) found --- 36 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 7

isOnSuperCubeMode: true

isOnShiftMode: false

isOnInversionMode: false

isOnRotationSymmetryMode: false

isOnReflectionSymmetryMode: false

isOnFindNearestPositionMode: false

Generator algorithm: NR NU' L2 NU NR' NU' L2 NU NR' D NR NU NR' D' NR NU'

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

1 setup move(s)

Template symmetry index: 0

1 Template(s):

X NR NU L NU' L NU NR' NU' L' NU L' NU' X'

1 Algorithm(s):

D NR NU L NU' L NU NR' NU' L' NU L' NU' D' (14 moves) (6 solved stickers) (Order: 3)

Example A4

Corner twists – 8 variables – 2 faces – 2 templates: commutator + semi-commutator (3x3x3 cube)

Form A4

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

Face index:

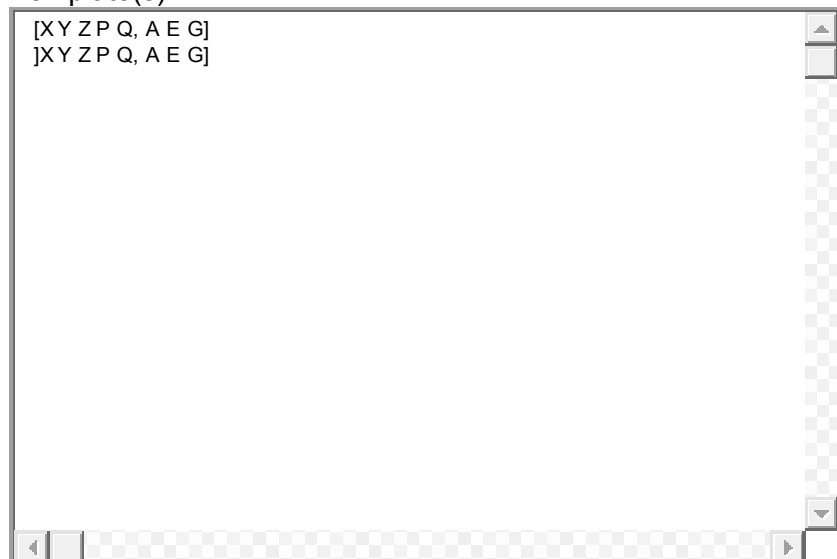
Turn index:

Symmetry index:

'Insert' template:



Template(s):



```
[XY Z P Q, A E G]  
]XY Z P Q, A E G]
```

Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

Generator:



Seed Finder settings:

- N-cycles
- All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:



Flipped midges:



Result A4

Elapsed Time (Hours:Minutes:Seconds) = 00:01:57

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues

2 algorithm(s) found --- 3359232 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 3

isOnSuperCubeMode: true

isOnShiftMode: false

isOnInversionMode: false

isOnRotationSymmetryMode: false

isOnReflectionSymmetryMode: false

isOnFindNearestPositionMode: false

Generator algorithm: U R2 U' F L2 F' U R2 U' F L2 F'

Insert algorithm template: none

2 Faces: R + U

1/4 turns + 1/2 turns

0 setup move(s)

Template symmetry index: 0

2 Template(s):

X Y Z P Q A E G Q' P' Z' Y' X' G' E' A'

X Y Z P Q A E G X' Y' Z' P' Q' G' E' A'

2 Algorithm(s):

R' U2 R2 U2 R U R' U R U2 R2 U2 R' U' R U' (16 moves) (6 solved stickers) (Order: 3)

U R U' R U R2 U R2 U' R' U R' U' R2 U' R2 (16 moves) (6 solved stickers) (Order: 3)

Example A5

Corner-centers – 4-move setup (7x7x7 cube)

Form A5

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

7

Face index:

6

Turn index:

2

Symmetry index:

0

'Insert' template:



Template(s):



```
NF ND NF' ND''
```

Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

4

Generator:



```
D2 F2 R' L' (NF ND NF' ND') R L F2 D2
```

Seed Finder settings:

N-cycles

All cycles

Piece type:

Corner

- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:

Flipped midges:

Result A5

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues
Elapsed Time (Hours:Minutes:Seconds) = 00:01:17

24 algorithm(s) found --- 1679616 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 7

isOnSuperCubeMode: true

isOnShiftMode: false

isOnInversionMode: false

isOnRotationSymmetryMode: false

isOnReflectionSymmetryMode: false

isOnFindNearestPositionMode: false

Generator algorithm: D2 F2 R' L' NF ND NF' ND' R L F2 D2

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

4 setup move(s)

Template symmetry index: 0

1 Template(s):

X Y Z P NF ND NF' ND' P' Z' Y' X'

24 Algorithm(s):

D2 L' F2 R' NF ND NF' ND' R F2 L D2 (12 moves) (6 solved stickers) (Order: 3)

D2 L' R' F2 NF ND NF' ND' F2 R L D2 (12 moves) (6 solved stickers) (Order: 3)

D2 F2 L' R' NF ND NF' ND' R L F2 D2 (12 moves) (6 solved stickers) (Order: 3)

D2 F2 R' L' NF ND NF' ND' L R F2 D2 (12 moves) (6 solved stickers) (Order: 3)

D2 R' L' F2 NF ND NF' ND' F2 L R D2 (12 moves) (6 solved stickers) (Order: 3)

D2 R' F2 L' NF ND NF' ND' L F2 R D2 (12 moves) (6 solved stickers) (Order: 3)

L' D2 F2 R' NF ND NF' ND' R F2 D2 L (12 moves) (6 solved stickers) (Order: 3)

L' D2 R' F2 NF ND NF' ND' F2 R D2 L (12 moves) (6 solved stickers) (Order: 3)

L' F2 D2 R' NF ND NF' ND' R D2 F2 L (12 moves) (6 solved stickers) (Order: 3)

L' F2 R' D2 NF ND NF' ND' D2 R F2 L (12 moves) (6 solved stickers) (Order: 3)

L' R' D2 F2 NF ND NF' ND' F2 D2 R L (12 moves) (6 solved stickers) (Order: 3)

L' R' F2 D2 NF ND NF' ND' D2 F2 R L (12 moves) (6 solved stickers) (Order: 3)

F2 D2 L' R' NF ND NF' ND' R L D2 F2 (12 moves) (6 solved stickers) (Order: 3)

F2 D2 R' L' NF ND NF' ND' L R D2 F2 (12 moves) (6 solved stickers) (Order: 3)

F2 L' D2 R' NF ND NF' ND' R D2 L F2 (12 moves) (6 solved stickers) (Order: 3)

F2 L' R' D2 NF ND NF' ND' D2 R L F2 (12 moves) (6 solved stickers) (Order: 3)

F2 R' D2 L' NF ND NF' ND' L D2 R F2 (12 moves) (6 solved stickers) (Order: 3)

F2 R' L' D2 NF ND NF' ND' D2 L R F2 (12 moves) (6 solved stickers) (Order: 3)

R' D2 L' F2 NF ND NF' ND' F2 L D2 R (12 moves) (6 solved stickers) (Order: 3)

R' D2 F2 L' NF ND NF' ND' L F2 D2 R (12 moves) (6 solved stickers) (Order: 3)

R' L' D2 F2 NF ND NF' ND' F2 D2 L R (12 moves) (6 solved stickers) (Order: 3)

R' L' F2 D2 NF ND NF' ND' D2 F2 L R (12 moves) (6 solved stickers) (Order: 3)

R' F2 D2 L' NF ND NF' ND' L D2 F2 R (12 moves) (6 solved stickers) (Order: 3)

R' F2 L' D2 NF ND NF' ND' D2 L F2 R (12 moves) (6 solved stickers) (Order: 3)

Example A6

Edge-centers – 2 3-cycles – conjugate algorithms of close positions to shorten generator algorithm (7x7x7 cube)
Shorten generator algorithm from 22 moves down to 20 by conjugating close position algorithms with 3 setup moves

Form A6

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

7

Face index:

6

Turn index:

2

Symmetry index:

0

'Insert' template:

Template(s):

```
SF N3L2 F' ND F N3L2 NR N3B NR' F' NR N3B' NR' ND' B
F2 NR2 F' N3D F NR2 N3R NF' N3R' F' N3R NF N3R' N3D' F'
U N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U'
N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F'
U' N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U
N3L2 ND2 B' N3U2 NL B N3D2 B' NL' B VD2 B' N3U2 B N3L2
N3R F NU' F' N3D2 F VU NF' N3U' F' N3U NF N3U' N3D2 N3R'
B2 NL2 F' N3U F NL2 N3L NF' N3L' F' N3L NF N3L' N3U' F B2
SF N3L2 F' ND' F N3L2 NR' N3F' NR F' NR' N3F NR ND B
F2 NR2 F N3D' N3L' NB' N3L F' N3L' NB N3L NR2 F N3D F
D N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D'
N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F
D' N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D
N3L2 ND2 B' N3U2 NL' B N3D2 B' NL B VD2 B' N3U2 B N3L2
ND2 F NU2 F' N3D2 F NU2 ND2 F' N3L2 F ND2 F' N3L2 VD2
NU F' ND2 F N3D2 NR N3B' NR' F' NR N3B NR' ND2 F N3D2 NU'
ND NU N3L2 NU' R' NU N3L2 VU' R' NU' R N3U R' NU R2 ND'
ND2 NB NF N3L2 NF' TR' TF NR F' N3L2 F NR' TF' TR NB' ND2
ND' N3F2 N3U' R' NU' R VU N3F2 N3L NU' R' NU R N3L' ND
N3R' NB VU' R N3U R' NU NB' NR' R N3U' R' N3U VR
```

Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

3

Generator:

```
F' NL2 N3U2 F' NL2 F N3U2 F' NL2 F NR2 NL2 N3U2 F NL2 F' N3U2 F NL2 F' NR2 F
```

Seed Finder settings:

N-cycles

All cycles

Piece type:

Corner

Midge

Edge

Corner-Center

Midge-Center

Edge-Center

True Center

Permutation order:

Permuted pieces:

Twisted corners:

▼

Flipped midges:

▼

Result A6

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues
Elapsed Time (Hours:Minutes:Seconds) = 00:06:09

44 algorithm(s) found --- 4408992 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 7

isOnSuperCubeMode: true

isOnShiftMode: false

isOnInversionMode: false

isOnRotationSymmetryMode: false

isOnReflectionSymmetryMode: false

isOnFindNearestPositionMode: false

Generator algorithm: F' NL2 N3U2 F' NL2 F N3U2 F' NL2 F NR2 NL2 N3U2 F NL2 F' N3U2 F NL2 F' NR2 F

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

3 setup move(s)

Template symmetry index: 0

28 Template(s):

X Y Z SF N3L2 F' ND F N3L2 NR N3B NR' F' NR N3B' NR' ND' B Z' Y' X'

X Y Z F2 NR2 F' N3D F NR2 N3R NF' N3R' F' N3R NF N3R' N3D' F' Z' Y' X'

X Y Z U N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U' Z' Y' X'

X Y Z N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' Z' Y' X'

X Y Z U' N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U' Z' Y' X'

X Y Z N3L2 ND2 B' N3U2 NL B N3D2 B' NL' B VD2 B' N3U2 B N3L2 Z' Y' X'

X Y Z N3R F NU' F' N3D2 F VU NF' N3U' F' N3U NF N3U' N3D2 N3R' Z' Y' X'

X Y Z B2 NL2 F' N3U F NL2 N3L NF' N3L' F' N3L NF N3L' N3U' F B2 Z' Y' X'

X Y Z SF N3L2 F' ND' F N3L2 NR' N3F' NR F' NR' N3F NR ND B Z' Y' X'

X Y Z F2 NR2 F N3D' N3L' NB' N3L F' N3L' NB N3L NR2 F N3D F Z' Y' X'

X Y Z D N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D' Z' Y' X'

X Y Z N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F Z' Y' X'

X Y Z D' N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D Z' Y' X'

X Y Z N3L2 ND2 B' N3U2 NL' B N3D2 B' NL B VD2 B' N3U2 B N3L2 Z' Y' X'

X Y Z ND2 F NU2 F' N3D2 F NU2 ND2 F' N3L2 F ND2 F' N3L2 VD2 Z' Y' X'

X Y Z NU F' ND2 F N3D2 NR N3B' NR' F' NR N3B NR' ND2 F N3D2 NU' Z' Y' X'

X Y Z ND NU N3L2 NU' R' NU N3L2 VU' R' NU' R N3U R' NU R2 ND' Z' Y' X'

X Y Z ND2 NB NF N3L2 NF' TR' TF NR F' N3L2 F NR' TF' TR NB' ND2 Z' Y' X'

X Y Z ND' N3F2 N3U' R' NU' R VU N3F2 N3L NU' R' NU R N3L' ND Z' Y' X'

X Y Z N3R' NB VU' R N3U R' NU NB' NR' R N3U' R' N3U VR Z' Y' X'

X Y Z NR' F2 NU' N3F' NU F2 NU' N3F N3R NU R' NU' N3R' NU TR Z' Y' X'

X Y Z N3U NL F2 NL' N3F' VL NF' N3L' F2 N3L NF VL' N3F N3U' Z' Y' X'

X Y Z N3R2 B L N3U2 L' B' NU2 B L N3U2 L' B' NU2 N3R2 Z' Y' X'

X Y Z N3R2 B N3U2 B' L' NU2 L B N3U2 B' L' NU2 L N3R2 Z' Y' X'

X Y Z ND' N3F2 N3U' R' NU' R VU N3F2 N3L2 NU' R' NU R N3L2 ND Z' Y' X'

X Y Z NU NB2 N3D NR N3B' NR' F' NR N3B NR' N3D' NB2 N3D F N3D' NU' Z' Y' X'

X Y Z ND2 R TB NR2 B' N3L2 B NR2 TB' R' NB N3L2 NB' ND2 Z' Y' X'

X Y Z N3R' TR N3U' R' N3U NR' NB VU' R N3U R' NU NB' N3R Z' Y' X'

44 Algorithm(s):

NL' D2 NL N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F NL' D2 NL (20 moves) (6 solved stickers)
(Order: 3)

NL N3F2 NL' N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F NL N3F2 NL' (20 moves) (6 solved stickers)
(Order: 3)

NR' B2 NR N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F NR' B2 NR (20 moves) (6 solved stickers)
(Order: 3)

NR N3U2 NR' N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F NR N3U2 NR' (20 moves) (6 solved stickers)
(Order: 3)

NL' N3B2 NL N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' NL' N3B2 NL (20 moves) (6 solved stickers)

stickers) (Order: 3)
 NL U2 NL' N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' NL U2 NL' (20 moves) (6 solved stickers)
 (Order: 3)
 NR' N3U2 NR N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' NR' N3U2 NR (20 moves) (6 solved stickers)
 (Order: 3)
 NR B2 NR' N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' NR B2 NR' (20 moves) (6 solved stickers)
 (Order: 3)
 N3D' B N3D NU F' ND2 F N3D2 NR N3B' NR' F' NR N3B NR' ND2 F N3D NU' B' N3D (21 moves) (6 solved stickers)
 (Order: 3)
 N3D B N3D' NU F' ND2 F N3D2 NR N3B' NR' F' NR N3B NR' ND2 F N3D' NU' B' N3D' (21 moves) (6 solved stickers)
 (Order: 3)
 N3D' B' N3D ND2 F NU2 F' N3D2 F NU2 ND2 F' N3L2 F ND2 F' N3L2 VD2 N3D' B N3D (21 moves) (6 solved stickers)
 (Order: 3)
 N3D B' N3D' ND2 F NU2 F' N3D2 F NU2 ND2 F' N3L2 F ND2 F' N3L2 VD2 N3D B N3D' (21 moves) (6 solved stickers)
 (Order: 3)
 NR' B' NR ND2 F NU2 F' N3D2 F NU2 ND2 F' N3L2 F ND2 F' N3L2 VD2 NR' B NR (21 moves) (6 solved stickers)
 (Order: 3)
 NR B' NR' ND2 F NU2 F' N3D2 F NU2 ND2 F' N3L2 F ND2 F' N3L2 VD2 NR B NR' (21 moves) (6 solved stickers)
 (Order: 3)
 N3D' NL' N3D N3L2 ND2 B' N3U2 NL' B N3D2 B' NL B VD2 B' N3U2 B N3L2 N3D' NL N3D (21 moves) (6 solved stickers)
 (Order: 3)
 N3D NL' N3D' N3L2 ND2 B' N3U2 NL' B N3D2 B' NL B VD2 B' N3U2 B N3L2 N3D NL N3D' (21 moves) (6 solved stickers)
 (Order: 3)
 N3D' B2 N3D F2 NR2 F N3D' N3L' NB' N3L F' N3L' NB N3L NR2 F N3D F N3D' B2 N3D (21 moves) (6 solved stickers)
 (Order: 3)
 N3D NL2 N3D' F2 NR2 F N3D' N3L' NB' N3L F' N3L' NB N3L NR2 F N3D F N3D NL2 N3D' (21 moves) (6 solved stickers)
 (Order: 3)
 N3U' L2 N3U F2 NR2 F N3D' N3L' NB' N3L F' N3L' NB N3L NR2 F N3D F N3U' L2 N3U (21 moves) (6 solved stickers)
 (Order: 3)
 N3U NB2 N3U' F2 NR2 F N3D' N3L' NB' N3L F' N3L' NB N3L NR2 F N3D F N3U NB2 N3U' (21 moves) (6 solved stickers)
 (Order: 3)
 NL N3F' NL' SF N3L2 F' ND' F N3L2 NR' N3F' NR F' NR' N3F NR ND B NL N3F NL' (21 moves) (6 solved stickers)
 (Order: 3)
 N3U' L N3U SF N3L2 F' ND' F N3L2 NR' N3F' NR F' NR' N3F NR ND B N3U' L' N3U (21 moves) (6 solved stickers)
 (Order: 3)
 NL' N3B' NL N3R F NU' F' N3D2 F VU NF' N3U' F' N3U NF N3U' N3D2 N3R' NL' N3B NL (21 moves) (6 solved stickers)
 (Order: 3)
 N3U' L' N3U N3R F NU' F' N3D2 F VU NF' N3U' F' N3U NF N3U' N3D2 N3R' N3U' L N3U (21 moves) (6 solved stickers)
 (Order: 3)
 N3D' NL N3D N3L2 ND2 B' N3U2 NL B N3D2 B' NL' B VD2 B' N3U2 B N3L2 N3D' NL' N3D (21 moves) (6 solved stickers)
 (Order: 3)
 N3D NL N3D' N3L2 ND2 B' N3U2 NL B N3D2 B' NL' B VD2 B' N3U2 B N3L2 N3D NL' N3D' (21 moves) (6 solved stickers)
 (Order: 3)
 N3D' NL2 N3D F2 NR2 F' N3D F NR2 N3R NF' N3R' F' N3R NF N3R' N3D' F' N3D' NL2 N3D (21 moves) (6 solved stickers)
 (Order: 3)
 N3D B2 N3D' F2 NR2 F' N3D F NR2 N3R NF' N3R' F' N3R NF N3R' N3D' F' N3D B2 N3D' (21 moves) (6 solved stickers)
 (Order: 3)
 N3U' NF2 N3U F2 NR2 F' N3D F NR2 N3R NF' N3R' F' N3R NF N3R' N3D' F' N3U' NF2 N3U (21 moves) (6 solved stickers)
 (Order: 3)
 N3U R2 N3U' F2 NR2 F' N3D F NR2 N3R NF' N3R' F' N3R NF N3R' N3D' F' N3U R2 N3U' (21 moves) (6 solved stickers)
 (Order: 3)
 NL' N3B NL SF N3L2 F' ND F N3L2 NR N3B NR' F' NR N3B' NR' ND' B NL' N3B' NL (21 moves) (6 solved stickers)
 (Order: 3)
 N3U R N3U' SF N3L2 F' ND F N3L2 NR N3B NR' F' NR N3B' NR' ND' B N3U R' N3U' (21 moves) (6 solved stickers)
 (Order: 3)
 NR' B NR NU F' ND2 F N3D2 NR N3B' NR' F' NR N3B NR' ND2 F N3D2 NU' NR' B' NR (22 moves) (6 solved stickers)
 (Order: 3)
 NR B NR' NU F' ND2 F N3D2 NR N3B' NR' F' NR N3B NR' ND2 F N3D2 NU' NR B' NR' (22 moves) (6 solved stickers)
 (Order: 3)
 NL' D' NL D' N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D NL' D NL (22 moves) (6 solved stickers)
 (Order: 3)
 N3U NB' N3U' D' N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D N3U NB N3U' (22 moves) (6 solved stickers)
 (Order: 3)

NL' D NL D N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D' NL' D' NL (22 moves) (6 solved stickers) (Order: 3)
N3U' NF' N3U D N3D2 F' NR' F N3D2 NU' N3F' NU F' NU' N3F NU NR F D' N3U' NF N3U (22 moves) (6 solved stickers) (Order: 3)
NR' N3U' NR B2 NL2 F' N3U F NL2 N3L NF' N3L' F' N3L NF N3L' N3U' F B2 NR' N3U NR (22 moves) (6 solved stickers) (Order: 3)
NR N3U' NR' B2 NL2 F' N3U F NL2 N3L NF' N3L' F' N3L NF N3L' N3U' F B2 NR N3U NR' (22 moves) (6 solved stickers) (Order: 3)
NL U' NL' U' N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U NL U NL' (22 moves) (6 solved stickers) (Order: 3)
N3U' NF N3U U' N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U N3U' NF' N3U (22 moves) (6 solved stickers) (Order: 3)
NL U NL' U N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U' NL U' NL' (22 moves) (6 solved stickers) (Order: 3)
N3U NB N3U' U N3D2 F NR ND N3B' ND' F' ND N3B ND' N3D2 F NR' F' U' N3U NB' N3U' (22 moves) (6 solved stickers) (Order: 3)

Example A7

Corner-centers – 23-cycle – find nearest position (7x7x7 cube)

Search for algorithm giving the least number of permuted stickers from solved position: useful to know how close the solution is and can be reached with just a few additional setup moves

Form A6

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

7

Face index:

6

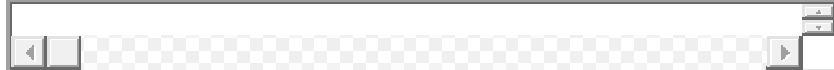
Turn index:

2

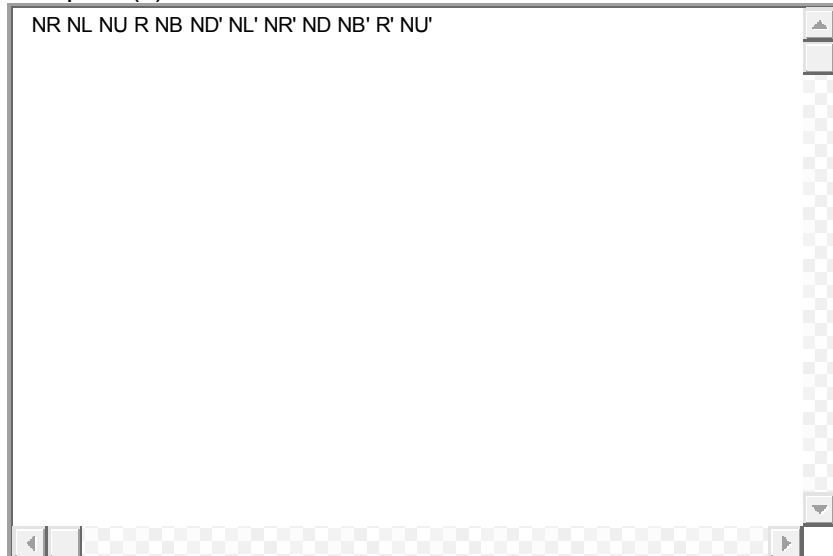
Symmetry index:

0

'Insert' template:



Template(s):



```
NR NL NU R NB ND' NL' NR' ND NB' R' NU'
```

Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

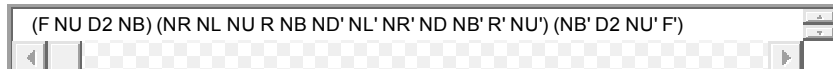
Reflection symmetry

Find nearest position

Setup index:

3

Generator:



```
(F NU D2 NB) (NR NL NU R NB ND' NL' NR' ND NB' R' NU)' (NB' D2 NU' F)'
```

Seed Finder settings:

N-cycles

All cycles

Piece type:

Corner

Midge

Edge

Corner-Center

Midge-Center

Edge-Center

True Center

Permutation order:

Permuted pieces:

Twisted corners:

▼

Flipped midges:

▼

Result A7

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues
Elapsed Time (Hours:Minutes:Seconds) = 00:00:04

1 algorithm(s) found --- 46656 algorithms checked.

Algorithm Finder Lite settings:

Cube order: 7

isOnSuperCubeMode: true

isOnShiftMode: false

isOnInversionMode: false

isOnRotationSymmetryMode: false

isOnReflectionSymmetryMode: false

isOnFindNearestPositionMode: true

Generator algorithm: F NU D2 NB NR NL NU R NB ND' NL' NR' ND NB' R' NU' NB' D2 NU' F'

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

3 setup move(s)

Template symmetry index: 0

1 Template(s):

X Y Z NR NL NU R NB ND' NL' NR' ND NB' R' NU' Z' Y' X'

1 Algorithm(s):

NU D2 NB NR NL NU R NB ND' NL' NR' ND NB' R' NU' NB' D2 NU' (18 moves) (7 unsolved stickers) (Order: 23)

Example S1

Corner-centers 17-cycle – 5 variables – 4 faces – $\frac{1}{4}$ turns (7x7x7 cube)

Form S1

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

Face index:

Turn index:

Symmetry index:

'Insert' template:



Template(s):



Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

Generator:

Seed Finder settings:

- N-cycles
- All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:

Flipped midges:

Result S1

Elapsed Time (Hours:Minutes:Seconds) = 00:00:03

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues

4 algorithm(s) found --- 76832 algorithms checked.

Seed Finder settings:

Cube order: 7

isOnSearchForNCyclesMode: true

isOnSearchForAllCyclesMode: false

Insert algorithm template: none

4 Faces: R + U + F + L

1/4 turns only

0 setup move(s)

Template symmetry index: 0

1 Template(s):

X Y Z P Q Y' X' Q' P' Z'

4 Algorithm(s):

NR NL NU R' NF NL' NR' NF' R NU' (10 moves) (17 solved stickers) (Order: 17)

NR NL NU L NF NL' NR' NF' L' NU' (10 moves) (17 solved stickers) (Order: 17)

NR NL' NU R' NF NL NR' NF' R NU' (10 moves) (17 solved stickers) (Order: 17)

NR NL' NU L NF NL NR' NF' L' NU' (10 moves) (17 solved stickers) (Order: 17)

Example S2

True centers – batch mode – 2 3-cycles – 4 variables (7x7x7 cube)

Form S2

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

Face index:

Turn index:

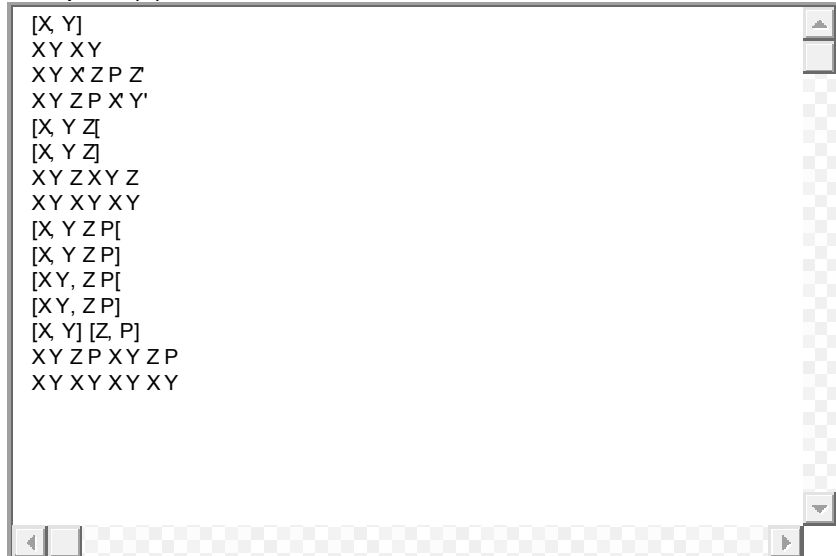
Symmetry index:

'Insert' template:



Template(s):

```
[X Y]
XY XY
XY X Z P Z
XY Z P X Y'
[X Y Z]
[X Y Z]
XY Z X Y Z
XY X Y X Y
[X Y Z P]
[X Y Z P]
[X Y, Z P]
[X Y, Z P]
[X Y] [Z, P]
XY Z P X Y Z P
XY X Y X Y X Y
```



Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

Generator:

Seed Finder settings:

- N-cycles
- All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:

Flipped midges:

Result S2

Elapsed Time (Hours:Minutes:Seconds) = 00:00:52

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues

28 algorithm(s) found --- 1163580 algorithms checked.

Seed Finder settings:

Cube order: 7

isOnSearchForNCyclesMode: true

isOnSearchForAllCyclesMode: false

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

0 setup move(s)

Template symmetry index: 0

15 Template(s):

X Y X' Y'

X Y X Y

X Y X' Z P Z'

X Y Z P X' Y'

X Y Z X' Y' Z'

X Y Z X' Z' Y'

X Y Z X Y Z

X Y X Y X Y

X Y Z P X' Y' Z' P'

X Y Z P X' P' Z' Y'

X Y Z P Y' X' Z' P'

X Y Z P Y' X' P' Z'

X Y X' Y' Z P Z' P'

X Y Z P X Y Z P

X Y X Y X Y X Y

28 Algorithm(s):

MR MU MR' MU' (4 moves) (6 solved stickers) (Order: 3)

MR MU' MR' MU (4 moves) (6 solved stickers) (Order: 3)

MR MU MR MU' MR2 (5 moves) (6 solved stickers) (Order: 3)

MR MU' MR MU MR2 (5 moves) (6 solved stickers) (Order: 3)

R MR' MU' MR MU R' (6 moves) (6 solved stickers) (Order: 3)

R MR' MF' MR MF R' (6 moves) (6 solved stickers) (Order: 3)

R MR' MU MR MU' R' (6 moves) (6 solved stickers) (Order: 3)

MR R MU' MR' MU R' (6 moves) (6 solved stickers) (Order: 3)

MR R MU MR' MU' R' (6 moves) (6 solved stickers) (Order: 3)

MR L MF MR' MF' L' (6 moves) (6 solved stickers) (Order: 3)

MR L MF' MR' MF L' (6 moves) (6 solved stickers) (Order: 3)

R MU MR MU' MR' R' (6 moves) (6 solved stickers) (Order: 3)

MR MU MF MR2 MU' MF' MR (7 moves) (6 solved stickers) (Order: 3)

MR MU MF' MR2 MU' MF MR (7 moves) (6 solved stickers) (Order: 3)

MR MF MU MR2 MF' MU' MR (7 moves) (6 solved stickers) (Order: 3)

MR MU' MF MR2 MU MF' MR (7 moves) (6 solved stickers) (Order: 3)

MR MF' MU' MR2 MF MU MR (7 moves) (6 solved stickers) (Order: 3)

MR MF MU' MR2 MF' MU MR (7 moves) (6 solved stickers) (Order: 3)

MR MF' MU MR2 MF MU' MR (7 moves) (6 solved stickers) (Order: 3)

MR MU MF MU2 MR' MF' MU (7 moves) (6 solved stickers) (Order: 3)

MR MF MR MF MR' MF' MR' MF' (8 moves) (6 solved stickers) (Order: 3)

MR MU MR MU MR' MU' MR' MU' (8 moves) (6 solved stickers) (Order: 3)

MR MU MR' MU MR' MU' MR MU' (8 moves) (6 solved stickers) (Order: 3)

MR MF MR' MF' MR' MF' MR MF (8 moves) (6 solved stickers) (Order: 3)

MR MF MR MF' MR' MF' MR' MF (8 moves) (6 solved stickers) (Order: 3)

MR MF MR' MF MR' MF' MR MF' (8 moves) (6 solved stickers) (Order: 3)

MR MU' MR' MU MR' MU MR MU' (8 moves) (6 solved stickers) (Order: 3)

MR MU' MR MU MR' MU MR' MU' (8 moves) (6 solved stickers) (Order: 3)

Example S3

Corner-centers – generalized commutator – 2 3-cycles – 5 variables (7x7x7 cube)

$[X,Y,Z,P,Q] = [X,Y][Y,Z][Z,P][P,Q] = X Y X' Z Y' P Z' Q P' Q'$

Form S3

Settings common to both Finders:

Finder type:

Algorithm Finder

Seed Finder

Cube size:

7

Face index:

6

Turn index:

2

Symmetry index:

0

'Insert' template:

Template(s):

[X,Y][Y,Z][Z,P][P,Q]

Algorithm Finder settings:

Super Cube mode

Shift

Inversion

Rotation symmetry

Reflection symmetry

Find nearest position

Setup index:

0

Generator:

Seed Finder settings:

N-cycles

All cycles

Piece type:

- Corner
- Midge
- Edge
- Corner-Center
- Midge-Center
- Edge-Center
- True Center

Permutation order:

Permuted pieces:

Twisted corners:

 ▼

Flipped midges:

 ▼

Result S3

Algorithm Finder Lite --- JavaScript Version 2.4 --- Copyright (c) 2011 mementoslangues
Elapsed Time (Hours:Minutes:Seconds) = 00:06:55

40 algorithm(s) found --- 4743684 algorithms checked.

Seed Finder settings:

Cube order: 7

isOnSearchForNCyclesMode: true

isOnSearchForAllCyclesMode: false

Insert algorithm template: none

6 Faces: R + U + F + L + D + B

1/4 turns + 1/2 turns

0 setup move(s)

Template symmetry index: 0

1 Template(s):

X Y X' Y' Y Z Y' Z' Z P Z' P' P Q P' Q'

40 Algorithm(s):

NR NU NR' NU' (4 moves) (6 solved stickers) (Order: 3)

NR NU' NR' NU (4 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NU2 (4 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR2 NU2 (4 moves) (6 solved stickers) (Order: 3)

NR NU NR2 NU' NR (5 moves) (6 solved stickers) (Order: 3)

NR NU NR NU' NR2 (5 moves) (6 solved stickers) (Order: 3)

NR NU' NR NU NR2 (5 moves) (6 solved stickers) (Order: 3)

NR NU2 NR2 NU2 NR (5 moves) (6 solved stickers) (Order: 3)

NR NU2 NR NU2 NR2 (5 moves) (6 solved stickers) (Order: 3)

NR NU NR' NF' NU NF NU2 (7 moves) (6 solved stickers) (Order: 3)

NR NU NR NU2 NR' NU NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU NR NU NR' NU2 NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU NR' NU2 NR NU NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU NR' NU NR NU2 NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU' NR NU' NR' NU2 NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU' NR' NU' NR NU2 NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU NR2 NU2 NR2 NU NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU NR2 NU NR2 NU2 NR' (7 moves) (6 solved stickers) (Order: 3)

NR NU' NR2 NU' NR2 NU2 NR' (7 moves) (6 solved stickers) (Order: 3)

NR2 NU NR' NU2 NR NU NR2 (7 moves) (6 solved stickers) (Order: 3)

NR2 NU NR' NU NR NU2 NR2 (7 moves) (6 solved stickers) (Order: 3)

NR2 NU' NR' NU' NR NU2 NR2 (7 moves) (6 solved stickers) (Order: 3)

NR2 NU' NR2 NU2 NR2 NU' NR2 (7 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR2 NU' NR2 NU' NR2 (7 moves) (6 solved stickers) (Order: 3)

NR NU NR NU' NB' NR NB NR (8 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR2 NL2 NU2 ND2 NL2 ND2 (8 moves) (6 solved stickers) (Order: 3)

NR NU' NR' NF' NU NL NF' NL' NF2 (9 moves) (6 solved stickers) (Order: 3)

NR NU2 NR2 NU2 NR NL NF2 NL' NF2 (9 moves) (6 solved stickers) (Order: 3)

NR NU2 NR NU2 NR2 NL NF2 NL' NF2 (9 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL NU2 NF2 NL NF2 NL2 (9 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR' NU2 NR' NL2 ND2 NL2 ND2 (9 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL NU2 NL' NR NU2 NR' NU2 (10 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL NU2 NF2 NL' NR' NF2 NR (10 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL' NU2 NL NR NU2 NR' NU2 (10 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL' NU2 NL NR' NF2 NR NF2 (10 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL2 NU2 NL2 NR NU2 NR' NU2 (10 moves) (6 solved stickers) (Order: 3)

NR NU2 NR' NL2 NU2 ND2 NL2 NR2 ND2 NR2 (10 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR2 NU2 ND NR2 ND' NU2 NR2 NU2 (10 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR2 NL2 NU2 NL2 NR2 ND2 NR2 ND2 (10 moves) (6 solved stickers) (Order: 3)

NR2 NU2 NR2 NU2 ND2 NR2 ND2 NU2 NR2 NU2 (10 moves) (6 solved stickers) (Order: 3)