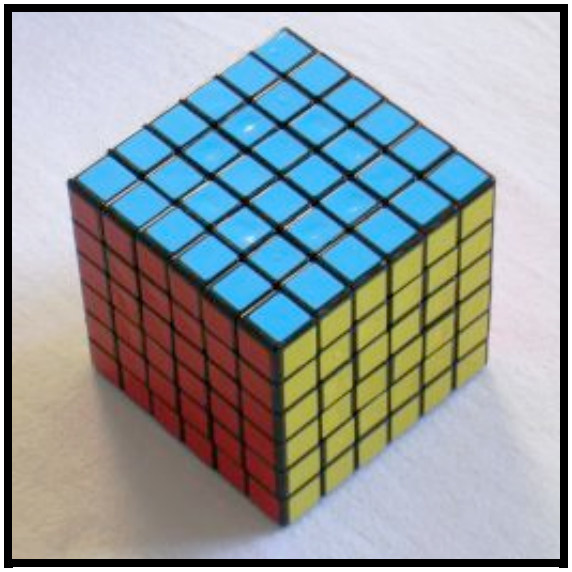
6x6x6 V-Cube



This puzzle is a cube which is built from smaller cubes, 6 to an edge, i.e. a 6×6×6 cube. Like a Rubik's Cube each slice can rotate, which rearranges the small cubes on the surface of the puzzle. The six sides of the cube are coloured, so every corner piece shows three colours, every edge piece shows 2 colours, and every face centre only one.

Unlike the normal 3×3×3 Rubik's cube, turning a face does move the face centres. The centres therefore can not be immediately used as a fixed reference point.

The V-Cubes worldwide patent was granted to inventor Panagiotis Verdes on 2 December 2012, WO 2004 103497.

The number of positions:

There are 8 corner pieces with 3 orientations each, 24 inner edge pieces and 24 outer edge pieces apparently with 2 orientations each, 24 centre corner pieces, two sets of 24 centre edge pieces, 24 inner centre pieces, giving a maximum of $8!\cdot24!^6\cdot3^8\cdot2^{48}$ positions. This limit is not reached because:

- The total twist of the corners is fixed (3)
- The edge orientation is dependent on its position, i.e. edges cannot actually be flipped (2^{48})
- There are indistinguishable face centres ($4!^{6\cdot4}$)
- The orientation of the puzzle does not matter (24)

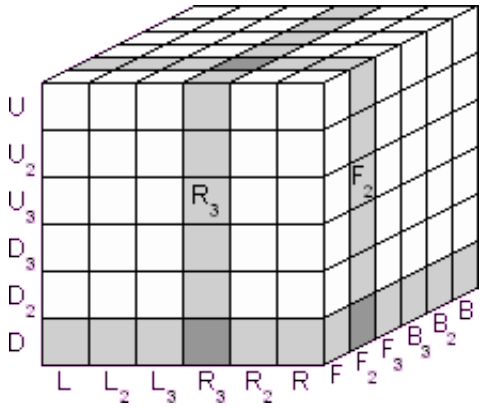
This leaves $7!\cdot24!^6\cdot3^6 / 4!^{24}$ = 157,152,858,401, 024,063,281,013,959, 519,483,771,508,510, 790,313,968,742,344, 694,684,829,502,629, 887,168,573,442,107, 637,760,000,000,000, 000,000,000,000,000 = $1.57\cdot10^{116}$ positions.

Links to other useful pages:

V-Cubes homepage has an on-line shop, and a solution method like this one.

Like the normal cube, there are several types of solution. Here I will only give the 'Edge-Matching' solution method.

Notation:

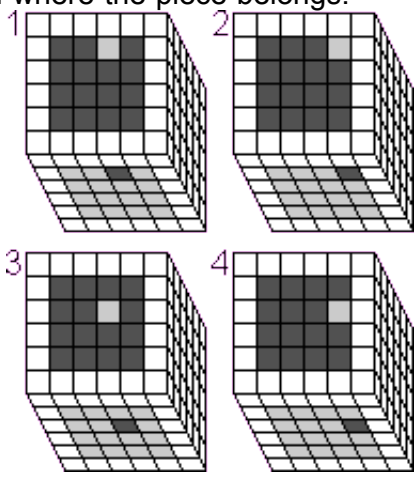


Let the faces be denoted by the letters L, R, F, B, U and D (Left, Right Front, Back, Up and Down). Clockwise quarter turns of a face layer are denoted by the appropriate letter, anti-clockwise quarter turns by the letter with an apostrophe (i.e. L', R', F', B', U' or D'). Half turns are denoted by the letter followed by a 2 (i.e. L2, R2, F2, B2, U2 or D2). The above is the same notation as for the 3×3×3 cube. An internal slice will be denoted by adding a subscript 2 or 3. So F_2 is a clockwise turn of the slice immediately behind the Front face, and F_3' is an anti-clockwise turn of the slice immediately behind that. Note that these denote a slice only, so such a move will not disturb the corners of the cube.
The location of any piece can be denoted by listing the three faces/slices it lies in.

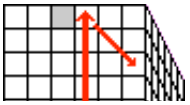
Solution

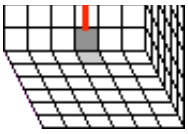
Phase 1: Solve centres
To do this phase, you must know where the colours of the cube are supposed to be. If at any point you are unsure, look at the corner pieces to find out. The method below solves the U centres without disturbing any already solved faces. Simply repeat this for each of the faces.

a. Find any centre piece edge that belongs on the U face. Hold the cube so that it lies on the F or D face.
b. If the piece is in the front face, turn F to put the piece at the top right, i.e. in the U_2 or U_3 layer, and the R_2 or R_3 slice. If it is in the bottom face, turn D to put the piece at the front right, i.e. in the F_2 or F_3 slice, and the R_2 or R_3 slice.
c. Turn the U face so that there is an incorrect piece at the back right location where the piece belongs.
d. Do one of the following move sequences to insert the centre piece:
   1. From F U_2 R_3 to U B_2 R_3: Do R_3 U' L_2' U R_3' U' L_2
   2. From F U_2 R_2 to U B_2 R_2: Do R_2 U' L_2' U R_2' U' L_2
   3. From F U_3 R_3 to U B_3 R_3: Do R_3 U' L_3' U R_3' U' L_3
   4. From F U_3 R_2 to U B_3 R_2: Do R_2 U' L_3' U R_2' U' L_3
   5. From D F_2 R_3 to U B_2 R_3: Do $R_3$2 U' $L_2$2 U $R_3$2 U' $L_2$2
   6. From D F_2 R_2 to U B_2 R_2: Do $R_2$2 U' $L_2$2 U $R_2$2 U' $L_2$2
   7. From D F_3 R_3 to U B_3 R_3: Do $R_3$2 U' $L_3$2 U $R_3$2 U' $L_3$2
   8. From D F_3 R_2 to U B_3 R_2: Do $R_2$2 U' $L_3$2 U $R_2$2 U' $L_3$2
e. Repeat a-d until all 16 centre pieces in the U face are correct.
f. Repeat a-e for each of the faces.



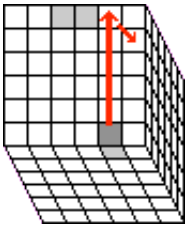
Phase 2: Match up the inner edges.
In this phase the inner edge pieces are matched up to form matching pairs.





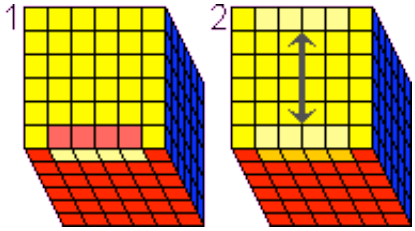
a. Find any inner edge piece that is not yet matched up with its twin inner edge piece. Hold the cube so that this piece lies at the U B L_3 location.
b. Find the matching inner edge piece. Use any face moves to bring it to the U F R_3 location.
c. Find any unmatched inner edge pair and put them at the U R location, using only L/R/D face moves so as not to disturb the other pieces. If there is no other unmatched pair, then do U2 R_3 U2 R_3 U2 R_3 U2 R_3 U2 R_3 to make some new unmatched inner edge pairs and try again.
d. Do R_3 B'RB R_3' to pair up the inner edges.
e. Repeat a-d until all inner edges are paired up.

Phase 3: Match up the outer edges.
In this phase the outer edge pieces are matched up to the inner edge pairs.



a. Find any outer edge that is not yet matched up with its inner edge pair. Hold the cube so that this piece lies at the U F R_2 location.
b. Find the matching inner edge pair. Use any face moves to bring them to the U B location.
c. Check that the inner edge pair shows a different colour on the U face than the outer edge piece. If not, then flip over the inner edge pair by doing B' U R' U'.
d. Find any other unmatched outer edge piece and put it at the U R B_2location without disturbing the other pieces. If there is no other unmatched pair, then do U2 R_2 U2 R_2 U2 R_2 U2 R_2 U2 R_2 to make some new unmatched outer edges and try again.
e. Do R_2 B'RB R_2'
f. Repeat a-e until all edges lie in matching edge quadruplets.

Phase 4: Solve the cube.



a. Solve the cube as far as possible by turning outer faces only, using any method for the 3×3×3 cube.
b. There are two situations that can occur that are not possible on the normal Rubik's cube, viz. a flipped 'edge', or two swapped 'edges'.
To solve the cube in these situations, you can use one of the following sequences:
1. To flip the UF quad, do R_{123}2 B2L U2 L_{23} U2 R_{23}' U2 R_{23} U2 F2 R_{23} F2 L_{123}' B2 R_{123}2.
2. To swap the UF-UB quads, do U_{23}2 R_{23}2 U_{123}2 R_{23}2 U2 R_{23}2.
If you end up with two swapped corners because your method solves the corners last, then also swap two edges using the second sequence above, after which you should be able to solve the cube again.

| Home | Links | Guestbook |