

TEACH YOURSELF CUBE-BASHING

1 The Cube

Definitions of moves, directions, and cubes.

2 The Moves

2.1 The Tumble.

2.2 The Jelly Roll.

2.3 The Ripple.

3 The Methods

3.1 To Scramble the Cube.

3.2 To Solve the Cube.



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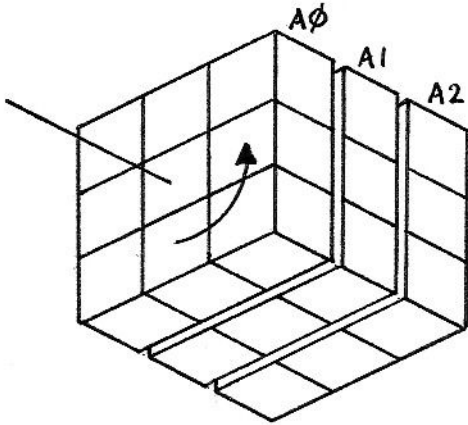
Introduction

The smile of the novice Cube-basher broadens as the first correct Cube face emerges. This euphoria soon evaporates as it seems impossible to progress without losing everything on the first face.

Since the creation of the first Cube, teams of experts have been dedicated to discovering sequences of moves which will manipulate the Cube without corrupting the corrected face. There are many such sequences; this paper describes three of them which the authors have found to be sufficient to solve the Cube. Each of these sequences are applied to achieve recognisable milestones. By studying the effects of each sequence the Cube-basher can soon optimise his route to the next milestone.

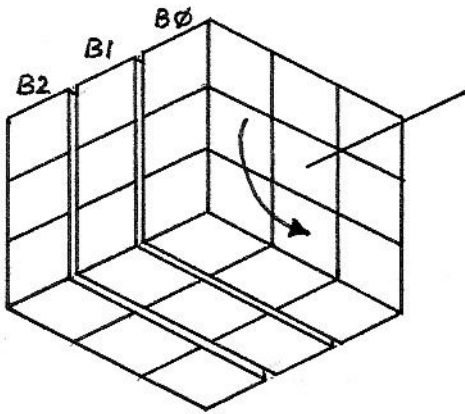
The authors felt that it was not desirable to give optimisation details as this paper is aimed at the beginner. Each milestone can be attained by applying the appropriate sequence almost at random.

1 The Cube

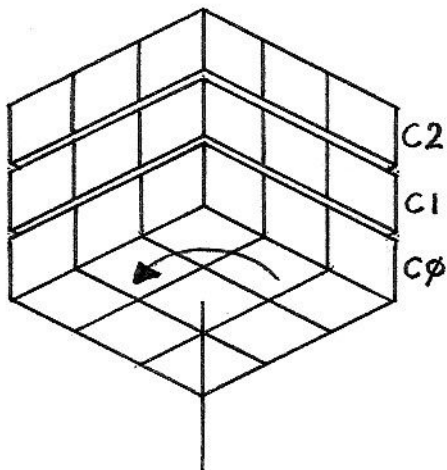


The Cube is apparently constructed from 27 cubes in such a way that there are 9 planes of movement.

For any given orientation, the 9 planes are referred to as A0, A1, A2; B0, B1, B2; C0, C1, C2 as seen in the diagrams.



A move of any one plane is defined as a quarter-turn (90°) of that plane in a clockwise or anticlockwise direction, as seen by the cube-basher. Anticlockwise turns are positive moves; clockwise turns are negative. In the diagrams, the arrows show the directions of positive moves.



In the Cube there are 8 corner cubes, 12 edge cubes, 6 face cubes (and 1 unseen imaginary cube). Note that the positions of the face cubes relative to each other are fixed. This shows which colours are opposite which (not necessarily the same for all Cubes).

2.1 The Tumble

The main effect of this move is to tumble the corner cubes around the bottom face C0. One corner cube may be considered to remain stationary while the other three change both position and orientation. The Tumble has side effects on the four edge cubes in the C0 plane and on the edge cube which is common to planes A0 and B0 in figures 1(a) and 1(b).

The Tumble has a period of three to return to the original corner-cube configuration, or fifteen to return to the original Cube configuration.

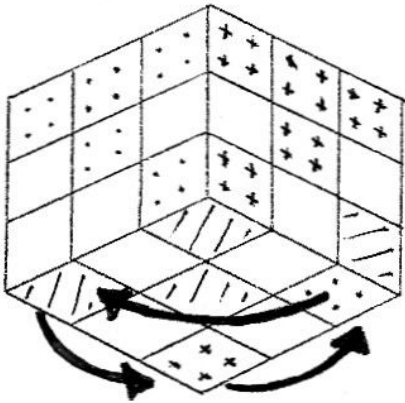


Figure 1(a)

Right-hand Tumble

B0 C0 -B0 -C0 -A0 -C0 A0 C0

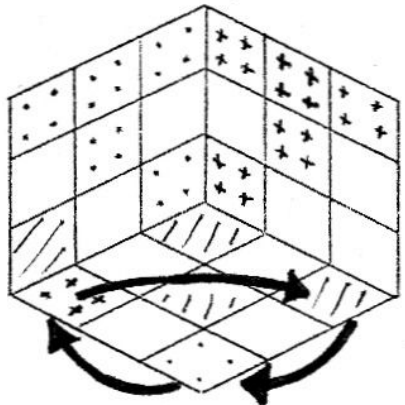


Figure 1(b)

Left-hand Tumble

-A0 -C0 A0 C0 B0 C0 -B0 -C0

2.2 The Jelly Roll

This move changes the orientation of three of the corner cubes of the bottom face $C0$, the fourth being unaffected. Their relative positions remain unchanged. The Jelly Roll move also has side effects on the edge cubes of the $C0$ plane.

If we consider imaginary axes from the centre of the Cube passing through each of the four corner cubes of the $C0$ plane, then the Jelly Roll will rotate three of those corner cubes 120° about their respective axes, the direction of rotation being dependant on the type of Jelly Roll performed (right-hand Roll causes anticlockwise, and left-hand Roll clockwise rotation).

The Jelly Roll has a period of three to return to the original Cube configuration.

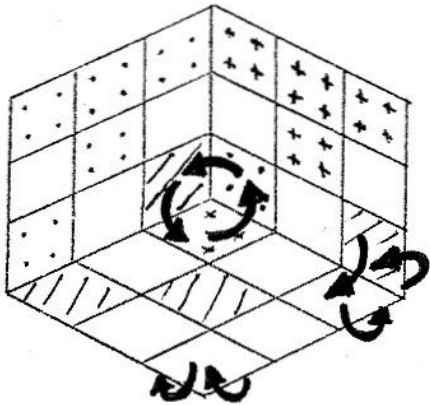


Figure 2(a)

Right-hand Jelly Roll

$B0 \ C0 \ -B0 \ C0 \ B0 \ C0 \ C0 \ -B0 \ C0 \ C0$

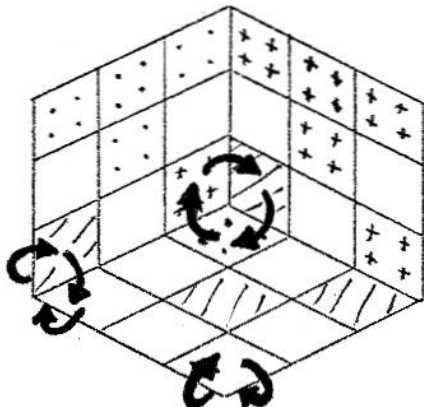


Figure 2(b)

Left-hand Jelly Roll

$-A0 \ -C0 \ A0 \ -C0 \ -A0 \ -C0 \ -C0 \ A0 \ -C0 \ -C0$

2.3 The Ripple

The Ripple changes three edge cubes as shown in the figures.
 No other cube is affected. The period of a Ripple is three.

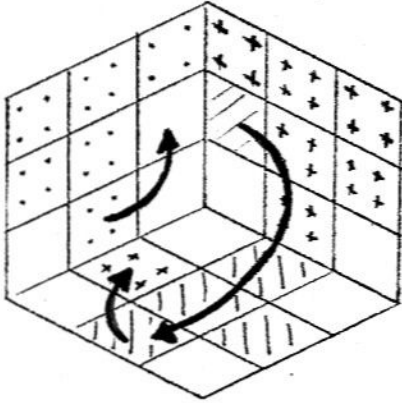


Figure 3(a)

Right-hand Forward Ripple

B0 -A1 -B0 C0 B0 A1 -B0 -C0

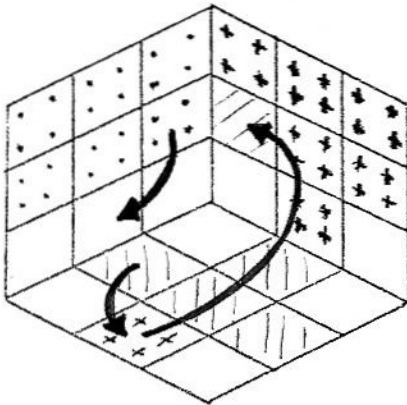


Figure 3(b)

Right-hand Backward Ripple

C0 B0 -A1 -B0 -C0 B0 A1 -B0

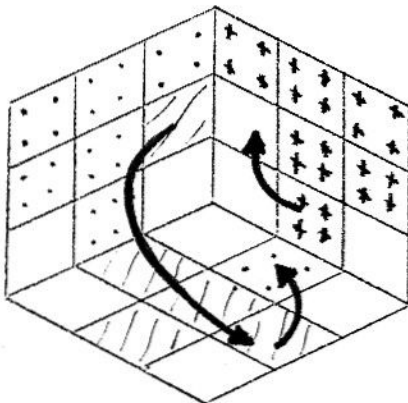


Figure 3(c)

Left-hand Forward Ripple

-A0 B1 A0 -C0 -A0 -B1 A0 C0

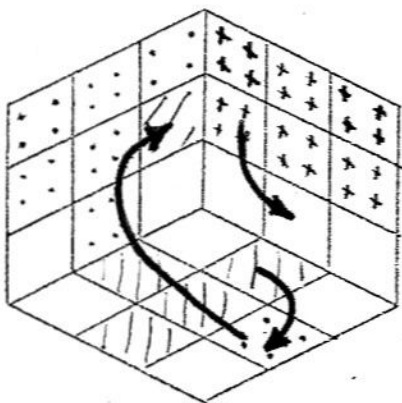


Figure 3(d)

Left-hand Backward Ripple

-C0 -A0 B1 A0 C0 -A0 -B1 A0

3 The Methods

3.1 To Scramble the Cube

If it is not already in a scrambled state by the time it reaches you, give it to a well-meaning friend.

3.2 To Solve the Cube

3.2.1 Manipulate the Cube until one plane is correct. Any plane other than a middle plane (A1, B1, C1) may be used.

3.2.2 Hold the Cube with the correct plane in the C2 position (upwards) and maintain this orientation for the rest of the procedure.

3.2.3 Align the C2 plane with the face cubes of the C1 plane.

3.2.4 Perform Tumbles until the corner cubes of the C0 plane are in the correct location relative to each other (their orientation is immaterial).

3.2.5 Perform Jelly Rolls until the corner cubes of the C0 plane are correctly orientated.

3.2.6 Perform Ripples to correct any 3 out of the 4 edge cubes of the C1 plane.

3.2.7 Perform Ripples to correct any 2 adjacent edge cubes of the C0 plane (do not corrupt the three correct edge cubes of the C1 plane in doing so).

3.2.8 Only 3 edge cubes in the whole Cube are now wrong (one in the C1 plane and two in the C0 plane). Perform 1 or possibly 2 Ripples to complete the solving of your Cube.