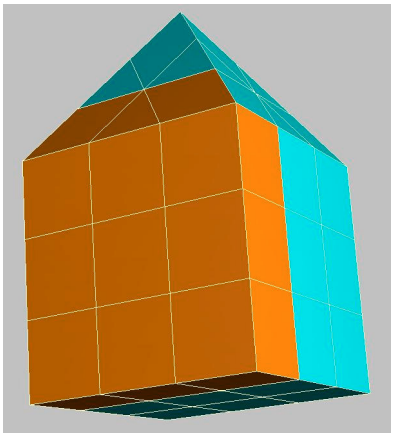
Virtual True Rubik Elongated Square Pyramid

by Eduard Baumann

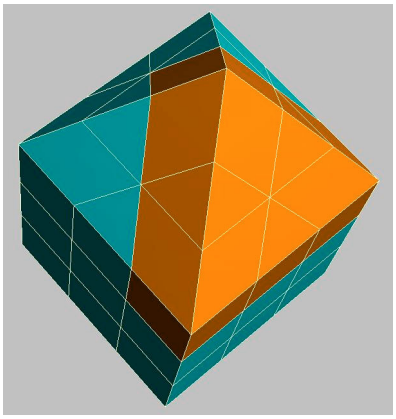
Rotational puzzles can be played virtually in a computer programm. If real versions of such a rotational puzzle are available on the marketplace then there is no doubt that they are superior to any virtual version.

It is possible that very obvious generalisations of real rotational puzzles are very hard to realize. The necessary mechanics can be very difficult or impossible.

In such cases a virtual programm may be more convincing. Lets look at the houselike ennahedron which still has a small number of faces (9). Here is an illustration which shows the rotated part (slice) in another color.



For this polyhedron a mechanical realisation is certainly not possible because the sides of the “cubicle” change their form when the slice is turned. See also that one label is not transported in the case of the left illustration (a 4-vertex becomes a 3-vertex). This means that in contrary to the edge cubicles the corner cubicles can be disassembled.



The programmed version of this rotational puzzle has the very big advantage of easy undo's and of the automatic execution of compactly written sequences. It is also possible to retain the whole history of all movements done on the puzzle.

Principles for an Excel Worksheet

(a) record simple cell circulations
(b) give such recordings one letter names
(c) have one macro which calls all such recordings following a sequence given in form of a letter string in the selected cell
(d) the saving of positions are simple copy/pastes and ‘undo’ can also be prepared by copy/paste.

The forced cartesian arrangement of the cells in the Excelsheet shows as follows (shown are at left the front part and at right the back part seen from inside). In order to not loose interesting aspects it is clear that all parts must be distinguishable. This can be obtained giving a individual letter for each label.

In the following the letters C,D,E, … mean the turning of the corresponding slice by 90° or 120° clockwise, seen from outside.

Only the turning of three slices F, A and D and one turning T of the whole ennahedron around the vertical axis are predefined. With this all other turns can be constructed. For example R=TC$\underline{T}$.

Notation:

$\underline{F}$ is the inverse of F. The elements in round brackets change place in a cycle. [$\underline{R}$F] is the commutator of $\underline{R}$ and F and means $\underline{R}$FR$\underline{F}$.

The near neighbourhood commutator NNC like [FR] gives an cycle for three edge cubicles with side effects on corners.

The far neighbourhood commutator FNC like [CF] which is not possible on classic Rubik cube yields a cycle for three corners without side effects on the edges.

The edge cubicles can return to their home place with a twist. We use the wellknown edge twister from the Rubik cube W=(D2F2)2 D RD2R FD RF2R F which flips R4 and D6. Here the edge elements are quoted with only one representative label.

For the assembling of corners in this puzzle we need a cycle 3 corner labels only. A not very short sequence which does this job is the following. Execute [FC] and [CG] five times to get Q = (C4 B1 C1). The following derivations of Q are usefull. Z= TATFTT Q TT$\underline{FTAT}$, X= [QZ] yielding (C1 C4 C6), Y= FF D TFF$\underline{T}$ X TFF$\underline{T}$ $\underline{D}$ FF yielding (A4 A6 C1) and V= X TF$\underline{T}$XT$\underline{FT}$ $\underline{X}$ TF$\underline{TX}$T$\underline{FT}$ yielding (C6 C1 F3).

With all this sequences you can apply the following strategy

(a) place all edge elements with NNC's
(b) orient the edge elements with W
(c) assemble and place all 3-vertices with FNC's and Q
(d) assemble and place all 4-vertices with FNC's and Q

An Excelsheet with the True Rubik ennahedron is available at baumann@mcnet.ch.