LED Matrix Cube Design

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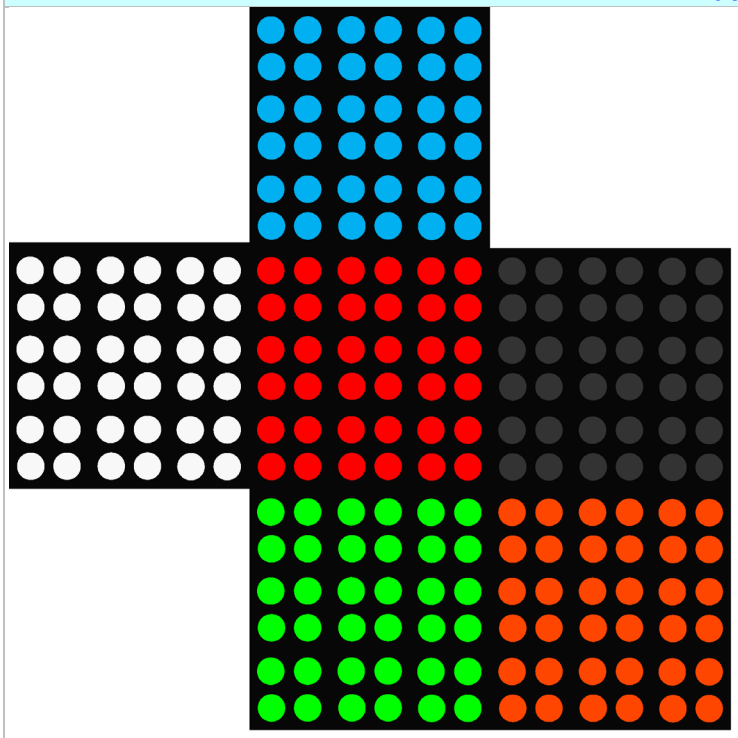
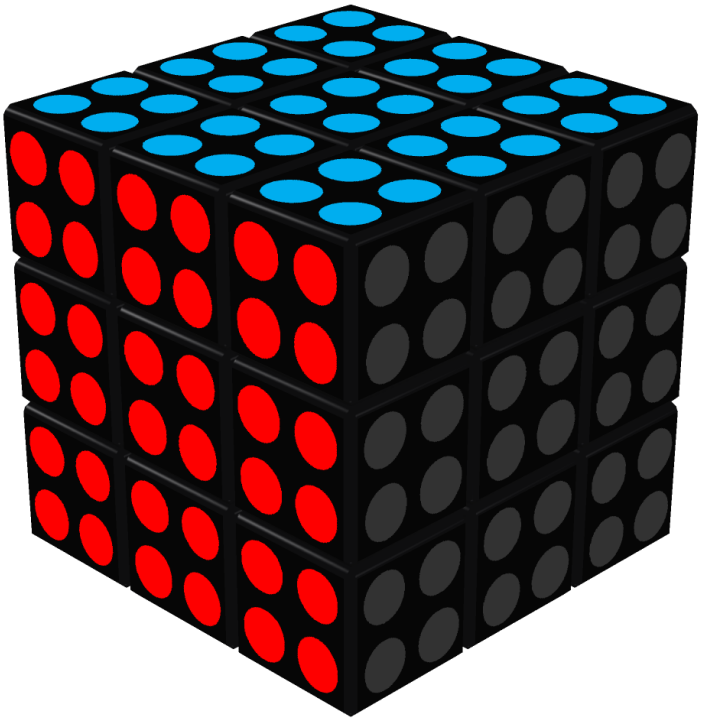
WebSites	http://www.mementoslangues.fr/	http://www.randelshofer.ch/

Introduction

A **LED Matrix Cube** is a 3x3x3 **Rubik's Cube** used to display 'LED-like' dotted patterns.

Light Emitting Diode – Useful Links	
http://en.wikipedia.org/wiki/Light-emitting_diode	http://en.wikipedia.org/wiki/Dot_matrix
http://andrewfentem.com/	http://www.rubikstouchcube.com/

There are **Virtual Cubes** that can be *virtually* rotated and twisted on a computer screen and **Real Cubes** that can only be *physically* rotated and twisted by hand. A **Texture** is laid down on a Virtual Cube whereas real **Stickers** are stuck down on a Real Cube. A LED Matrix Cube is designed by placing 2x2 dotted patterns on a texture which is then laid down on a Virtual Cube (see http://www.randelshofer.ch/ for more details). Various patterns can then be displayed on selected faces.

LED Matrix Cube	
	
LED Matrix Cube Texture	Virtual LED Matrix Cube

Design Features

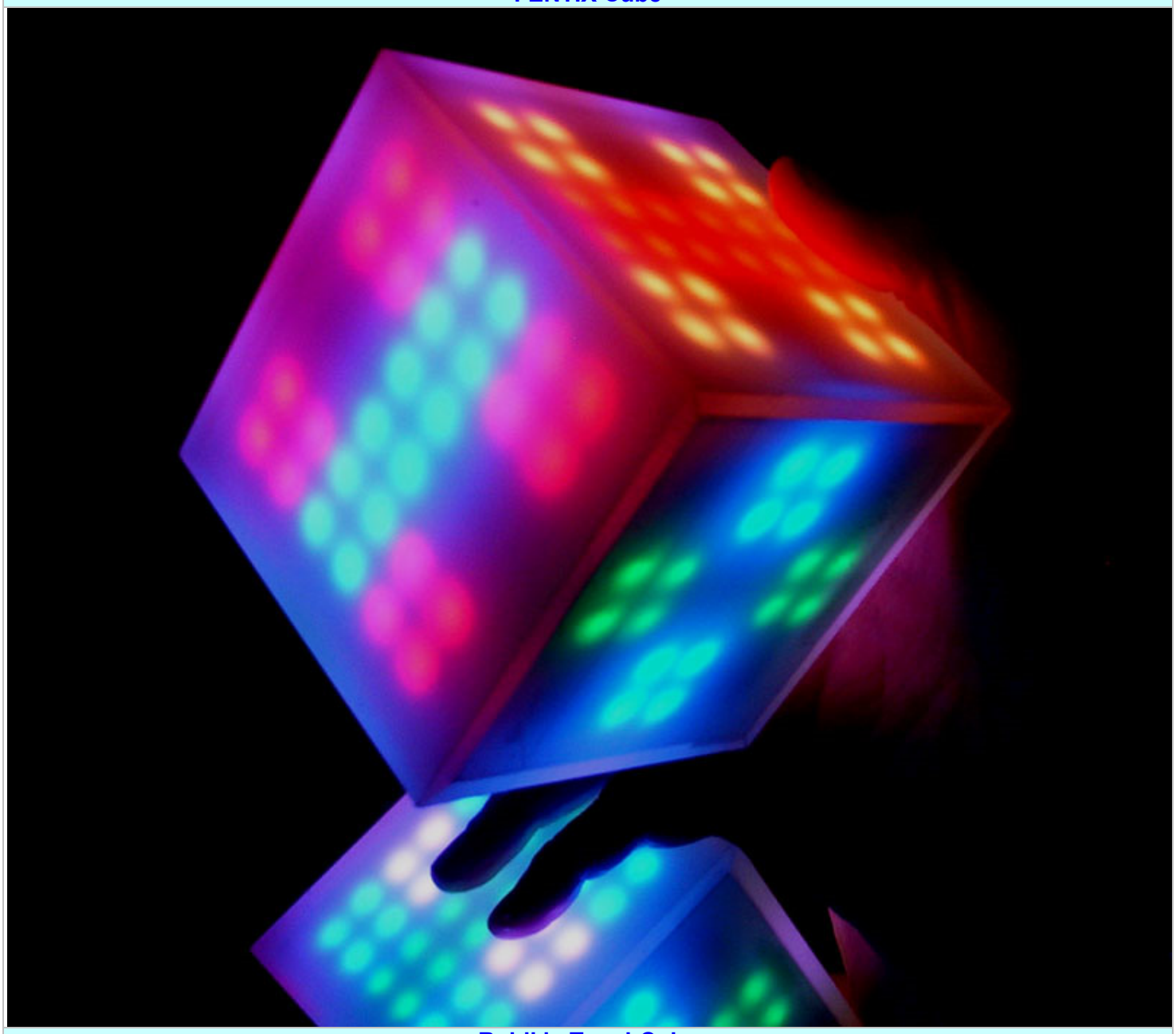
The cube can be used in 2 display modes:

1- Mode A: Selected patterns on a selected face
2- Mode B: Pretty patterns on the whole cube (see: http://www.randelshofer.ch/rubik/patterns.html)

The right face simulates unlit LEDs whereas colored LEDs are lighted on all other faces. Opposed colors are used on opposed faces, as for a regular Rubik's Cube.

LED Cubes – Examples

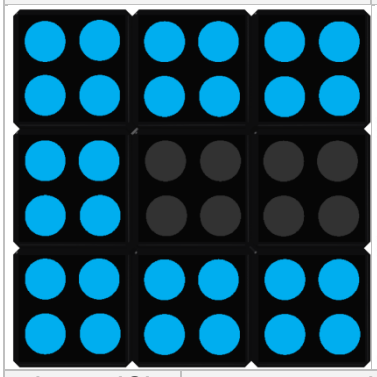
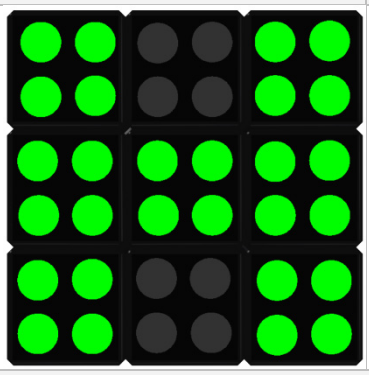
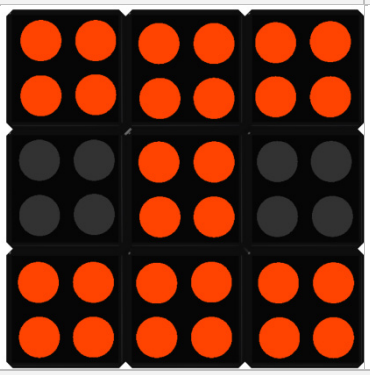
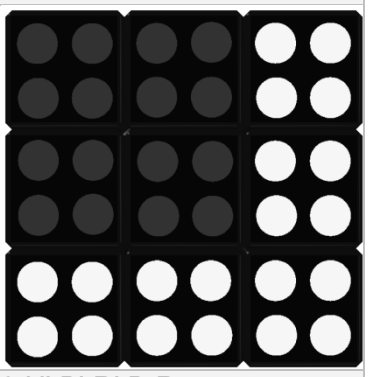
FENTIX Cube



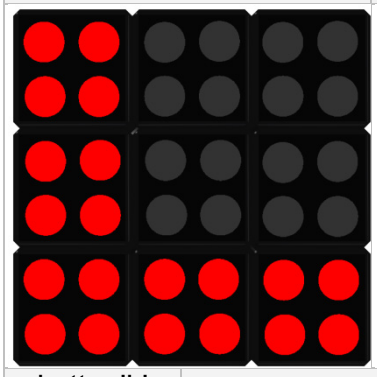
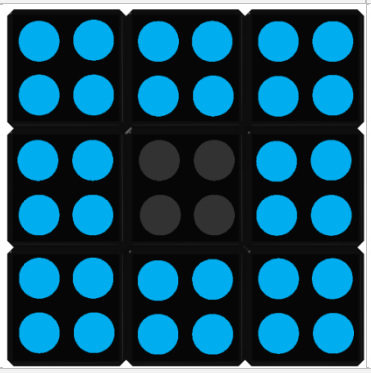
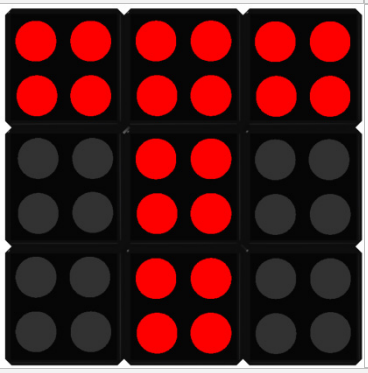
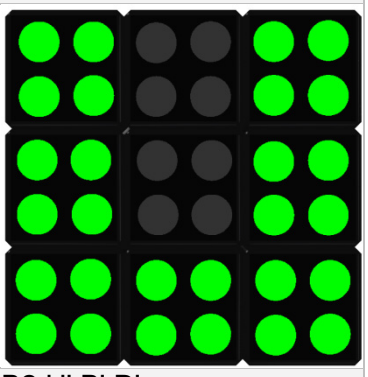
Rubik's TouchCube

LED Matrix Cube – Pattern Examples

Single-Color Patterns

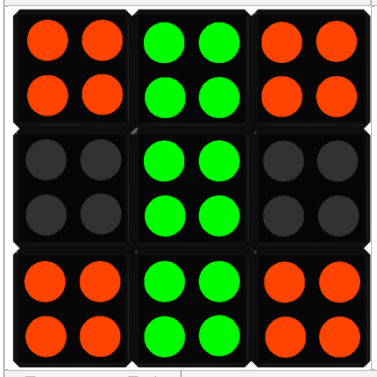
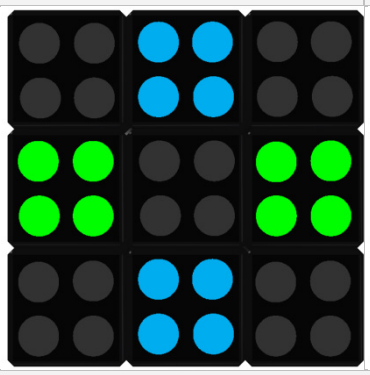
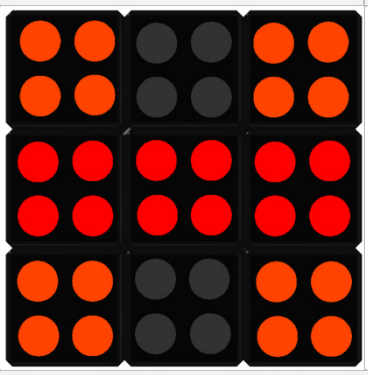
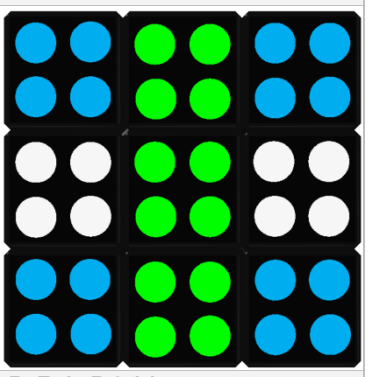
Letter 'C'	Letter 'H'	Letter 'I'	Letter 'J'
			

Letter 'C'	U U2 R B U2 L2 B2 R2 D2 L B D' B' D' L2 B2 R B' R' U B2 U' B' R' B R
Letter 'H'	CR U L' B D' R B L' D L2 B' D' B D L' B L B2 D B' D'
Letter 'I'	CU2 B D' R U' B U L' D B' U' L U L' D B2 D' L D' B2 D L B2 L2 B2 L U B2 U2 B U
Letter 'J'	CU L2 B' U2 L2 B2 R2 B D2 B2 L2 R' B2 R D' B D2 B2 D' R' B2 R

Letter 'L'	Letter 'O'	Letter 'T'	Letter 'U'
			

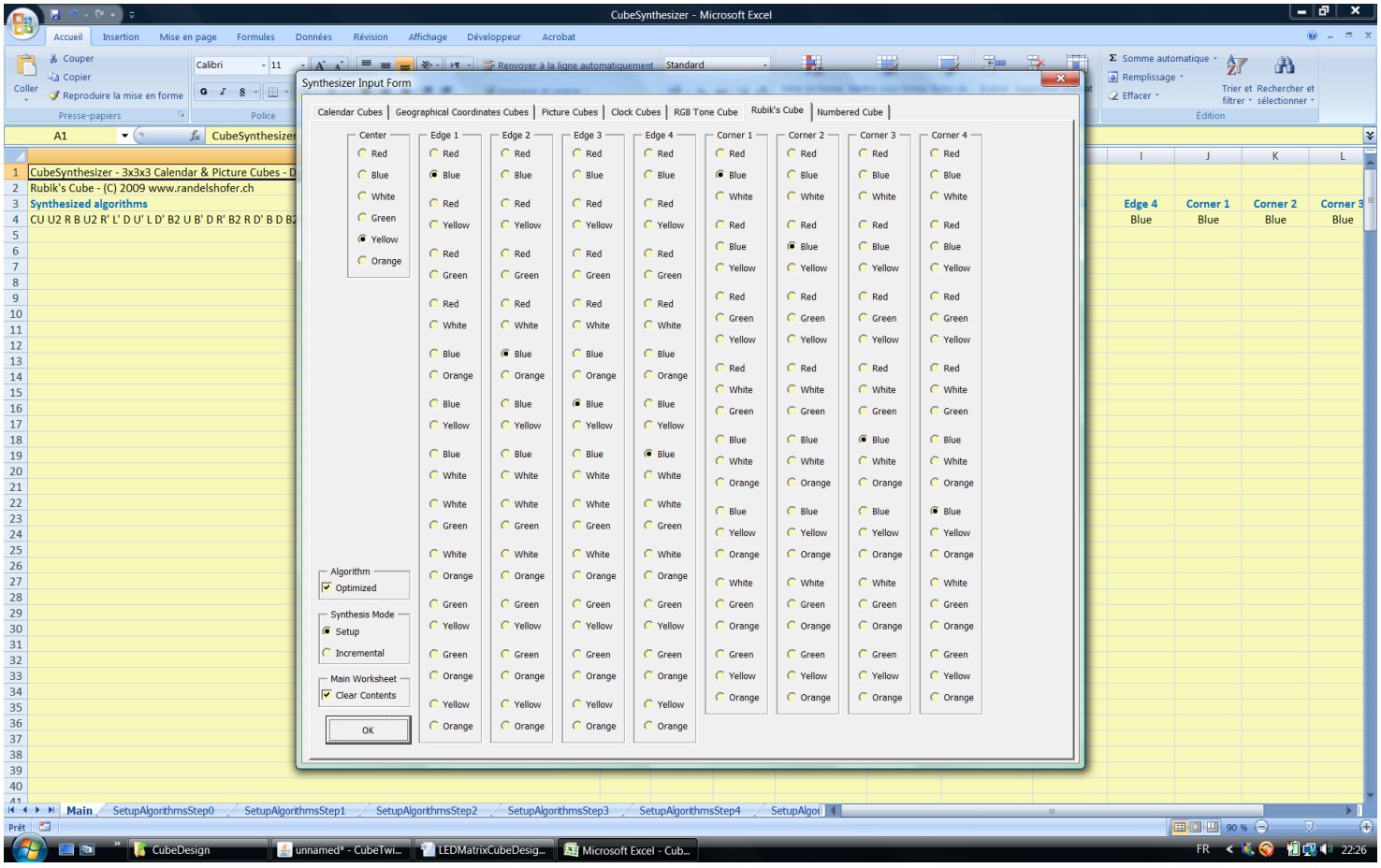
Letter 'L'	CU L2 B' U2 B' R2 D B' L2 D' B' D R B' R' L B2 L' D U B2 U' B' D'
Letter 'O'	CU U2 R B U2 R' L' D U' L D' B2 U B' D R' B2 R D' B D B2 U B' U'
Letter 'T'	R' D B R2 U' B2 U D2 B' U' L U R' B2 R D B2 D2 U' B2 U D L B2 L'
Letter 'U'	CU L2 B' U2 R' L' D' L' D2 B' R' B R B' D' B D B2 U B' U'

Multi-Color Patterns

Pattern P1	Pattern P2	Pattern P3	Pattern P4
			

Pattern P1	CR R2 D B R2 L2 B D2 U' L U L' B2 L U B2 U' R B2 R2 B R L B2 L'
Pattern P2	CU U2 R B U2 D2 R B' D B' D L2 B2 L' B L D' B D B' U' B U R B2 R2 B2 R
Pattern P3	R U L' B D' R B L' D L' U B U' L2 B R B' R2 B2 R B' L' B L B2 D' B D
Pattern P4	CR L' B D' R L' B D2 B2 L2 R B' R' B2 U B' U' B2 L B' L' R' B R

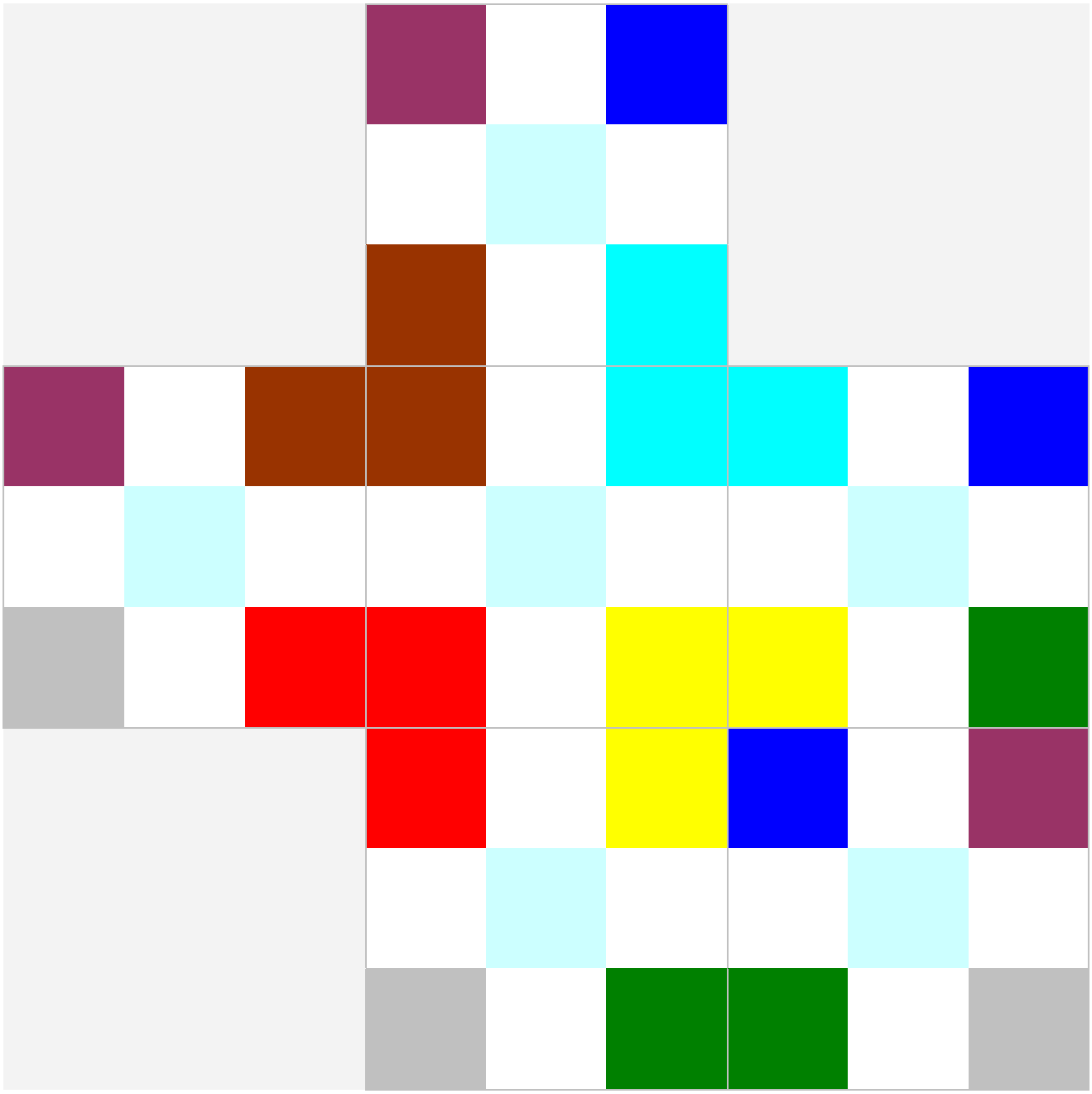
Cube Synthesizer Input Form Example



This example shows how to use an Input Form for synthesizing algorithms. Here, the 'Yellow' color means that LEDs are 'OFF' on the selected cubie. Other colors are pretty much the same as of a regular Rubik's Cube. Note that by unchecking the 'Clear Contents' CheckBox, algorithms are displayed one after another and stay on screen. Optimized algorithms can also be computed by checking the 'Optimized' CheckBox.

Corner Cubes Final Check

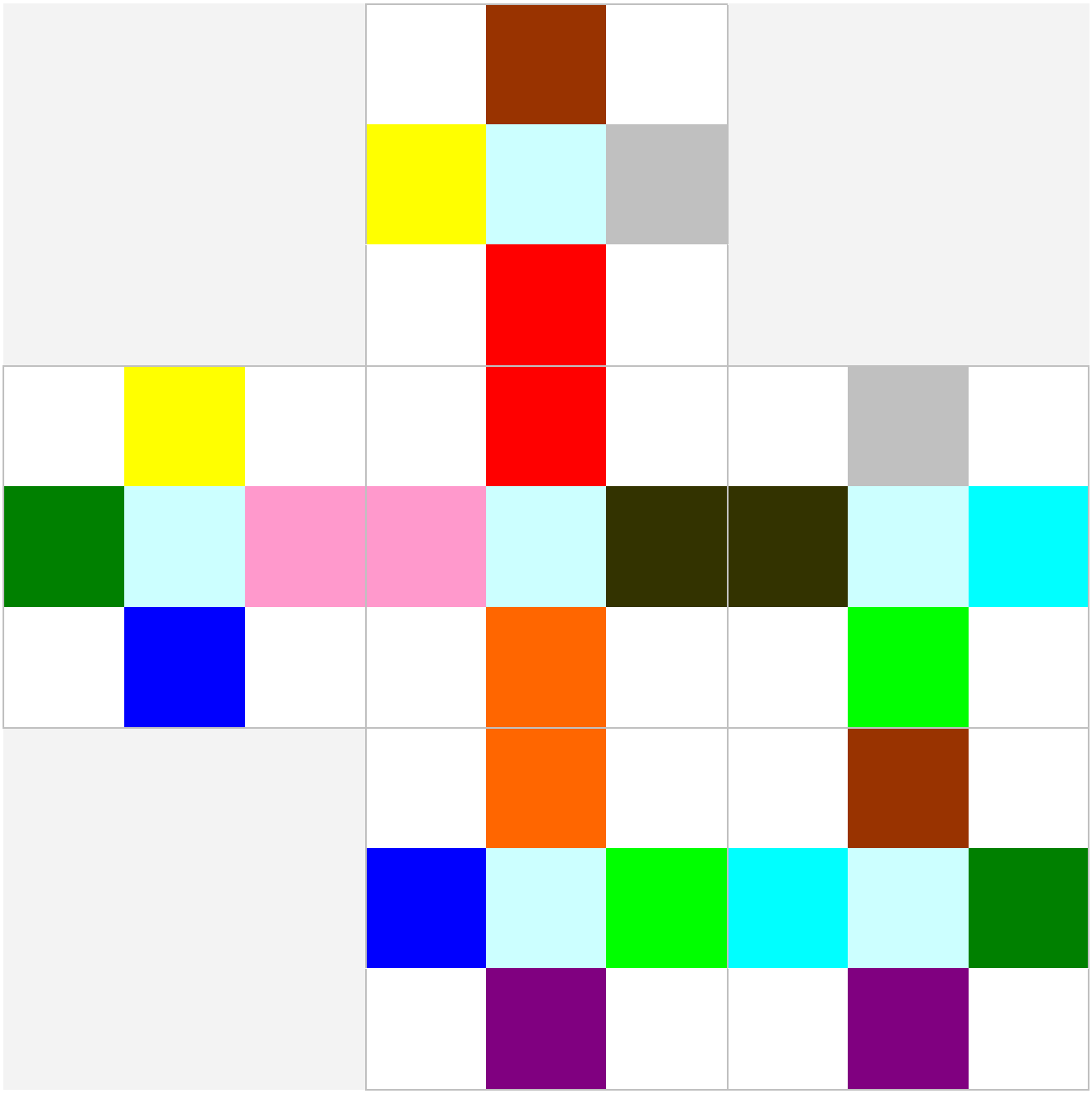
There are 8 Corner Cubes and 3 faces per Corner Cube. In the diagram below, each Corner Cube is displayed in 8 different colors and with the same color applied to each of its 3 faces. This diagram can be used as a convenient *visual aid* to check Design Rules (DRC).



	Up		
Left	**F**ront	**R**ight	Back
	Down	**B**ack	

Edge Cubes Final Check

There are 12 Edge Cubes and 2 faces per Edge Cube. In the diagram below, each Edge Cube is displayed in 12 different colors and with the same color applied to each of its 2 faces. This diagram can be used as a convenient *visual aid* to check Design Rules (DRC).



	Up		
Left	**F**ront	**R**ight	Back
	Down	**B**ack	

Texture Template

This is a texture template that can be printed out and used for writing down numbers and letters by hand *prior to* texture design. All is needed are pencil, rubber…and time.