Abbreviations Cube Design

Introduction

Many words or expressions can be abbreviated into just 2 or 3 letters. Among the 26 letters of the alphabet, only a few can be displayed on a low-order cube. Using a 5x5x5 cube, which can be considered as the 'minimum' cube for displaying a 'sufficient' set of selected letters, some interesting letter combinations can be shown.

Letter Combinations

Using center moves only, seven letters can be displayed on a 5x5x5 cube: C, H, I, L, O, T, U. From these, the following letter combinations can be shown on 2, 4 or 6 faces:

Letter Combinations – 5x5x5 Cube					
Notice that other combinations may also exist…					
See you	**H**i	**I** **L**ove you	**I** see you	**L**aughing **O**ut **L**oud	**HOT**
CU	**HI**	**ILU**	**ICU**	**LOL**	**HOT**
2 faces	4 faces	6 faces	6 faces	6 faces	6 faces

Cycle Structures

Centers can be moved either individually by 2-cycles or by blocks of 2 or more pieces. It is easier to use 2-cycles to put pieces in place but at the expense of longer sequences of moves. A good strategy would probably be to first use 2-cycles to display a pattern and see if it is suitable or not, and then search for shorter sequences by using block moves.

Sequences of 2-cycles can be used on a per orbit basis. If each orbit parity is even, then each orbit can be solved separately. If the number of 2-cycles in a given orbit is even, then the orbit parity is also even. But if the number of 2-cycles is odd, the orbit parity may then be either odd or even. To toggle an orbit parity from odd to even, simply convert two 2-cycles into one 4-cycle, if this is possible.

Permutation of True Centers

Due to mechanical restrictions, true centers do not behave exactly as other centers do. But the same permutation laws apply to them with the added feature of orientation parity. Main restrictions are listed below:

1- Only 4-spot and 6-spot true center permutations are legal
2- Opposed centers will always stay opposed through any legal move
3- For a solved cube, the sum of the orientations of all centers will always be equal either to 0° or 180° modulo 360°

Cycle structures of true center permutations, shown in the table below, are either of even or of odd parity. Odd parity permutations imply that other pieces are messed up, eg. edges, so they aren't really usable for displaying letters on cube centers only. In the 6-spot even parity case, there are two 3-cycles of true centers. Again this is not a suitable case because only opposed centers are to be swapped, ie only 2-cycles can be used. The only remaining case is thus the 4-spot two 2-cycles case. This means that only 0 or 2 letters using true centers can be displayed on the cube.

True Centers – Cycle Structures			
N-spot	Cycle Structure	Note	Permutation Parity
4-spot	2-cycle + 2-cycle	2-cycles: 2 *opposed* centers	even
4-spot	2-cycle + 2-cycle + 2-cycle	–	odd
6-spot	3-cycle + 3-cycle	3-cycles: 3 *adjacent* centers	even
6-spot	2-cycle + 2-cycle + 2-cycle	–	odd

Hexadecimal Display

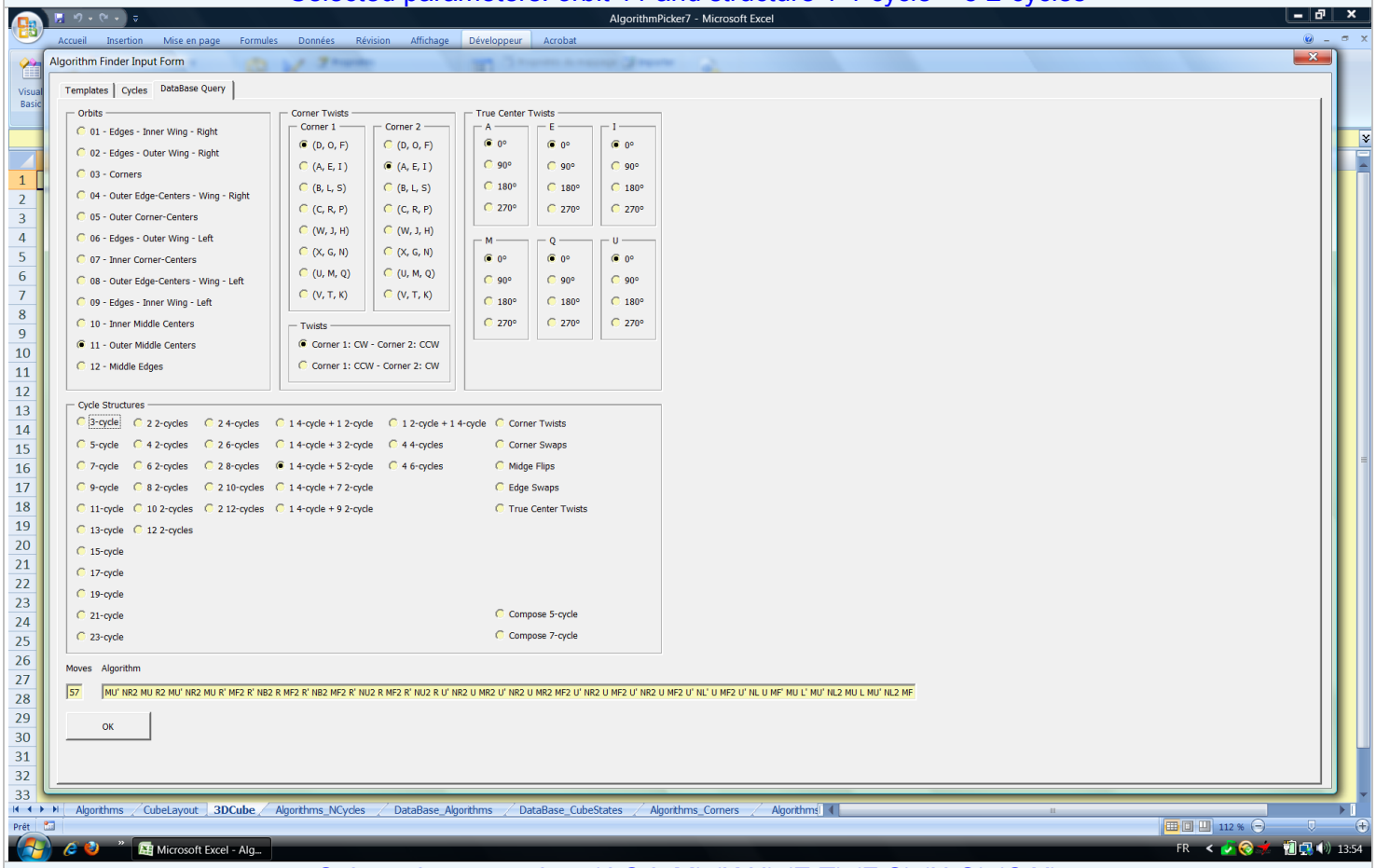
Numbers from 0 to 9, letters from A to F plus a decimal point can also be displayed on 4 opposed faces of a 7x7x7 cube, the same way as they would be on an hexadecimal display.

Algorithm Picker 7 – UserForms

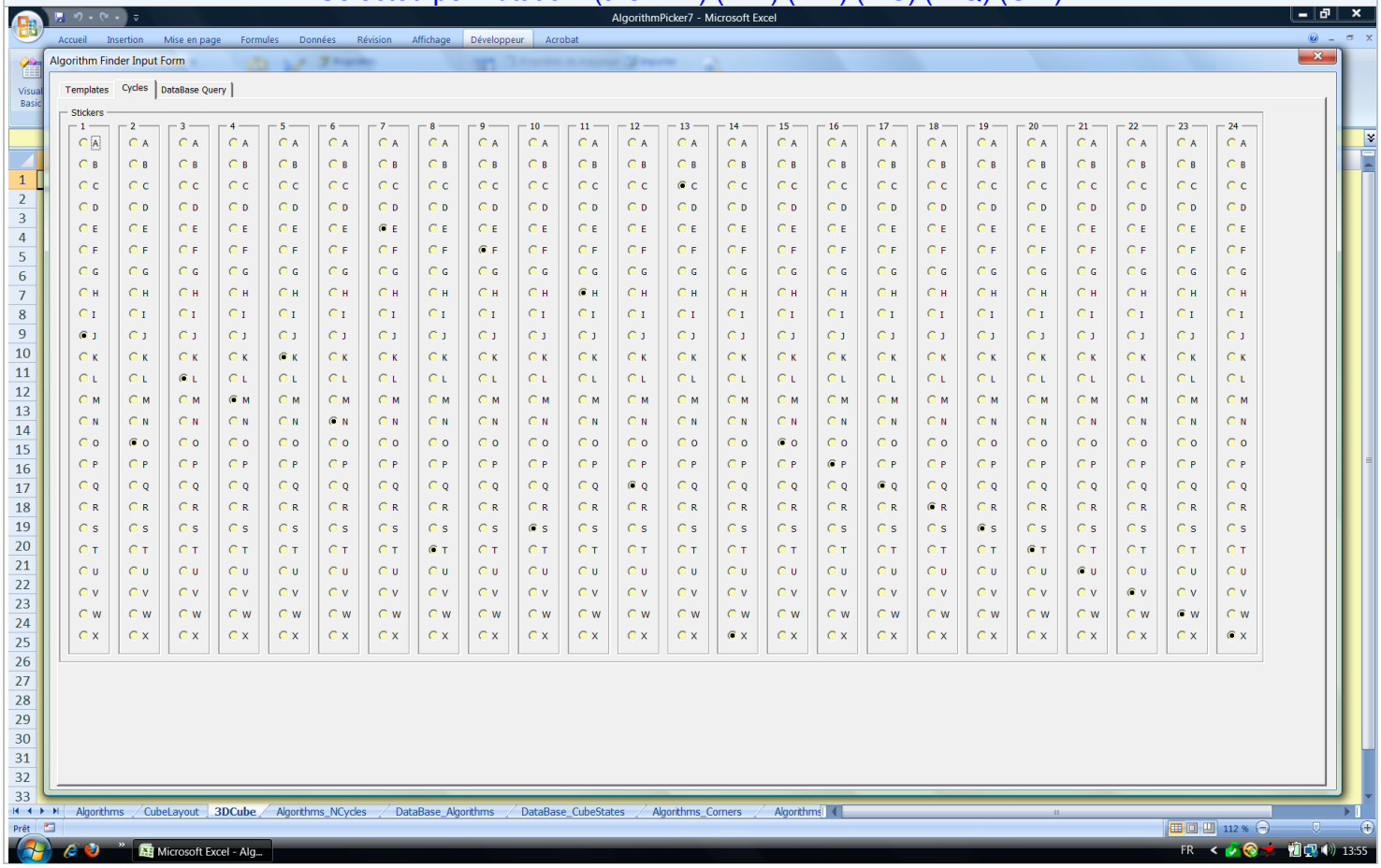
Algorithms of combinations of 2-cycles and 4-cycle + 2-cycles can be found using Algorithm Picker.

ICU Pattern – Excel/VBA UserForms

Selected parameters: orbit 11 and structure 1 4-cycle + 5 2-cycles



Selected permutation: (J O L M) (K N) (E T) (F S) (H Q) (C X)



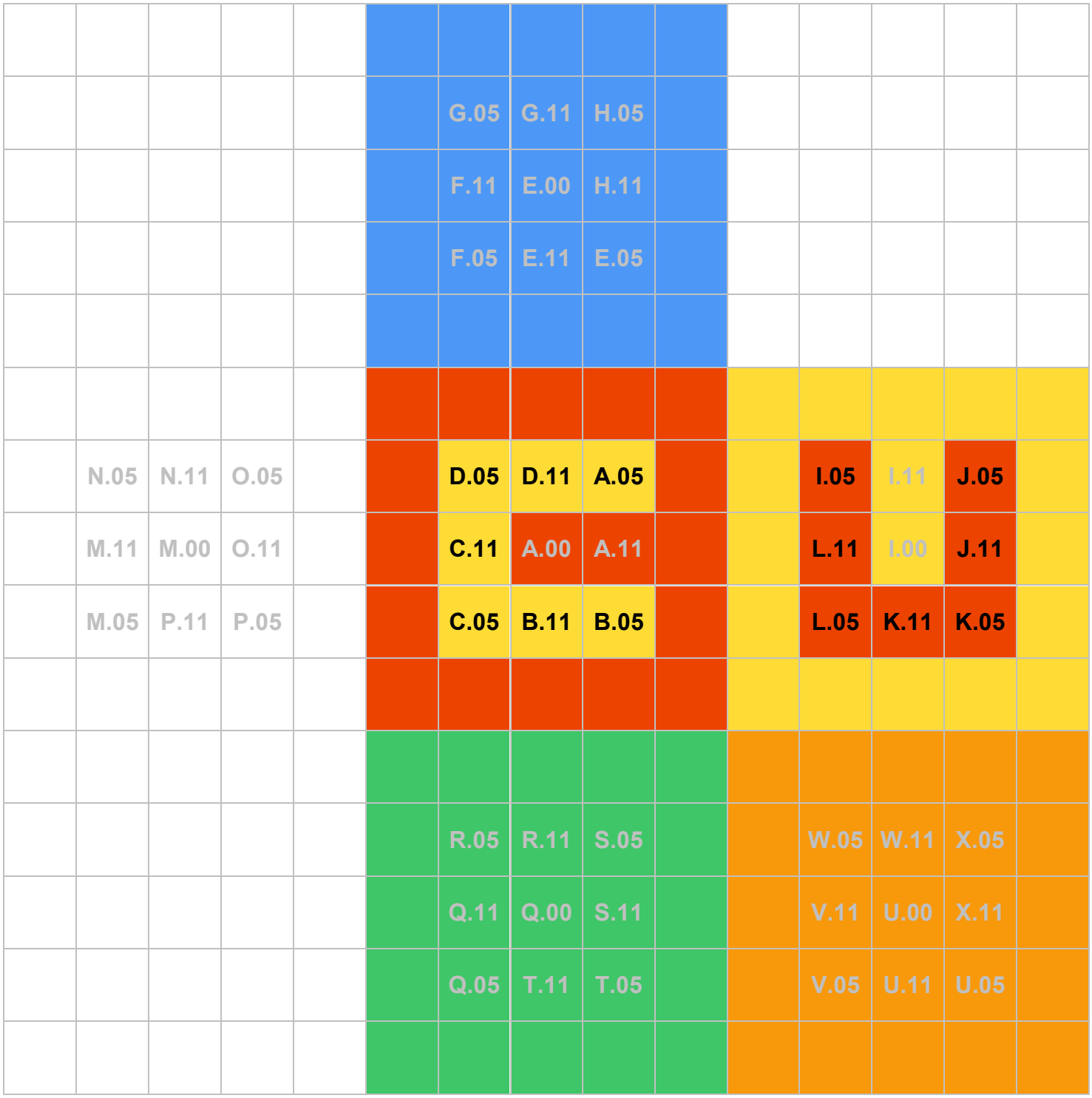
Orbit Cube Texture – Centers – 5x5x5

Letters and numbers are those of the 7x7x7 Orbit Cube texture. Only centers are shown.

						G.05	G.11	H.05						
						F.11	E.00	H.11						
						F.05	E.11	E.05						
	N.05	N.11	O.05			D.05	D.11	A.05			I.05	I.11	J.05	
	M.11	M.00	O.11			C.11	A.00	A.11			L.11	I.00	J.11	
	M.05	P.11	P.05			C.05	B.11	B.05			L.05	K.11	K.05	
						R.05	R.11	S.05			W.05	W.11	X.05	
						Q.11	Q.00	S.11			V.11	U.00	X.11	
						Q.05	T.11	T.05			V.05	U.11	U.05	

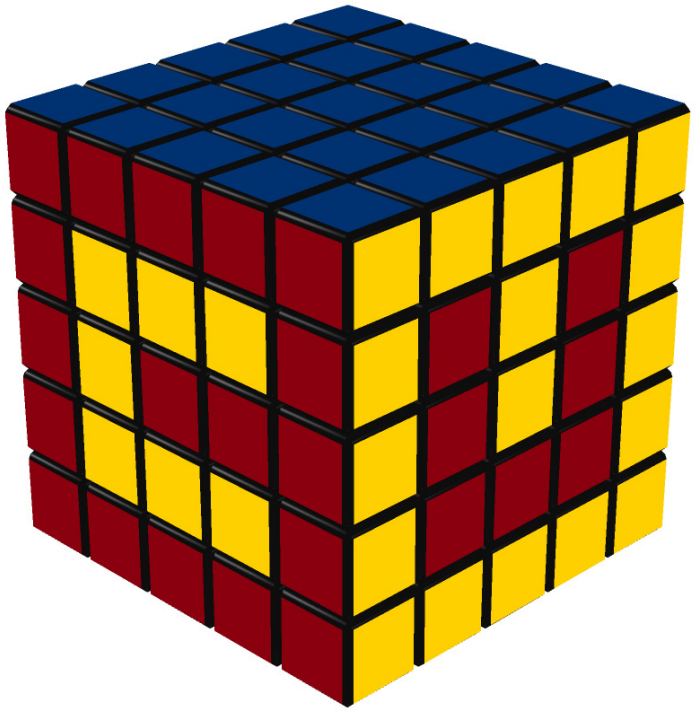
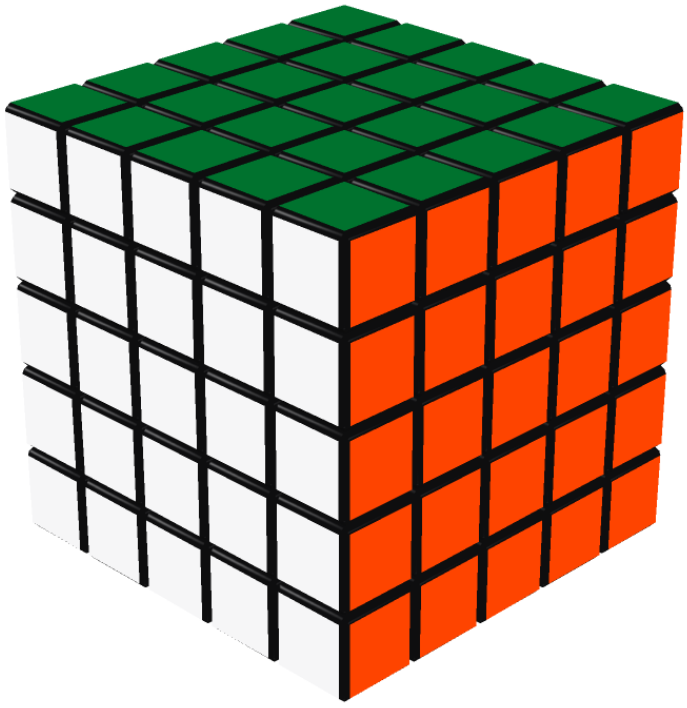
Abbreviation Pattern 1: CU

CU = See you



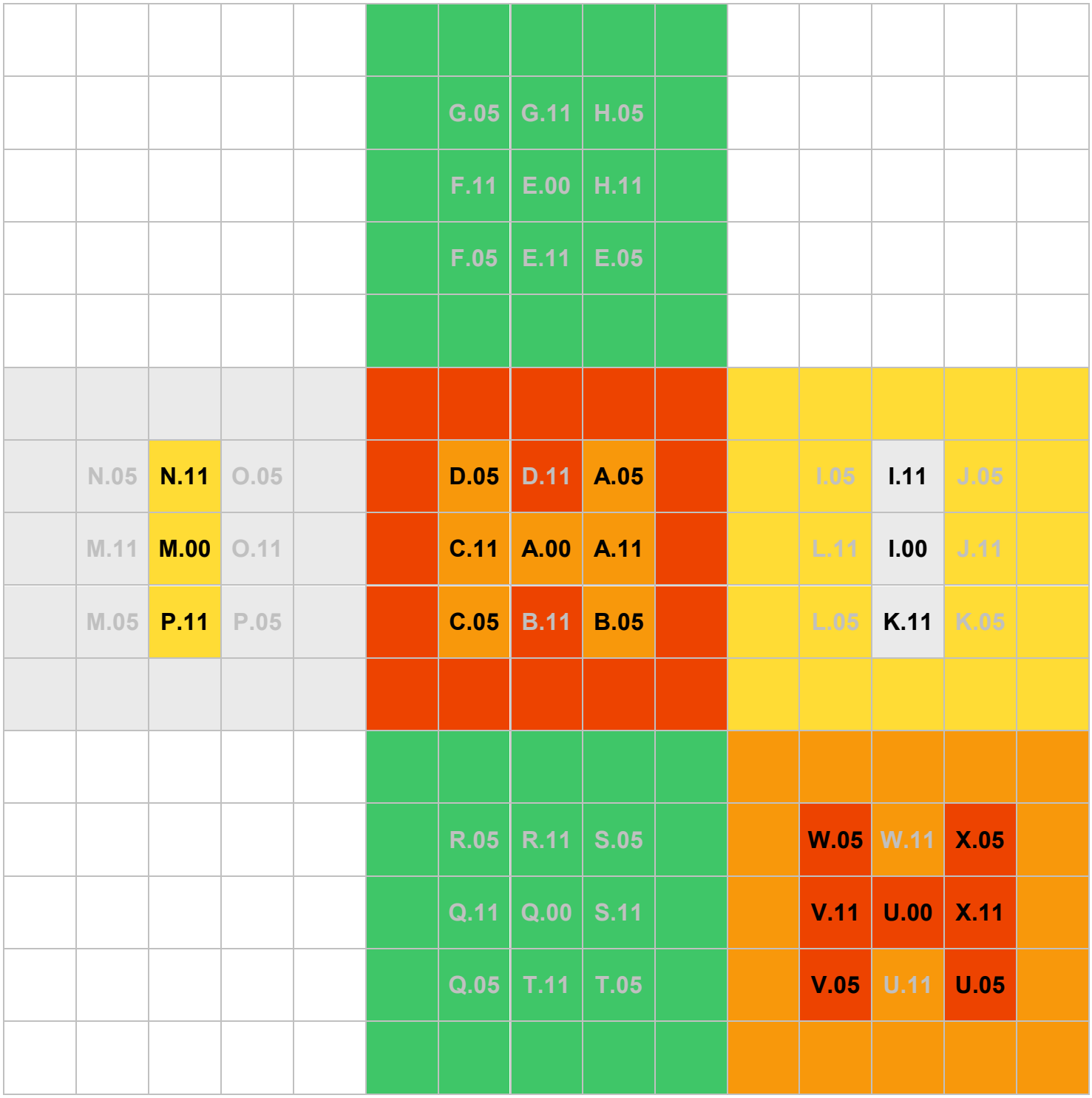
CU Pattern – Cycle Decomposition – Orbits 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
'C', 'U'	2-cycle + 2-cycle + 2-cycle = 4-cycle + 2-cycle*	even	6
Composition	One 4-cycle + One 2-cycle	even	6
Permutation	(D J B L) (C K)	even	6
Orbit 05			
Letters	Cycles	Parity	Centers
'C', 'U'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Composition	Four 2-cycles	even	8
Permutation	(C K) (D L) (A I) (B J)	even	8
*Two 2-cycles are grouped into a 4-cycle to keep permutation parity even.			

CU Pattern – Algorithms – Orbits 05 & 11
Orbit 11 Only
MR' NF MR F2 MR' NF' MR F MR' NB' MR F MR' NB MR NL MF NL' F NL MF' NL' F'
Orbit 05 Only
F' NL NB' NL' F NL NB NF NL' F NL NF' NL' F2 NR' NF NR F NR' NF' NB' NR F NR' NB NR F'
Complete Pattern
MR' NF MR F2 MR' NF' MR F MR' NB' MR F MR' NB MR NL MF NL' F NL MF' NL' F' F' NL NB' NL' F NL NB NF NL' F NL NF' NL' F2 NR' NF NR F NR' NF' NB' NR F NR' NB NR F'

CU Pattern – 5x5x5 Cube	
	
FRU View	LBD View

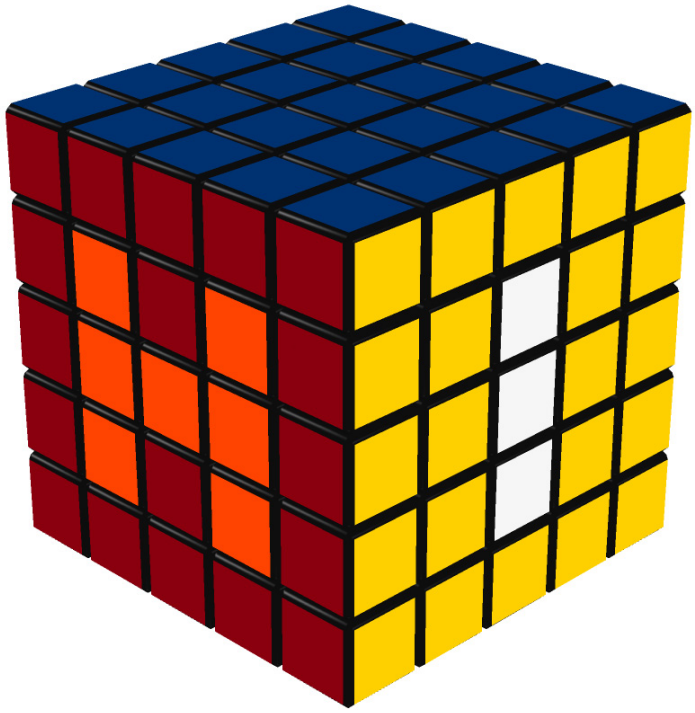
Abbreviation Pattern 2: HI

HI = Hi



HI Pattern – Cycle Decomposition – Orbits 00, 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
Letter 'H'	2-cycle + 2-cycle	even	4
Letter 'I'	2-cycle + 2-cycle	even	4
All Cycles	(2-cycle + 2-cycle) + (2-cycle + 2-cycle)	even	8
Composition	Four 2-cycles	even	8
Permutation	(A V) (C X) (I P) (K N)	even	8
Orbit 05			
Letters	Cycles	Parity	Centers
Letter 'H'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Composition	Four 2-cycles	even	8
Permutation	(A V) (C X) (B W) (D U)	even	8
Orbit 00			
Letters	Cycles	Parity	Centers
Letter 'H'	2-cycle	odd	2
Letter 'I'	2-cycle	odd	2
All Cycles	(2-cycle) + (2-cycle)	even	4
Composition	Two 2-cycles (4-spot)	even	4
Permutation	(A U) (I M)	even	4

HI Pattern – Algorithms – Orbits 00, 05 & 11
Orbit 11 Only
B2 MU' NB2 MU B2 MU' NB2 NF2 MU B2 MU' NF2 MU B2 R2 MF' NR2 MF R2 L2 MF' NR2 MF L2
Orbit 05 Only
NR' U2 NR F2 NR' NF2 NR F2 NR' NF2 U2 NR NU R2 NU' F2 NU NF2 NU' F2 NU NF2 R2 NU2 L2 NU F2 NU' NF2 NU F2 NU' NF2 L2 NU NL D2 NL' B2 NL NB2 NL' B2 NL NB2 D2 NL'
Orbit 00 Only
MU MF2 MU' MF2
Complete Pattern
B2 MU' NB2 MU B2 MU' NB2 NF2 MU B2 MU' NF2 MU B2 R2 MF' NR2 MF R2 L2 MF' NR2 MF L2 NR' U2 NR F2 NR' NF2 NR F2 NR' NF2 U2 NR NU R2 NU' F2 NU NF2 NU' F2 NU NF2 R2 NU2 L2 NU F2 NU' NF2 NU F2 NU' NF2 L2 NU NL D2 NL' B2 NL NB2 NL' B2 NL NB2 D2 NL' MU MF2 MU' MF2

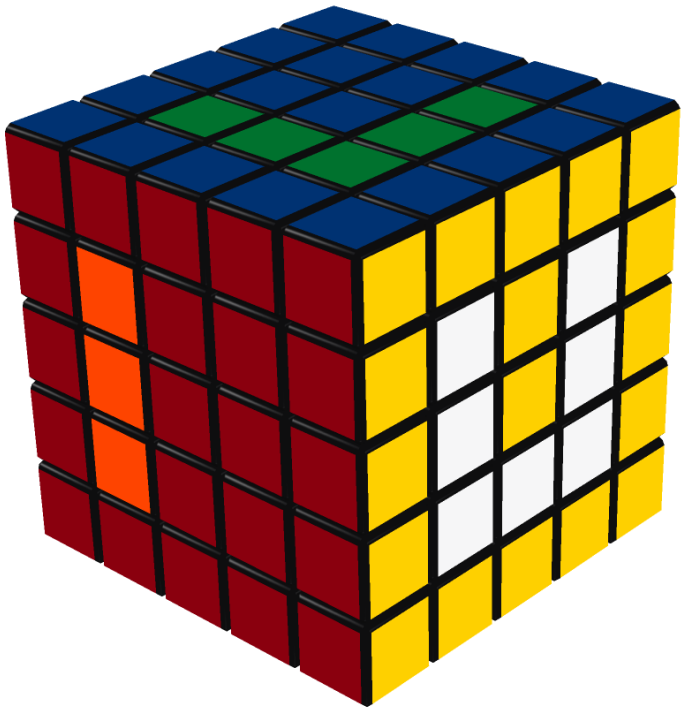
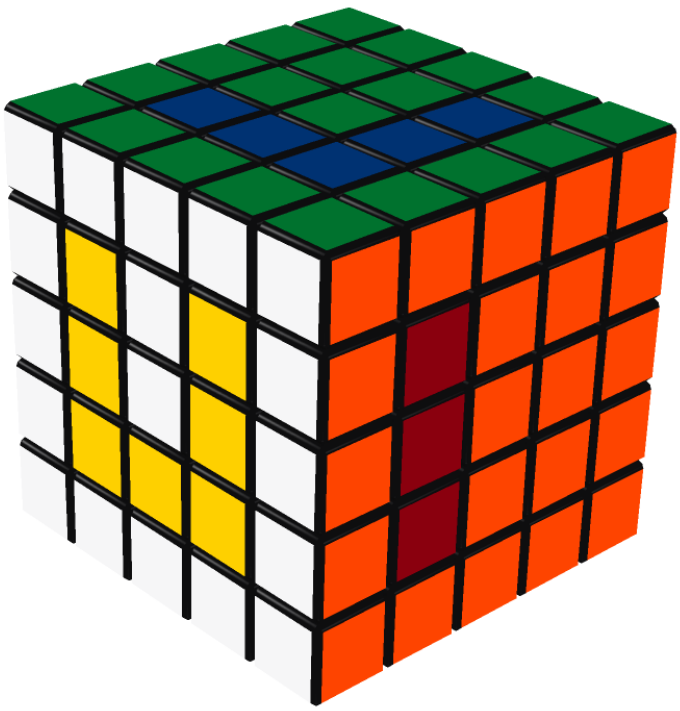
HI Pattern – 5x5x5 Cube	
	
FRU View	LBD View

Abbreviation Pattern 3: ILU #1

ILU = **I L**ove you

ILU #1 Pattern – Cycle Decomposition – Orbits 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle	odd	2
Letter 'L'	2-cycle + 2-cycle	even	4
Letter 'U'	2-cycle + 2-cycle + 2-cycle	odd	6
All Cycles	(2-cycle) + (2-cycle + 2-cycle) + (2-cycle + 2-cycle + 2-cycle)	even	12
Composition	Six 2-cycles	even	12
Permutation	(C X) (H Q) (E T) (K N) (J O) (L M)	even	12
Orbit 05			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle + 2-cycle	even	4
Letter 'L'	2-cycle + 2-cycle + 2-cycle = 4-cycle + 2-cycle*	even	6
Letter 'U'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
All Cycles	(2-cycle + 2-cycle) + (4-cycle + 2-cycle) + (2-cycle + 2-cycle + 2-cycle + 2-cycle)	even	18
Composition	One 4-cycle + Seven 2-cycles	even	18
Permutation	(F T H R) (E Q) (D U) (C X) (I M) (J P) (K O) (L N)	even	18
*Two 2-cycles are grouped into a 4-cycle to keep permutation parity even.			

ILU #1 Pattern – Algorithms – Orbits 05 & 11
Orbit 11 Only
MF MU L' MU' NL2 MU L MU' NL2 MF U' NL U MF2 U' NL' U NR' NF' L NF ML2 NF' L' NF ML2 NR R NF R' MF2 R NF' R' MF2 R2 MU' NR2 MU R2 L2 MU' NR2 MU L2
Orbit 05 Only
NF' U' NB2 U' NF U NB2 U' NF' U2 NF D' NF' D' NR ND NR' D NR ND' NR' NF D NF' L' NU NL NU' L NU NL' NU' NF B NU NR' NB' NR B NR' NB NR B' NU' B' F' NU' F' NR NF NR' F NR NF' NR' NU F NU NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NU'
Complete Pattern
MF MU L' MU' NL2 MU L MU' NL2 MF U' NL U MF2 U' NL' U NR' NF' L NF ML2 NF' L' NF ML2 NR R NF R' MF2 R NF' R' MF2 R2 MU' NR2 MU R2 L2 MU' NR2 MU L2 NF' U' NB2 U' NF U NB2 U' NF' U2 NF D' NF' D' NR ND NR' D NR ND' NR' NF D NF' L' NU NL NU' L NU NL' NU' NF B NU NR' NB' NR B NR' NB NR B' NU' B' F' NU' F' NR NF NR' F NR NF' NR' NU F NU NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NU'

ILU #1 Pattern – 5x5x5 Cube	
	
FRU View	LBD View

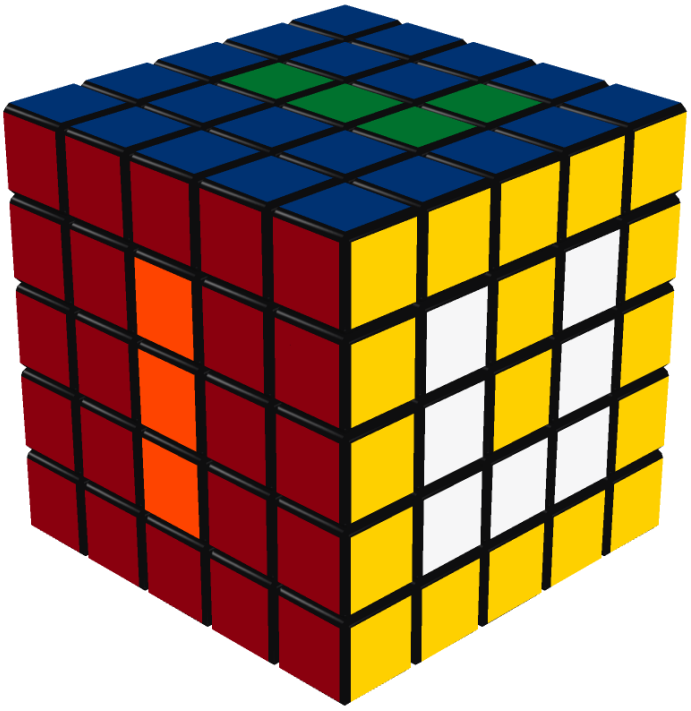
Abbreviation Pattern 4: ILU #2

ILU = **I** Love you

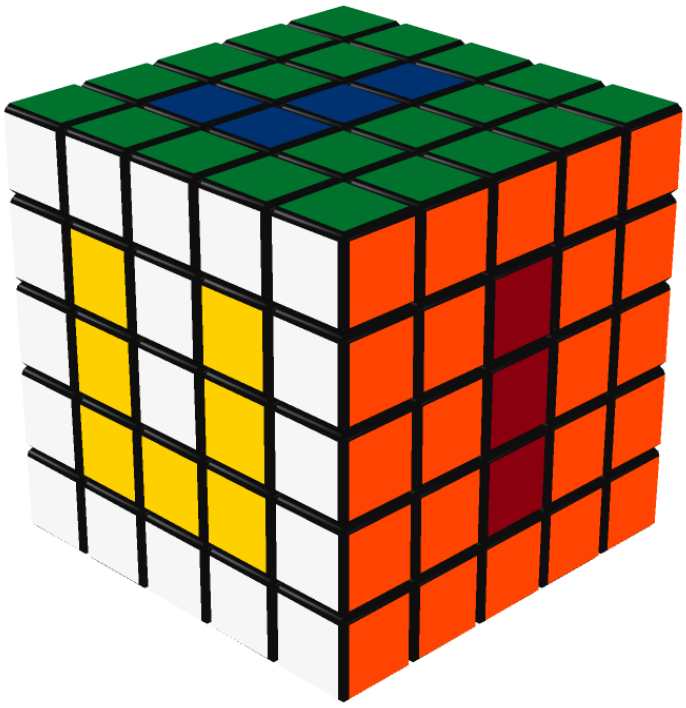
ILU #2 Pattern – Cycle Decomposition – Orbits 00, 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle + 2-cycle	even	4
Letter 'L'	2-cycle + 2-cycle	even	4
Letter 'U'	2-cycle + 2-cycle + 2-cycle = 4-cycle + 2-cycle*	even	6
All Cycles	(2-cycle + 2-cycle) + (2-cycle + 2-cycle) + (4-cycle + 2-cycle)	even	14
Composition	One 4-cycle + Five 2-cycles	even	14
Permutation	(M L O J) (K N) (D U) (B W) (F S) (H Q)	even	14
Orbit 05			
Letters	Cycles	Parity	Centers
Letter 'L'	2-cycle	odd	2
Letter 'U'	2-cycle + 2-cycle + 2-cycle + 2-cycle = 4-cycle + 2-cycle + 2-cycle*	odd	8
All Cycles	(2-cycle) + (4-cycle + 2-cycle + 2-cycle)	even	10
Composition	One 4-cycle + Three 2-cycles	even	10
Permutation	(O K N L) (I M) (J P) (H R)	even	10
Orbit 00			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle	odd	2
Letter 'L'	2-cycle	odd	2
All Cycles	2-cycle + 2-cycle (4-spot)	even	4
Composition	Two 2-cycles of True Centers	even	4
Permutation	(A U) (E Q)	even	4
*Two 2-cycles are grouped into a 4-cycle to keep permutation parity even.			

ILU #2 Pattern – Algorithms – Orbits 00, 05 & 11
Orbit 11 Only
MU' NR2 MU L2 MU' NR2 MU L2 NB2 R MF2 R' NB2 R MF2 R2 NB2 R MF2 R' NB2 R MF2 B2 MR' NF2 MR B2 F2 MR' NF2 MR F2 D2 MF' ND2 MF D2 U2 MF' ND2 MF U2
Orbit 05 Only
NU B NL' NB' NL B' NL' NB NL NU' NF' U2 NF L2 NF' NL2 NF L2 NF' NL2 U2 NF NB' L2 NB L' NF2 L NB' L' NF2 L' NB R' ND2 R2 ND NL ND' R2 ND NL' ND R D' NR' NU NR' D2 NR NU' NR' D2 NR2 D
Orbit 00 Only
MR MF2 MR' MF2
Complete Pattern
MU' NR2 MU L2 MU' NR2 MU L2 NB2 R MF2 R' NB2 R MF2 R2 NB2 R MF2 R' NB2 R MF2 B2 MR' NF2 MR B2 F2 MR' NF2 MR F2 D2 MF' ND2 MF D2 U2 MF' ND2 MF U2 NU B NL' NB' NL B' NL' NB NL NU' NF' U2 NF L2 NF' NL2 NF L2 NF' NL2 U2 NF NB' L2 NB L' NF2 L NB' L' NF2 L' NB R' ND2 R2 ND NL ND' R2 ND NL' ND R D' NR' NU NR' D2 NR NU' NR' D2 NR2 D MR MF2 MR' MF2

ILU #2 Pattern – 5x5x5 Cube



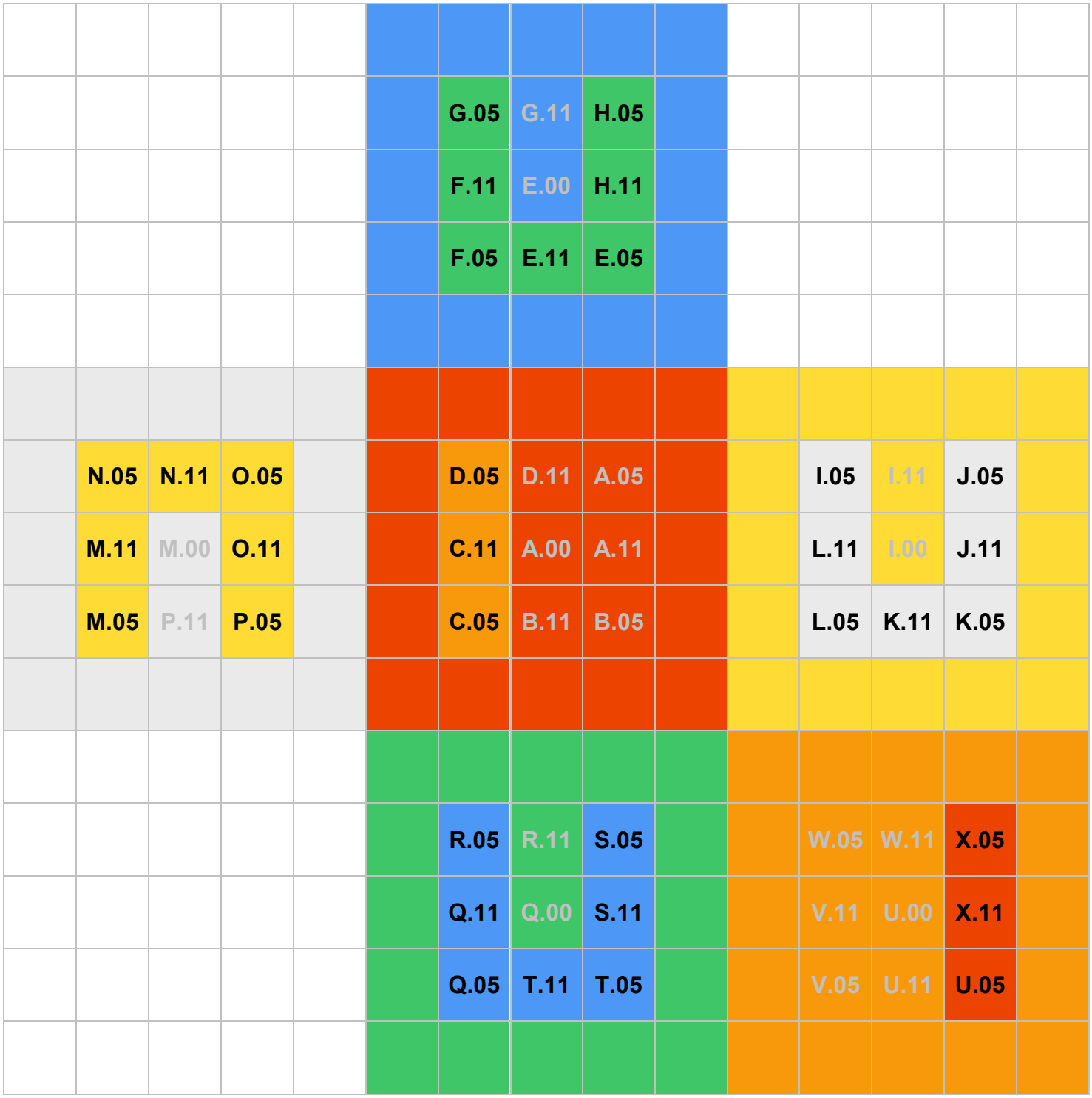
FRU View



LBD View

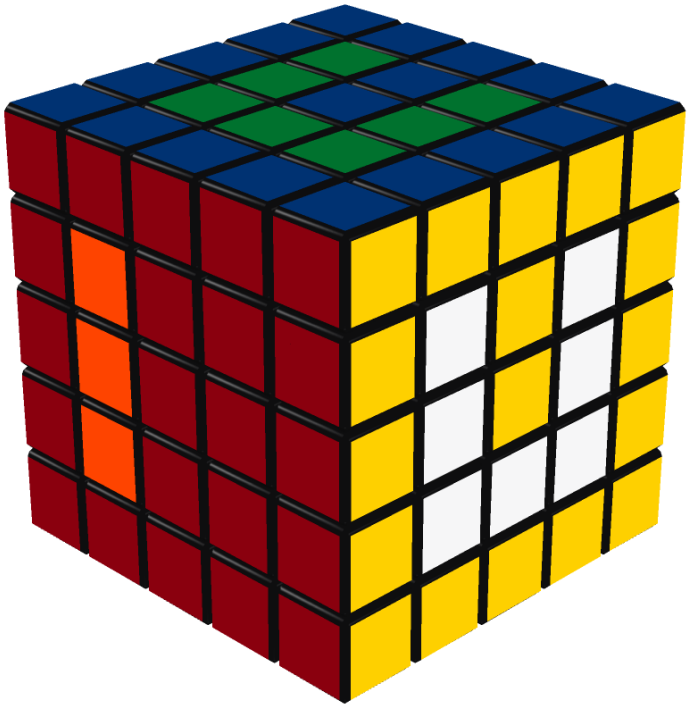
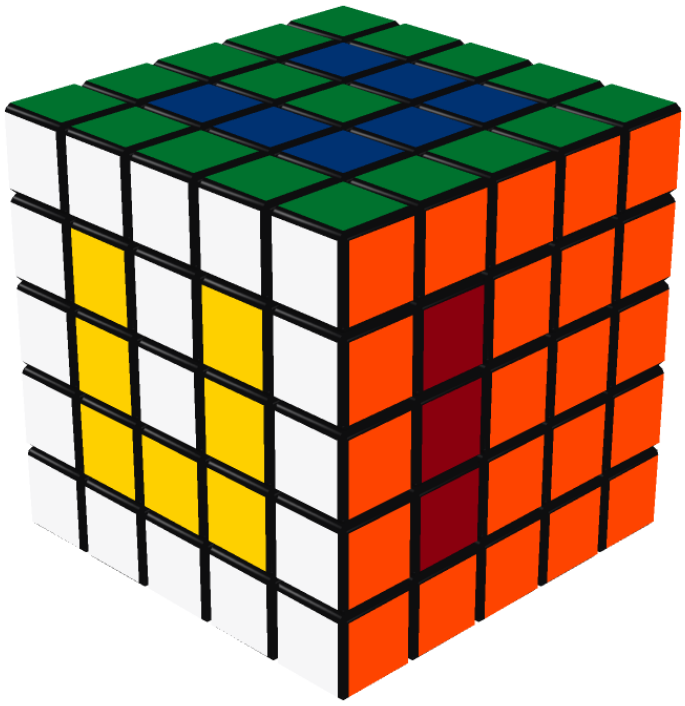
Abbreviation Pattern 5: ICU #1

ICU = **I** see you



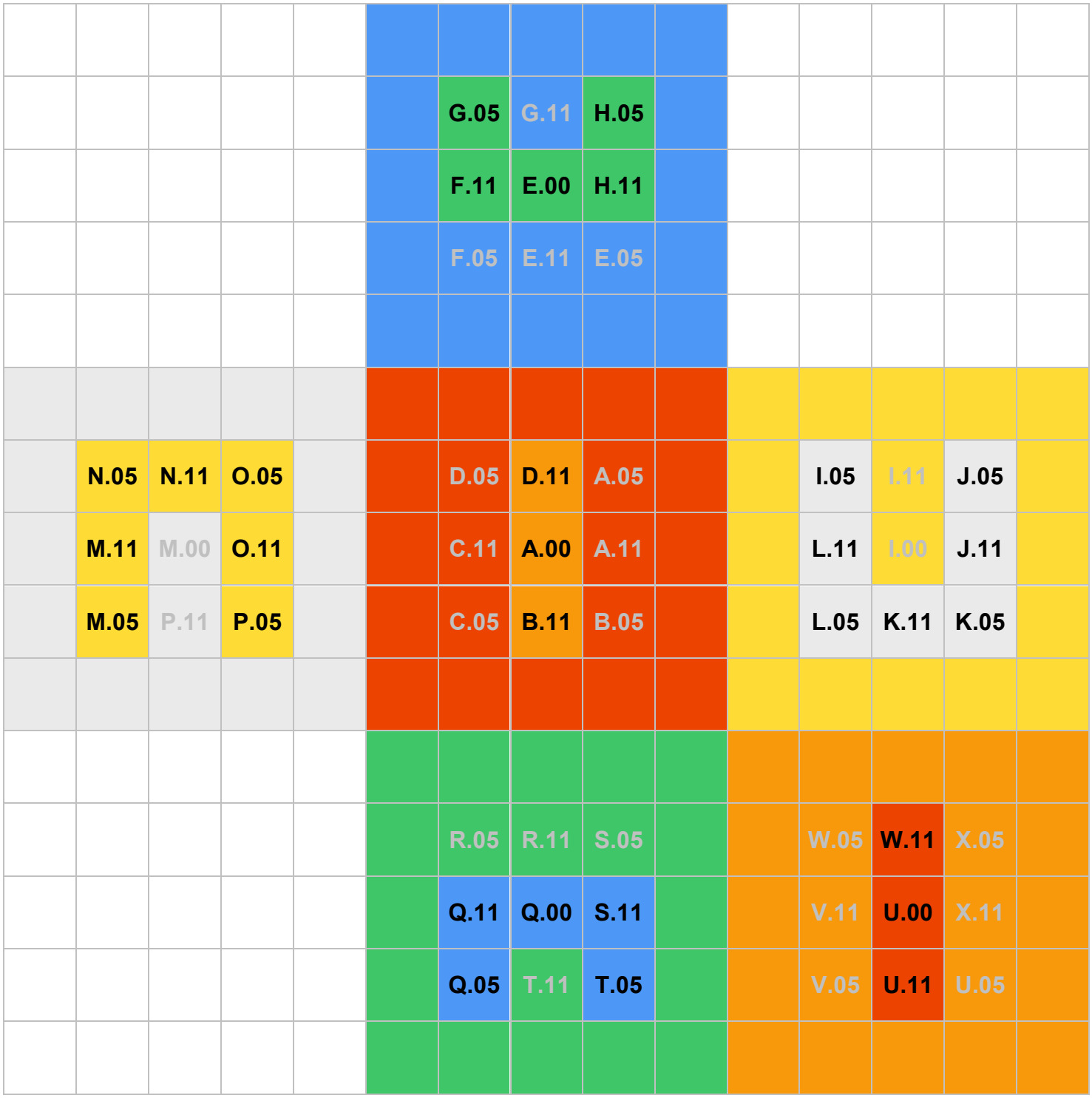
ICU #1 Pattern – Cycle Decomposition – Orbits 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle	odd	2
Letter 'C'	2-cycle + 2-cycle + 2-cycle	odd	6
Letter 'U'	2-cycle + 2-cycle + 2-cycle = 4-cycle + 2-cycle*	even	6
All Cycles	(2-cycle) + (2-cycle + 2-cycle + 2-cycle) + (4-cycle + 2-cycle)	even	14
Composition	One 4-cycle + Five 2-cycles	even	14
Permutation	(J O L M) (K N) (E T) (F S) (H Q) (C X)	even	14
Orbit 05			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle + 2-cycle	even	4
Letter 'C'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Letter 'U'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
All Cycles	(2-cycle + 2-cycle) + (2-cycle + 2-cycle + 2-cycle + 2-cycle)2	even	20
Composition	Ten 2-cycles	even	20
Permutation	(C X) (D U) (E Q) (F T) (G S) (H R) (I M) (J P) (K O) (L N)	even	20
*Two 2-cycles are grouped into a 4-cycle to keep permutation parity even.			

ICU #1 Pattern – Algorithms – Orbits 05 & 11
Orbit 11 Only
MU' NR2 MU R2 MU' NR2 MU R' MF2 R' NB2 R MF2 R' NB2 MF2 R' NU2 R MF2 R' NU2 R U' NR2 U MR2 U' NR2 U MR2 MF2 U' NR2 U MF2 U' NR2 U MF2 U' NL' U MF2 U' NL U MF' MU L' MU' NL2 MU L MU' NL2 MF
Orbit 05 Only
B' ND' B' NR NB NR' B NR NB' NR' ND B2 NU NR' NB' NR B NR' NB NR B' NU' B' NF NL' ND' NL D NL' ND NL D' R NU' NR' NU R' NU' NR NU ND' NL' ND L ND' NL ND L' U NR' NU' NR U' NR' NU NR NF' NU NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NU'
Complete Pattern
MU' NR2 MU R2 MU' NR2 MU R' MF2 R' NB2 R MF2 R' NB2 MF2 R' NU2 R MF2 R' NU2 R U' NR2 U MR2 U' NR2 U MR2 MF2 U' NR2 U MF2 U' NR2 U MF2 U' NL' U MF2 U' NL U MF' MU L' MU' NL2 MU L MU' NL2 MF B' ND' B' NR NB NR' B NR NB' NR' ND B2 NU NR' NB' NR B NR' NB NR B' NU' B' NF NL' ND' NL D NL' ND NL D' R NU' NR' NU R' NU' NR NU ND' NL' ND L ND' NL ND L' U NR' NU' NR U' NR' NU NR NF' NU NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NU'

ICU #1 Pattern – 5x5x5 Cube	
	
FRU View	LBD View

Abbreviation Pattern 6: ICU #2

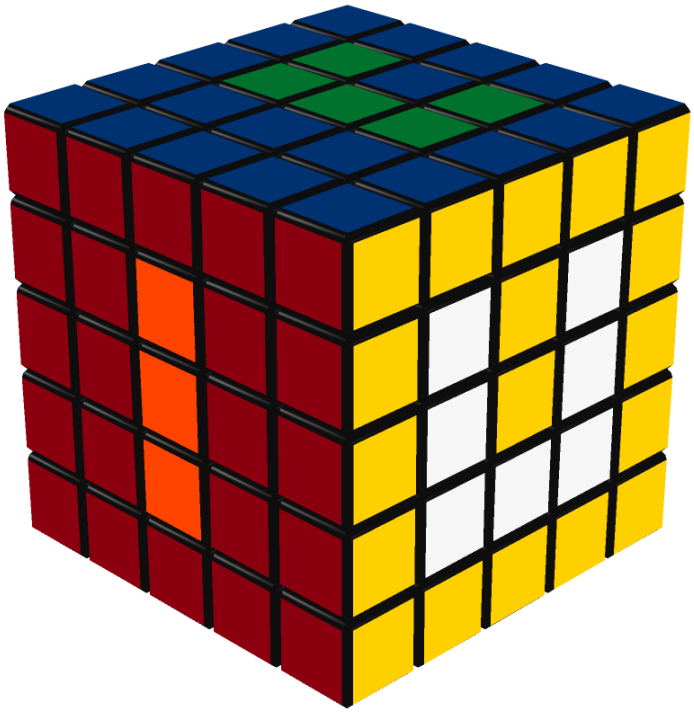
ICU = **I** see you



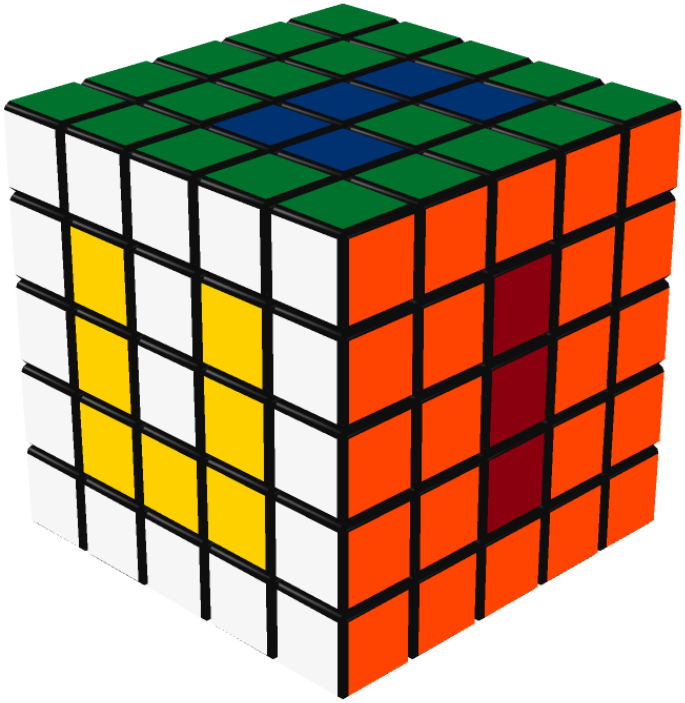
ICU #2 Pattern – Cycle Decomposition – Orbits 00, 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle + 2-cycle	even	4
Letter 'C'	2-cycle + 2-cycle	even	4
Letter 'U'	2-cycle + 2-cycle + 2-cycle = 4-cycle + 2-cycle*	even	6
All Cycles	(2-cycle + 2-cycle) + (2-cycle + 2-cycle) + (4-cycle + 2-cycle)	even	14
Composition	One 4-cycle + Five 2-cycles	even	14
Permutation	(M L O J) (K N) (D U) (B W) (F S) (H Q)	even	14
Orbit 05			
Letters	Cycles	Parity	Centers
Letter 'C'	2-cycle + 2-cycle	even	4
Letter 'U'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
All Cycles	(2-cycle + 2-cycle) + (2-cycle + 2-cycle + 2-cycle + 2-cycle)	even	12
Composition	Six 2-cycles	even	12
Permutation	(G T) (H Q) (K O) (L N) (I M) (J P)	even	12
Orbit 00			
Letters	Cycles	Parity	Centers
Letter 'I'	2-cycle	odd	2
Letter 'C'	2-cycle	odd	2
All Cycles	2-cycle + 2-cycle (4-spot)	even	4
Composition	Two 2-cycles of True Centers	even	4
Permutation	(A U) (E Q)	even	4
*Two 2-cycles are grouped into a 4-cycle to keep permutation parity even.			

ICU #2 Pattern – Algorithms – Orbits 00, 05 & 11
Orbit 11 Only
MU' NR2 MU L2 MU' NR2 MU L2 NB2 R MF2 R' NB2 R MF2 R2 NB2 R MF2 R' NB2 R MF2 B2 MR' NF2 MR B2 F2 MR' NF2 MR F2 D2 MF' ND2 MF D2 U2 MF' ND2 MF U2
Orbit 05 Only
D' NL' D' NF ND NF' D NF ND' NF' NL D2 NR NF' ND' NF D NF' ND NF D' NR' D' NU NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NU'
Orbit 00 Only
MR MF2 MR' MF2
Complete Pattern
MU' NR2 MU L2 MU' NR2 MU L2 NB2 R MF2 R' NB2 R MF2 R2 NB2 R MF2 R' NB2 R MF2 B2 MR' NF2 MR B2 F2 MR' NF2 MR F2 D2 MF' ND2 MF D2 U2 MF' ND2 MF U2 D' NL' D' NF ND NF' D NF ND' NF' NL D2 NR NF' ND' NF D NF' ND NF D' NR' D' NU NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NU' MR MF2 MR' MF2

ICU #2 Pattern – 5x5x5 Cube



FRU View



LBD View

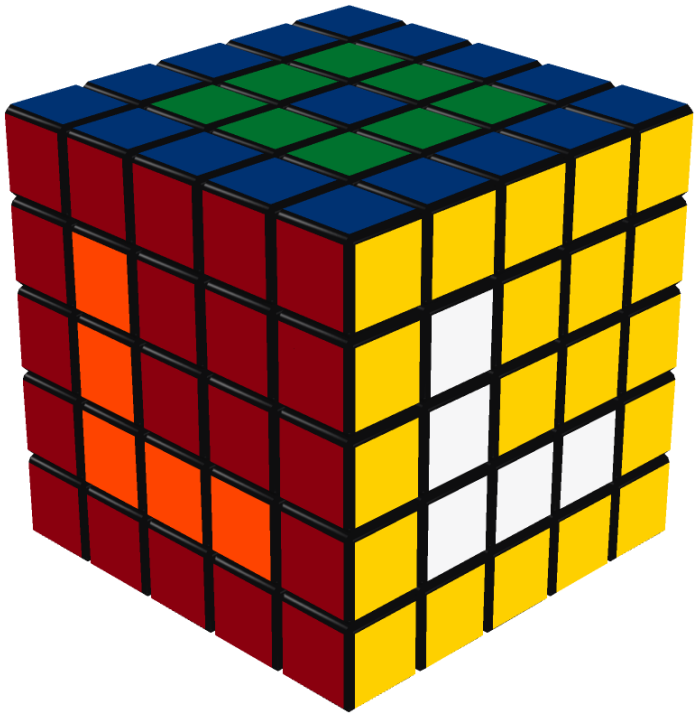
Abbreviation Pattern 7: LOL/OLL

LOL = **L**aughing **O**ut **L**oud / **OLL** = **O**rient **L**ast **L**ayer

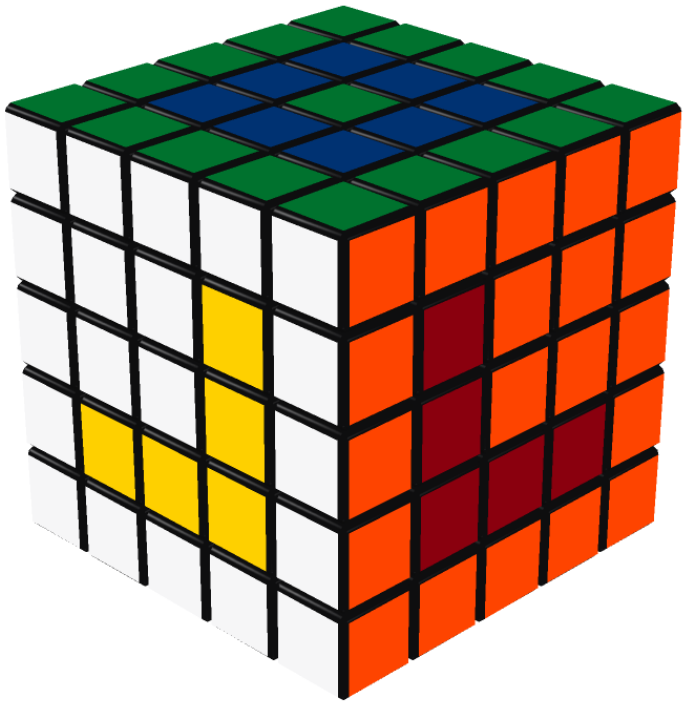
LOL/OLL Pattern – Cycle Decomposition – Orbits 05 & 11			
Orbit 11			
Letters	Cycles	Parity	Centers
Letter 'L'	2-cycle + 2-cycle	even	4
Letter 'O'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Letter 'L'	2-cycle + 2-cycle	even	4
All Cycles	(2-cycle + 2-cycle)2 + (2-cycle + 2-cycle + 2-cycle + 2-cycle)	even	16
Composition	Eight 2-cycles	even	16
Permutation	(B W) (C X) (L N) (K M) (G R) (E T) (H Q) (F S)	even	16
Orbit 05			
Letters	Cycles	Parity	Centers
Letter 'L'	2-cycle + 2-cycle + 2-cycle	odd	6
Letter 'O'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Letter 'L'	2-cycle + 2-cycle + 2-cycle	odd	6
All Cycles	(2-cycle + 2-cycle + 2-cycle)2 + (2-cycle + 2-cycle + 2-cycle + 2-cycle)	even	20
Composition	Ten 2-cycles	even	20
Permutation	(D U) (B W) (C X) (I M) (K O) (L N) (G S) (H R) (F T) (E Q)	even	20

LOL/OLL Pattern – Algorithms – Orbits 05 & 11
Orbit 11 Only
F NL2 F' MR2 F NL2 F' MR2 NL2 F' MU2 F NL2 F' MU2 F MU2 R NU2 R' MU2 R NU2 R2 NB2 R MU2 R' NB2 R MU2 D2 MR' NU2 MR D2 U2 MR' NU2 MR MF' ND2 MF U2 D2 MF' ND2 MF D2
Orbit 05 Only
NU' R2 NU B2 NU' NB2 NU B2 NU' NB2 R2 NU NR D2 NR' F2 NR NF2 NR' F2 NR NF2 D2 NR' NL NB R2 NB' NL2 NB R2 NB' NL NF2 L' NF NL' NF' L NF NL NF NU NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NU' NF ND' NL' ND L ND' NL ND L' U NR' NU' NR U' NR' NU NR NF2 NR ND NR' D' NR ND' NR' D L' NU NL NU' L NU NL' NU' NF
Complete Pattern
F NL2 F' MR2 F NL2 F' MR2 NL2 F' MU2 F NL2 F' MU2 F MU2 R NU2 R' MU2 R NU2 R2 NB2 R MU2 R' NB2 R MU2 D2 MR' NU2 MR D2 U2 MR' NU2 MR MF' ND2 MF U2 D2 MF' ND2 MF D2 NU' R2 NU B2 NU' NB2 NU B2 NU' NB2 R2 NU NR D2 NR' F2 NR NF2 NR' F2 NR NF2 D2 NR' NL NB R2 NB' NL2 NB R2 NB' NL NF2 L' NF NL' NF' L NF NL NF NU NL' NB' NL B NL' NB NL B' R NF' NR' NF R' NF' NR NF NU' NF ND' NL' ND L ND' NL ND L' U NR' NU' NR U' NR' NU NR NF2 NR ND NR' D' NR ND' NR' D L' NU NL NU' L NU NL' NU' NF

LOL/OLL Pattern – 5x5x5 Cube



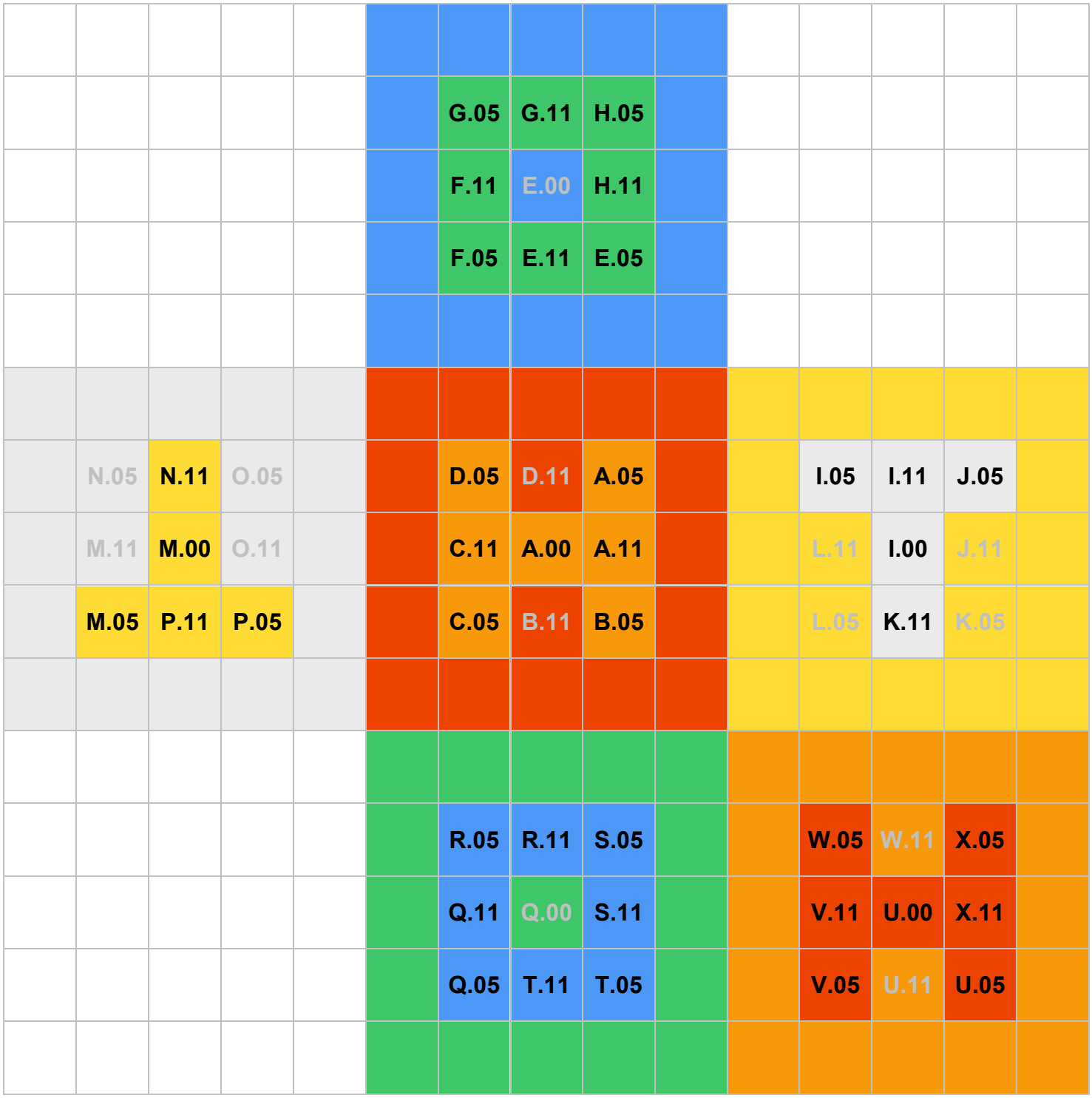
FRU View



LBD View

Abbreviation Pattern 8: HOT

HOT = HOT



HOT Pattern – Cycle Decomposition – Orbits 00, 05 & 11

Orbit 11

Letters	Cycles	Parity	Centers
Letter 'H'	2-cycle + 2-cycle	even	4
Letter 'O'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Letter 'T'	2-cycle + 2-cycle	even	4
All Cycles	(2-cycle + 2-cycle) + (2-cycle + 2-cycle + 2-cycle + 2-cycle) + (2-cycle + 2-cycle)	even	16
Composition	Eight 2-cycles	even	16
Permutation	(C X) (A V) (G R) (E T) (H Q) (F S) (I P) (K N)	even	16

Orbit 05

Letters	Cycles	Parity	Centers
Letter 'H'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Letter 'O'	2-cycle + 2-cycle + 2-cycle + 2-cycle	even	8
Letter 'T'	2-cycle + 2-cycle	even	4
All Cycles	(2-cycle + 2-cycle + 2-cycle + 2-cycle)2 + (2-cycle + 2-cycle)	even	20
Composition	Ten 2-cycles	even	20
Permutation	(C X) (A V) (D U) (B W) (G S) (H R) (E Q) (F T) (I M) (J P)	even	20

Orbit 00

Letters	Cycles	Parity	Centers
Letter 'H'	2-cycle	odd	2
Letter 'T'	2-cycle	odd	2
All Cycles	2-cycle + 2-cycle (4-spot)	even	4
Composition	Two 2-cycles of True Centers	even	4
Permutation	(A U) (I M)	even	4

*Two 2-cycles are grouped into a 4-cycle to keep permutation parity even.

HOT Pattern – Algorithms – Orbits 00, 05 & 11

Orbit 11 Only

MU' NF2 MU B2 MU' NF2 MU B2 F2 MU' NB2 MU F2 MU' NB2 MU D2 MR' NU2 MR D2 U2 MR' NU2 MR MF' ND2 MF U2 D2 MF' ND2 MF D2 L2 MF' NL2 MF L2 R2 MF' NL2 MF R2

Orbit 05 Only

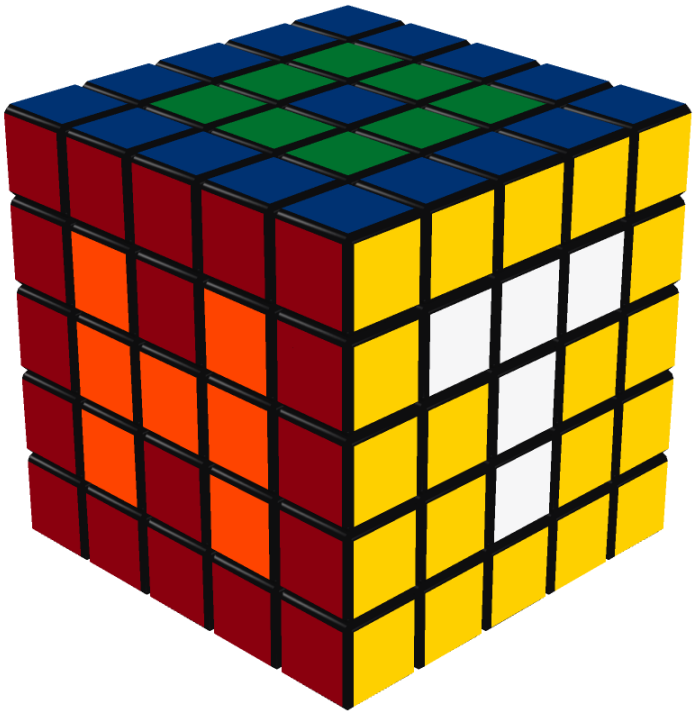
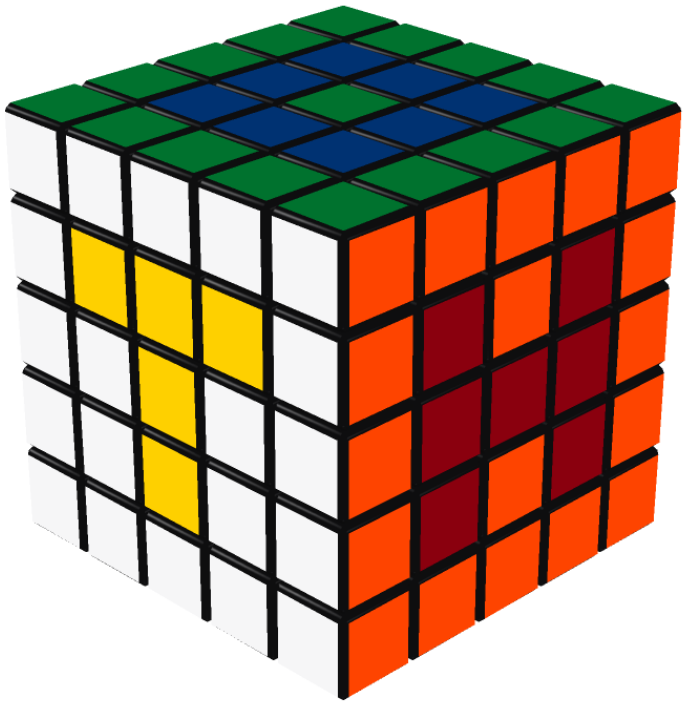
NL' U2 NL B2 NL' NB2 NL B2 NL' NB2 U2 NL NU L2 NU' B2 NU NB2 NU' B2 NU NB2 L2 NU2 R2 NU B2 NU' NB2 NU B2 NU' NB2 R2 NU NR D2 NR' F2 NR NF2 NR' F2 NR NF2 D2 NR' NF ND' NL' ND L ND' NL ND L' U NR' NU' NR U' NR' NU NR NL' ND' NL D NL' ND NL D' R NU' NR' NU R' NU' NR NU NF' NU NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NU'

Orbit 00 Only

MU MF2 MU' MF2

Complete Pattern

MU' NF2 MU B2 MU' NF2 MU B2 F2 MU' NB2 MU F2 MU' NB2 MU D2 MR' NU2 MR D2 U2 MR' NU2 MR MF' ND2 MF U2 D2 MF' ND2 MF D2 L2 MF' NL2 MF L2 R2 MF' NL2 MF R2
NL' U2 NL B2 NL' NB2 NL B2 NL' NB2 U2 NL NU L2 NU' B2 NU NB2 NU' B2 NU NB2 L2 NU2 R2 NU B2 NU' NB2 NU B2 NU' NB2 R2 NU NR D2 NR' F2 NR NF2 NR' F2 NR NF2 D2 NR' NF ND' NL' ND L ND' NL ND L' U NR' NU' NR U' NR' NU NR NL' ND' NL D NL' ND NL D' R NU' NR' NU R' NU' NR NU NF' NU NB' NL' NB L NB' NL NB L' F NR' NF' NR F' NR' NF NR NU'
MU MF2 MU' MF2

HOT Pattern – 5x5x5 Cube	
	
FRU View	LBD View