

TESSELATION

J. Lederberg
January 20, 1965

Algorithm for filling shells, out -> in.

6 bits = 1 byte. Use one byte for set of corresponding positions on 6 edges. Therefore, if n = order of the shell, the descriptive word will have n bytes.

The bytes are in order, ABCDEF, GHIJKL, MNOPQR, STUVWX, YZabcd, and +

1. Partition the shell count among the bytes. (A more efficient algorithm might well extract some symmetries at this point but would complicate the definition of dictionary order. The symmetry involved is reflection, since MNOPQR can interchange with GHIJKL on shell 3, for example.)

But dictionary order does not directly follow this; viz. ABC < AD. This should not be consequential in producing the canonical forms.

2. Consider first byte.
3. Consider possible arrangements of this byte:

	<u>Binary</u>	<u>Octal</u>	<u>Symmetries left</u>	
A	100000	40	/	
AB	110000	50	/1	B H N T Z C
AC	101000	50	/2	Y B H N T C I
AD	100100	44	2 /	S S B H N C I O
ABC	111000	70	/2	M M M B H C I O U
ABD	110100	64	none	G G G G B C I O U a
ACE	101010	52	3 /	A A A A A + D D D D D
ABCD	111100	74	/4	d X R L F E J J J J
ABCE	111010	72	/2	X R L F K E P P P
ABDE	110110	66	/1	R L F Q K E V V
ABCDE	111110	76	/4	L F W Q K E b
ABCDEF	111111	77	6 /	F C W Q K E
0	000000	00	6 /	

After translation, the figure must be canonicated to compare it with the original. If the latter is later in dictionary order, it is rejected.

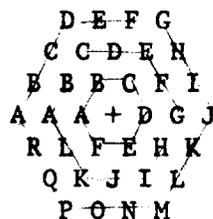
To canonicate, set up a look-up table of the function that transforms any 6-bit number to the canonical byte, and execute accordingly for the first byte. The remaining bytes are then tested in sequence under the allowed operations still remaining; the same for the next shell.

For masking one shell on the next: the first byte (ABCDEF) is unique and masks on as many as 3 bytes (1, 2 and last). The last is rotated before being masked.

Definition of canonical form.

1. Translate center of coordinates to give the minimum shell-count-vector.
2. (Translate) rotate and reflect to give minimum dictionary value of the list of items, shell by shell.

The outermost shell corresponds to the most significant (leftmost) item of the vector-



S. J. ...
 JAN 20 1965

Notation: list of shells separated by , and with or without terminal + .

Empty comma positions are possible at right-hand side of list only.

- Examples: (+) benzene
 (A+) naphthalene
 (AB+) phenalene
 (ABC+) pyrene
 (A,AD+) naphthacene

Possible economies: do not implement now

If more than one alphabetic cycle is needed in a ring, use initial . to set up rank

Commas between non-ascending characters could be dispensed with. Leading A and strings of A,A,A could be more economically coded

Tessellations 1/19/65

Tactical decisions:

1. Partition the count to shell count vector. No interstitial o's allowed. Largest shell allocates entire count to diameter.
2. Build shells from outside inwards. Retain record of symmetry restrictions for calculations on next inner shells.
3. Test for peripheral islands as each shell is filled.
- 4- When figure is completed, test (and discard if indicated)

translation to smaller shell count vector
discontinuity by masking in and out across shells (breathing)

if translation leaves any ambiguity (shell count vector same)
test results of operations (translation, rotation and reflection)
for any result with lower value than propositus.

5 eventually install search for enclaves

6 store list of results on disk!

In process, calculate and store appropriate masks unless the
procedure for calculating the mask is quite fast