

Upper Diagonal Matrix for Flag Signals

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Abstract

The flag signals (semaphores) are represented by pairs of vertices of a regular octagon, without regard of handiness.

For the flag signals (semaphores) see the references [1], [2], [4], and [5], especially the first and last one, for the 29 signals for the alphabet A, B, \dots, Z , including the letter J which is also used for ‘letter(s) to follow’ (here abbreviated as lf), and additional three signals for ‘number(s) to follow’ (here abbreviated by $\#$), ‘space’ (here sp) and ‘cancel, disregard the previous signal’ (here dp) The signals for the numbers 1, 2, ..., 9 are those of A, B, \dots, I , respectively, and for the number 0 the signal coincides with the one for K .

In order to encode these signals we consider the hands of the sender (idealized as points) as vertices on an regular octagon. We assume that the arms emerge from a point, the center of the octagon. The handiness (chirality) is therefore irrelevant. The vertices of the octagon are denoted by 0, 1, ..., 7, arranged in the positive sense (counterclockwise), starting with vertex 0 (Cartesian coordinates (1, 0)).

The 29 signals with their octagon vertex pairs are shown in the FIGURE.

In *Table 1* an 8×8 upper diagonal matrix \mathbf{M} , with elements $\mathbf{M}_{n,k}$, is used for the vertex pairs. The two vertices for a signal follow the positive orientation. Hence entries (n, k) , with $n > k$, do not appear, and there is only one diagonal element, namely (6,6) (the space (sp) signal). All 28 upper off-diagonal elements are used.

In *Table 2* the symmetry relations among the signals represented by entries of \mathbf{M} are given, regarding left-right and up-down symmetry.

There are two signals with left-right, as well as up-down symmetry, namely $D/4$ and R , they are colored blue. The three signals with only left-right symmetry, namely N, U and sp , are colored brown, and the two signals with only up-down symmetry, namely $I/9$ and X are colored red. There is no up-down mirror of the signal for space (sp), denoted by no .

In [3] there is another representation given in [A364733](#). See also [A326345](#).

The present representation has been proposed as [A364320](#) but it was rejected (see the history, earlier changes there).

References

- [1] Britannica, Semaphore flag signals, <https://cdn.britannica.com/41/133741-050-FA798221/Semaphore->
- [2] B. Busschots, Semiforify.info. The Online Semaphore Converter. <http://www.semaphorify.info/>
- [3] The On-Line Encyclopedia of Integer SequencesTM, published electronically at <http://oeis.org>, 2023.

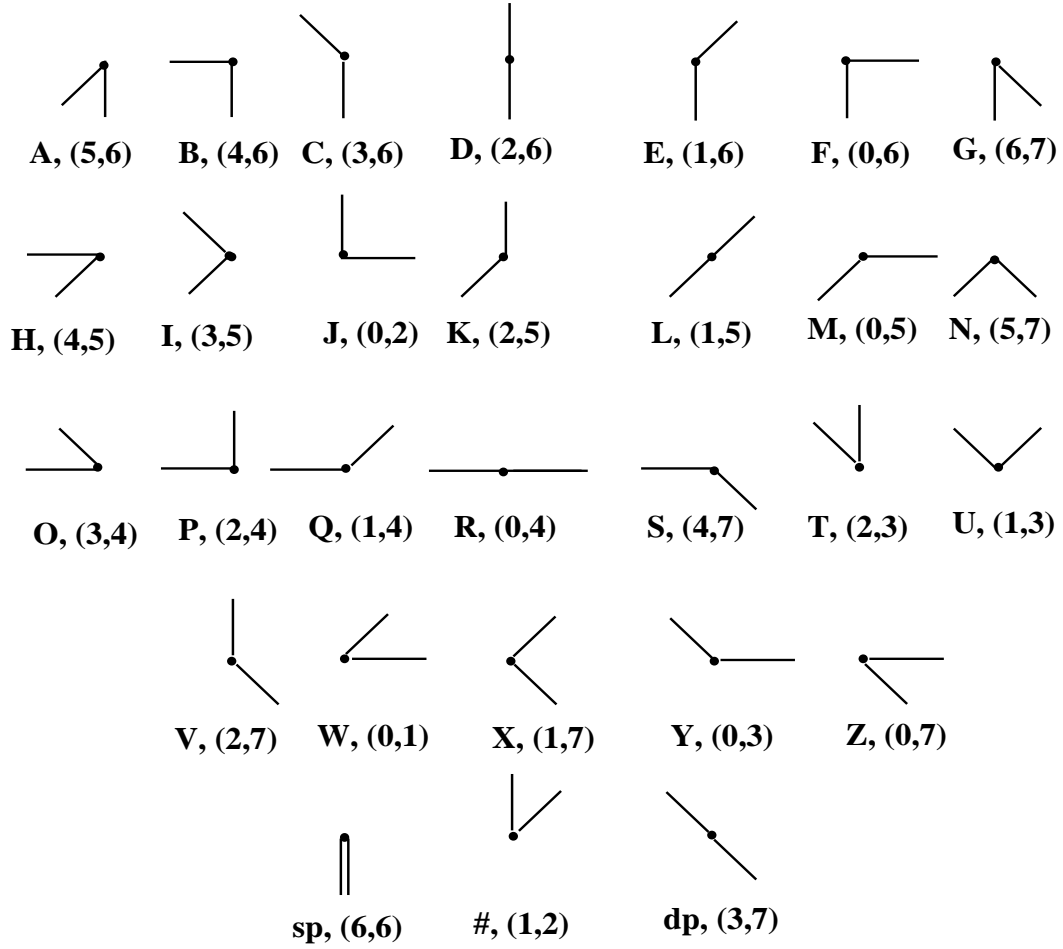
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[4] Wikipedia, Semaphore, <https://en.wikipedia.org/wiki/Semaphore>

[5] Wikipedia, Flag semaphore, https://en.wikipedia.org/wiki/Flag_semaphore

FIGURE

Flag signals



sp = space, # = number(s) follow, dp = disregard previous signal

Table 1: Flag signals $M_{n,k}$ for Octagon Vertex pairs (n, k)

$n \backslash k$	0	1	2	3	4	5	6	7
0	•	W	J/lf	Y	R	M	F/6	Z
1		•	#	U	Q	L	E/5	X
2			•	T	P	K/0	D/4	V
3				•	O	I/9	C/3	dp
4					•	H/8	B/2	S
5						•	A/1	N
6							sp	G/7
7								•

Table 2: Symmetry Relations between the Flag Signals

Letters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
left – right	G	F	E	D	C	B	A	Z	X	P	V	dp	S	N	W
up – down	T	P	K	D	V	J	#	O	I	F	C	dp	Y	U	H

Letters	P	Q	R	S	T	U	V	W	X	Y	Z	sp	#	dp
left – right	J	Y	R	M	#	U	K	O	I	Q	H	sp	T	L
up – down	B	S	R	Q	A	N	E	Z	X	M	W	no	G	L