Rank-65554 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

$$X_0^3 + X_1^3 + X_2^3 + X_3^3 + X_0X_1X_2 = 0$$

(1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is 1227134102

General information

Number of lines	1
Number of points	73
Number of singular points	1
Number of Eckardt points	0
Number of double points	0
Number of single points	9
Number of points off lines	64
Number of Hesse planes	0
Number of axes	0
Type of points on lines	9
Type of lines on points	1^9, 0^{64}

Singular Points

The surface has 1 singular points:

$0 : \ P_{20} = \mathbf{P}(1,1,1,0) = \mathbf{P}(1,1,1,0)$

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix}_{74} = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix}_{74} = \mathbf{Pl}(1,0,1,0,0,1)_{665}$$

Rank of lines: (74)
Rank of points on Klein quadric: (665)

Eckardt Points

The surface has 0 Eckardt points:

Double Points

The surface has 0 Double points:
The double points on the surface are:

Single Points

The surface has 9 single points:
The single points on the surface are:

0 : $P_5 = (1,1,0,0)$ lies on line ℓ_0
1 : $P_{12} = (1,0,1,0)$ lies on line ℓ_0
2 : $P_{19} = (0,1,1,0)$ lies on line ℓ_0
3 : $P_{30} = (3,2,1,0)$ lies on line ℓ_0
4 : $P_{37} = (2,3,1,0)$ lies on line ℓ_0
5 : $P_{48} = (5,4,1,0)$ lies on line ℓ_0
6 : $P_{55} = (4,5,1,0)$ lies on line ℓ_0
7 : $P_{66} = (7,6,1,0)$ lies on line ℓ_0
8 : $P_{73} = (6,7,1,0)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 64 points not on any line:
The points on the surface but not on lines are:

0 : $P_{20} = (1,1,1,0)$
1 : $P_{75} = (1,0,0,1)$
2 : $P_{82} = (0,1,0,1)$
3 : $P_{95} = (5,2,0,1)$
4 : $P_{105} = (7,3,0,1)$
5 : $P_{112} = (6,4,0,1)$
6 : $P_{116} = (2,5,0,1)$
7 : $P_{126} = (4,6,0,1)$
8 : $P_{133} = (3,7,0,1)$
9 : $P_{138} = (0,0,1,1)$
10 : $P_{148} = (3,1,1,1)$
11 : $P_{150} = (5,1,1,1)$
12 : $P_{151} = (6,1,1,1)$
13 : $P_{162} = (1,3,1,1)$
14 : $P_{178} = (1,5,1,1)$
15 : $P_{186} = (1,6,1,1)$
16 : $P_{206} = (5,0,2,1)$
17 : $P_{221} = (4,2,2,1)$
18 : $P_{232} = (7,3,2,1)$
19 : $P_{235} = (2,4,2,1)$
20 : $P_{238} = (5,4,2,1)$
21 : $P_{240} = (7,4,2,1)$
22 : $P_{241} = (0,5,2,1)$
23 : $P_{245} = (4,5,2,1)$
24 : $P_{260} = (3,7,2,1)$
25 : $P_{261} = (4,7,2,1)$
26 : $P_{264} = (7,7,2,1)$
27 : $P_{272} = (7,0,3,1)$
28 : $P_{274} = (1,1,3,1)$
29 : $P_{288} = (7,2,3,1)$
30 : $P_{321} = (0,7,3,1)$
31 : $P_{323} = (2,7,3,1)$
32 : $P_{335} = (6,0,4,1)$
33 : $P_{347} = (2,2,4,1)$
34 : $P_{350} = (5,2,4,1)$
35 : $P_{352} = (7,2,4,1)$

36 : $P_{368} = (7, 4, 4, 1)$
37 : $P_{371} = (2, 5, 4, 1)$
38 : $P_{377} = (0, 6, 4, 1)$
39 : $P_{384} = (7, 6, 4, 1)$
40 : $P_{387} = (2, 7, 4, 1)$
41 : $P_{389} = (4, 7, 4, 1)$
42 : $P_{391} = (6, 7, 4, 1)$
43 : $P_{395} = (2, 0, 5, 1)$
44 : $P_{402} = (1, 1, 5, 1)$
45 : $P_{409} = (0, 2, 5, 1)$
46 : $P_{413} = (4, 2, 5, 1)$
47 : $P_{427} = (2, 4, 5, 1)$
48 : $P_{461} = (4, 0, 6, 1)$
49 : $P_{466} = (1, 1, 6, 1)$
50 : $P_{489} = (0, 4, 6, 1)$
51 : $P_{496} = (7, 4, 6, 1)$
52 : $P_{517} = (4, 7, 6, 1)$
53 : $P_{524} = (3, 0, 7, 1)$
54 : $P_{540} = (3, 2, 7, 1)$
55 : $P_{541} = (4, 2, 7, 1)$
56 : $P_{544} = (7, 2, 7, 1)$
57 : $P_{545} = (0, 3, 7, 1)$
58 : $P_{547} = (2, 3, 7, 1)$
59 : $P_{555} = (2, 4, 7, 1)$
60 : $P_{557} = (4, 4, 7, 1)$
61 : $P_{559} = (6, 4, 7, 1)$
62 : $P_{573} = (4, 6, 7, 1)$
63 : $P_{579} = (2, 7, 7, 1)$

Line Intersection Graph

	0
0	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line
in point

The surface has 73 points:
The points on the surface are:

0 : $P_5 = (1, 1, 0, 0)$
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