Rank-73797 over GF(2)

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The equation

The equation of the surface is :

$$X_1^3 + X_0^2X_3 + X_0X_3^2 + X_0X_1X_2 = 0$$

(0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(2) is 73797

General information

Number of lines	3
Number of points	9
Number of singular points	1
Number of Eckardt points	1
Number of double points	0
Number of single points	6
Number of points off lines	2
Number of Hesse planes	0
Number of axes	0
Type of points on lines	3^3
Type of lines on points	3, 1^6, 0^2

Singular Points

The surface has 1 singular points:

$0:\ P_2 = \mathbf{P}(0,0,1,0) = \mathbf{P}(0,0,1,0)$

The 3 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_4 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_4 = \mathbf{Pl}(0,0,1,0,0,0)_2$$

$$\ell_1 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{34} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{34} = \mathbf{Pl}(0,1,0,0,0,0)_1$$

$$\ell_2 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{18} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{18} = \mathbf{Pl}(0,1,1,0,0,0)_4$$

Rank of lines: (4, 34, 18)
Rank of points on Klein quadric: (2, 1, 4)

Eckardt Points

The surface has 1 Eckardt points:
$0 : P_2 = \mathbf{P}(0,0,1,0) = \mathbf{P}(0,0,1,0).\ T = -1$

Double Points

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

Single Points

The surface has 6 single points:
The single points on the surface are:

$0 :\ P_0 = (1,0,0,0)$ lies on line ℓ_0
$1 :\ P_3 = (0,0,0,1)$ lies on line ℓ_1
$2 :\ P_6 = (1,0,1,0)$ lies on line ℓ_0
$3 :\ P_9 = (1,0,0,1)$ lies on line ℓ_2
$4 :\ P_{12} = (0,0,1,1)$ lies on line ℓ_1
$5 :\ P_{13} = (1,0,1,1)$ lies on line ℓ_2

The single points on the surface are:

Points on surface but on no line

The surface has 2 points not on any line:
The points on the surface but not on lines are:

$0 :\ P_4 = (1,1,1,1)$
$1 :\ P_8 = (1,1,1,0)$

Line Intersection Graph

	0 1 2
0	0 1 1
1	1 0 1
2	1 1 0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line	ℓ_1	ℓ_2
in point	P_2	P_2

Line 1 intersects

Line	ℓ_0	ℓ_2
in point	P_2	P_2

Line 2 intersects

Line	ℓ_0	ℓ_1
in point	P_2	P_2

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

$0: P_0 = (1,0,0,0)$
$1: P_2 = (0,0,1,0)$
$2: P_3 = (0,0,0,1)$
$3: P_4 = (1,1,1,1)$
$4: P_6 = (1,0,1,0)$
$5: P_8 = (1,1,1,0)$
$6: P_9 = (1,0,0,1)$
$7: P_{12} = (0,0,1,1)$
$8: P_{13} = (1,0,1,1)$