Theta function:

Steps:

1. For all pairs (x, z) such that $0 \le x < 5$ and $0 \le z < w$, let

   $C[x,z]=A[x,0,z] \oplus A[x,1,z] \oplus A[x,2,z] \oplus A[x,3,z] \oplus A[x,4,z]$.

2. For all pairs (x, z) such that $0 \le x < 5$ and $0 \le z < w$ let

   $D[x, z]=C[(x-1) \bmod 5, z] \oplus C[(x+1) \bmod 5, (z-1) \bmod w]$.

3. For all triples (x, y, z) such that $0 \le x < 5$, $0 \le y < 5$, and $0 \le z < w$, let

   $A'[x,y,z] = A[x,y,z] \oplus D[x,z]$.

Let us consider the output as the following

cf748aa5cd36e44be6659c8c35b35083f97cd7896c8403a800

Step 1:

11001111 01110100 10001010 10100101 11001101
00110110 11100100 01001011 11100110 01100101
10011100 10001100 00110101 10110011 01010000
10000011 11111001 01111100 11010111 10001001
01101100 10000100 00000011 10101000 00000000

Inversing the above bits

11110011 00101110 01010001 10100101 10110011
01101100 00100111 11010010 01100111 10100110
00111001 00110001 10101100 11001101 00001010
11000001 10011111 00111110 11101011 10010001
00110110 00100001 11000000 00010101 00000000

Step 2:

Z=0

2	1	0	0	0	0
1	0	1	0	0	1
0	1	1	1	0	0
4	0	0	0	0	1
3	1	1	1	1	0
	3	**4**	**0**	**1**	**2**

Z=1

2	1	0	0	0	0
1	1	0	1	0	1
0	0	0	1	0	1
4	0	0	0	0	1
3	1	0	1	0	0
	3	**4**	**0**	**1**	**2**

Z=2

2	1	0	1	1	1
1	1	1	1	1	0
0	1	1	1	1	0
4	1	0	1	1	0
3	1	0	0	0	1
	3	**4**	**0**	**1**	**2**

Z=3

2	0	1	1	1	1
1	0	0	0	0	1
0	0	1	1	0	1
4	1	0	1	0	0
3	0	1	0	1	1
	3	**4**	**0**	**1**	**2**

Z=4

2	1	1	1	0	1
1	0	0	1	0	0
0	0	0	0	1	0
4	0	0	0	0	0
3	1	0	0	1	1
	3	**4**	**0**	**1**	**2**

Z=5

2	1	0	0	0	1
1	1	1	1	1	0
0	1	0	0	1	0
4	1	0	1	0	0
3	0	0	0	1	1
	3	**4**	**0**	**1**	**2**

Z=6

2	0	1	0	0	0
1	1	1	0	1	1
0	0	1	1	1	0
4	0	0	1	0	0
3	1	0	0	1	1
	3	**4**	**0**	**1**	**2**

Z=7

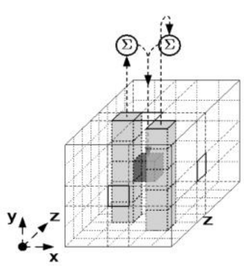
2	1	0	1	1	0
1	1	0	0	1	0
0	1	1	1	0	1
4	1	0	0	1	0
3	1	1	1	1	0
	3	**4**	**0**	**1**	**2**

The below is the compression operation that has been done based on the equation 1

Y plane

7	1	0	1	0	1
6	0	1	0	1	0
5	0	1	0	1	0
4	0	1	0	0	0
3	1	1	1	0	0
2	1	0	0	0	0
1	1	0	1	0	1
0	1	1	0	1	0
	3	**4**	**0**	**1**	**2**

Xor the bits as shown in the figure:



Y plane:

7	0	1	1	1	1
6	1	0	0	0	1
5	1	0	1	0	1
4	1	1	1	0	1
3	0	1	1	1	1
2	0	0	0	1	1
1	0	1	1	1	1
0	0	0	1	1	0
	3	**4**	**0**	**1**	**2**

Z=0

2	0	0	1	1	1
1	1	1	1	1	1
0	0	1	0	1	0
4	1	0	1	1	1
3	0	1	0	0	0
	3	**4**	**0**	**1**	**2**

Z=1

2	1	0	0	0	0
1	1	0	1	0	1
0	0	0	1	0	1
4	0	0	0	0	1
3	1	0	1	0	0
	3	**4**	**0**	**1**	**2**

Z=2

2	1	1	0	1	0
1	0	0	0	1	1
0	0	0	0	1	1
4	1	1	0	1	1
3	0	1	1	0	0
	3	**4**	**0**	**1**	**2**

Z=3

2	0	0	1	1	0
1	0	0	0	0	1
0	0	1	1	0	1
4	1	0	1	0	0
3	0	1	0	1	
	3	**4**	**0**	**1**	**2**

Z=4

2	0	1	0	0	0
1	1	0	0	0	1
0	1	0	1	1	1
4	1	0	1	0	1
3	0	1	1	1	0
	3	**4**	**0**	**1**	**2**

Z=5

2	0	0	1	0	1
1	0	1	0	1	0
0	0	1	1	1	0
4	0	0	0	0	0
3	1	0	1	1	1
	3	**4**	**0**	**1**	**2**

Z = 6

2	1	1	0	0	0
1	0	1	0	1	1
0	1	1	1	1	0
4	1	0	1	0	0
3	0	0	0	1	1
	3	**4**	**0**	**1**	**2**

Z=7

2	0	0	0	1	1
1	0	0	1	1	0
0	0	1	0	0	0
4	0	0	1	1	1
3	0	1	0	1	1
	3	**4**	**0**	**1**	**2**

The binary bits are obtained from the above the slices :

01011110, 10101110, 01111000, 00001010, 10010011,
11000001, 10100111, 11111011, 11001000, 10000110,
10010100, 10110001, 10000101, 01100010, 00101010,
01101100, 00011111, 00010111, 01000100, 10110001,
10011011, 10100001, 11101001, 10111010, 00100000

The inverse function is performed for the above values :

01111010, 01110101, 00011110, 01010000, 11001001,
10000011, 11100101, 11011111, 00010011, 01100001,
00101001, 10001101, 10100001, 01000110, 01010100,
00110110, 11111000, 11101000, 00100010, 10001101,
11011001, 10000101, 10010111, 01011101, 00000100

When coverting the above binary bits into hexa, we get the below result

7a751e50c983e5df1361298da1465436f8e8228dd985975d04

$C[(x-1) \bmod 5, z] = A[(x-1) \bmod 5,0, z] \oplus A[(x-1) \bmod 5,1, z] \oplus A[(x-1) \bmod 5,2, z] \oplus A[(x-1) \bmod 5,3, z] \oplus A[(x-1) \bmod 5,4, z]$.

----- equation (1)

$C [(x+1) \bmod 5, (z-1) \bmod 8] = A[(x+1) \bmod 5,0, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,1, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,2, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,3, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,4, (z-1) \bmod 8]$.

------equation (2)

$D[x, z]=C[(x-1) \bmod 5, z] \oplus C[(x+1) \bmod 5, (z-1) \bmod w]$. -----equation (3)

Equation 1 and 2 in 3

D[x, z] $= A[(x-1) \bmod 5,0, z] \oplus A[(x-1) \bmod 5,1, z] \oplus A[(x-1) \bmod 5,2, z] \oplus A[(x-1) \bmod 5,3, z] \oplus A[(x-1) \bmod 5,4, z] \oplus A[(x+1) \bmod 5,0, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,1, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,2, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,3, (z-1) \bmod 8] \oplus A[(x+1) \bmod 5,4, (z-1) \bmod 8]$

We know that

$A'[x,y,z] = A[x,y,z] \oplus D[x,z]$ ------equation (4)

Equation 3 in 4

$$A'[x,y,z] = A[x,y,z] \square A[(x-1) \bmod 5,0, z] \square A[(x-1) \bmod 5,1, z] \square A[(x-1) \bmod 5,2, z] \square A[(x-1) \bmod 5,3, z] \square A[(x-1) \bmod 5,4, z] \square A[(x+1) \bmod 5,0, (z-1) \bmod 8] \square A[(x+1) \bmod 5,1, (z-1) \bmod 8] \square A[(x+1) \bmod 5,2, (z-1) \bmod 8] \square A[(x+1) \bmod 5,3, (z-1) \bmod 8] \square A[(x+1) \bmod 5,4, (z-1) \bmod 8]$$

We were trying to get a definite relationship between A and A` but we were able to get till the the above equation