WE1.4

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Video explanation of solution is provided below the problem.

Error Correction

5/5 points (ungraded)

An internet Sudoku gaming site transmits messages containing nine data bits and seven parity bits, arranged in a rectangle as follows:

D_{00}	D_{01}	D_{02}	P_{0x}
D_{10}	D_{11}	D_{12}	P_{1x}
D_{20}	D_{21}	D_{22}	P_{2x}
P_{x0}	P_{x1}	P_{x2}	P_{xx}

Each D_{ij} in the above diagram indicates a data bit, equally likely to be a 0 or 1. Each P_{ix} and P_{xj} is an odd parity bit chosen to make the total number of 1s in the i^{th} row or j^{th} column, respectively, odd. P_{xx} is an odd parity bit chosen to make the total number of 1s in the entire transmission odd. Thus in an error-free transmission, the total number of 1s in 4-bit columns 0 thru 2 and 4-bit rows 0 thru 2, as well as in the entire 16-bit transmission, is odd.

Note that each 9-bit data word determines a unique 16-bit valid *codeword* to be transmitted.

What is the minimum Hamming distance between valid codewords? [Hint: flipping one bit of the data word changes how many bits of the codeword?] 4 ✔

Each of the following represents a transmission received, with at most a single-bit error. For each message, specify the bit, if any, that was changed due to a transmission error. Use the labels from the table above where data elements are labeled D_{ij} and parity elements are labeled P_{ij} to specify the erroneous bit. Enter these as *"P_ij"* and *"D_ij"*. If there is no error, write *"no error"* in the answer box.

1	0	1	1
0	1	1	1
1	1	0	1
1	1	1	1

no error ✔

1	0	1	1
1	1	0	1
0	1	1	1
1	0	1	1

P_x1 ✔

0	1	0	1
0	0	1	0
1	1	0	1

Calculator

1	1	0	0

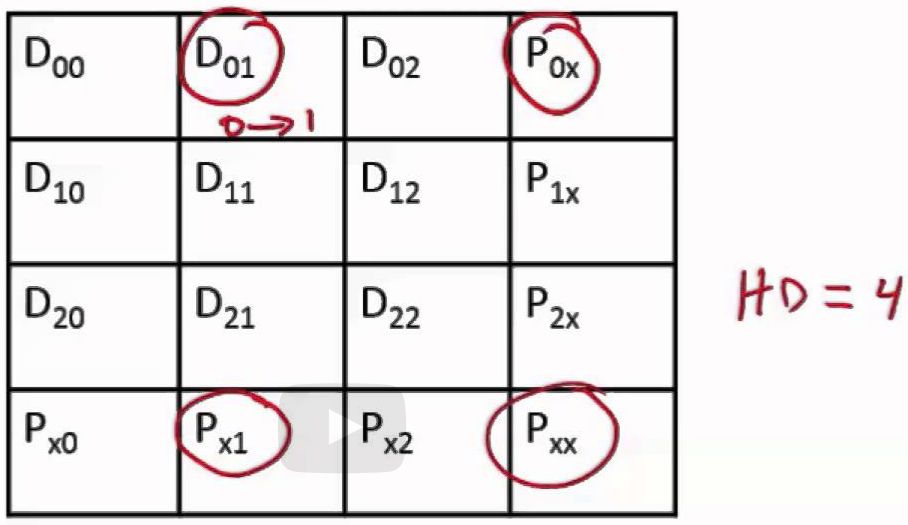
D_00 ✔

0	1	0	0
1	0	1	1
0	1	1	1
0	1	1	1

P_xx ✔

Submit

Error Correction



(Caption will be displayed when you start playing the video.)

▶ 0:00 / 0:00 1.0x

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A Problem of Semantics? 2
The hint: [Hint: flipping one bit of the data word changes how many bits of the codeword?] led me on quite a squirrel chase. My reas...

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