

Repetition code

010110 010110 010110
1st rep. 2nd 3rd

010010 010110 010110
↑
error

2nd 3rd

What's wrong with this code?

Parity checks

1 0 1 1 0 1 0 0

message

parity bit

A diagram showing a binary sequence '1 0 1 1 0 1 0 0'. The first seven bits are grouped by a green bracket labeled 'message'. The eighth bit, '0', is highlighted in blue. A blue arrow points from the text 'parity bit' to this blue bit.

message

pt. 1

pt. 2

pt. 3

1 0 1 0 0 0 1 1 1 0 0

parity bits

A diagram showing a binary sequence '1 0 1 0 0 0 1 1 1 0 0'. The first three bits '1 0 1' are grouped by a green bracket labeled 'message' and 'pt. 1'. The next three bits '0 0 0' are grouped by a green bracket labeled 'pt. 2'. The last four bits '1 1 1 0' are grouped by a green bracket labeled 'pt. 3'. The bits at positions 4, 5, 8, and 10 are highlighted in blue. Three blue arrows point from the text 'parity bits' to these four blue bits.

Parity checks

which of these have errors? (and why?)

011000101

1000101110

01100001111

010101101100

Luhn algorithm



This method detects whether there are single-digit errors, or digits next to each other are swapped.

(However, it can't correct any of these errors automatically or locate them in the card number.)

1) double every other digit

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
				4	8			12	16			0	4		

2) add the digits of these numbers together

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
				4	8			12	16			0	4		
				4	8			3	7			0	4		

3) add every 1st, 3rd, 5th, etc. digit of the card number to these

$$1 + 4 + 3 + 8 + 5 + 3 + \dots = 71$$

4) if the result is divisible by 10, the card number might be valid.



^ Hans Peter Luhn