Probability and Statistics Notes
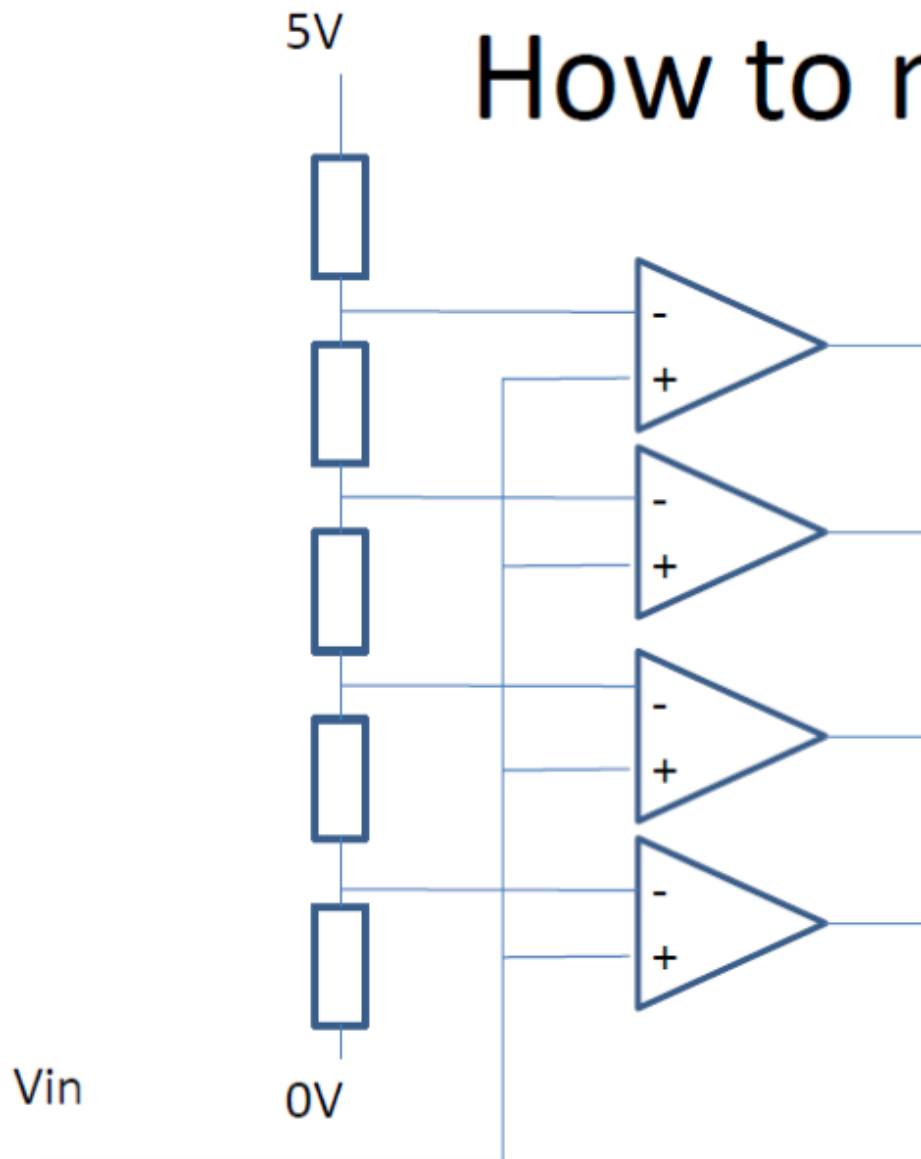
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Lecture 1: Elementary digital circuits

The flash converter, an analog signal can be converted from analog to digital using this converter. it will divide a voltage into different levels, shown as the resistors on the figure below. This will produce a truth table of sorts, if we put in a signal that is between 2 and 3 volts in the example on the blackboard, it will correspond to the 2nd row in the table below:

5V

How to me

Vin

0V

Exercises

1. Show by perfect induction the following relations:

1. $(A + B) * (A + C) = A + (B * C)$

A	B	C	$A+B$	$A+C$	$(A+B)*(A+C)$	$B*C$	$A+(B*C)$
0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	1	1	1	1
1	0	0	1	1	1	0	1
1	0	1	1	1	1	0	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

2. $A*(A+B) = A$

A	B	$A+B$	$A*(A+B)$
0	0	0	0
0	1	1	0
1	0	1	1
1	1	1	1

3. $A+\overline{A} = 1$

A	$\overline{A}$	$A+\overline{A}$
0	1	1
1	0	1

4. $\overline{A+B+C} = \overline{A}*\overline{B}*\overline{C}$

A	B	C	$A+B+C$	$\overline{A+B+C}$	$\overline{A}$	$\overline{B}$	$\overline{C}$	$\overline{A}*\overline{B}*\overline{C}$
0	0	0	0	1	1	1	1	1
0	0	1	1	0	1	1	0	0
0	1	0	1	0	1	0	1	0
0	1	1	1	0	1	0	0	0
1	0	0	1	0	0	1	1	0
1	0	1	1	0	0	1	0	0
1	1	0	1	0	0	0	1	0
1	1	1	1	0	0	0	0	0

1. Show that the following expression is equivalent to the exclusive or function This is denoted by $\oplus$