CS257: Applied Robotics & Embedded Programming
Courtesy of by Jeff Mowbray at Collingwood Collegiate Institute
Computer Engineering & Robotics Dept.

Lesson 3: Introduction to Integrated Circuits

Integrated circuits are the building blocks for modern-day electronic devices. An integrated circuit contains millions of interconnected transistors, capacitors and other discreet electronic components. It is normally packaged inside a small plastic chip, which has small metal legs which allow the IC chip to communicate with the outside world.

Basic Logic Gates

Inside the computer, data is represented in binary form, using transistors to represent 1s and 0s. However, the computer (and in particular, the CPU) must be able to "control" the binary data, in order to perform mathematical and logical operations. This is done inside of an IC chip using special electronic components known as logic gates.

Logic gates accept one or two binary inputs, and generate one binary output. The output for each gate depends on the combination of inputs ... and can be summarized in a table known as a **truth table**.

The five basic logic gates (and their corresponding truth tables) are as follows:

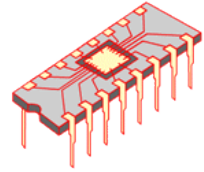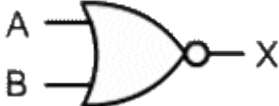| Gate Name	Symbol	Truth Table		
NOT	A ▷o— X	**A**		**X**
		0		1
		1		0
AND	A, B — X	**A**	**B**	**X**
		0	0	0
		0	1	0
		1	0	0
		1	1	1
OR	A, B — X	**A**	**B**	**X**
		0	0	0
		0	1	1
		1	0	1
		1	1	1

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Gate Name	Symbol	Truth Table		
		A	B	X
NAND	A, B → X	0	0	1
		0	1	1
		1	0	1
		1	1	0
		A	B	X
NOR	A, B → X	0	0	1
		0	1	0
		1	0	0
		1	1	0