HyperionDev

Introduction to Boolean Algebra

04 February 2025

Tech Talks Session Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly.
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions.
- If you have any questions outside of this session, or that are not answered during this session, please do submit these for upcoming Tech Talks Sessions. You can submit these questions here: **https://forms.gle/MomSYvUWiSfKgMaZ9**

Tech Talks Session Housekeeping

- For all **non-academic questions**, please submit a query:

  www.hyperiondev.com/support
- We would love your **feedback**. Please fill in the feedback form after the session.
- If you are hearing impaired, please kindly use your computer's function through Google chrome to enable captions.

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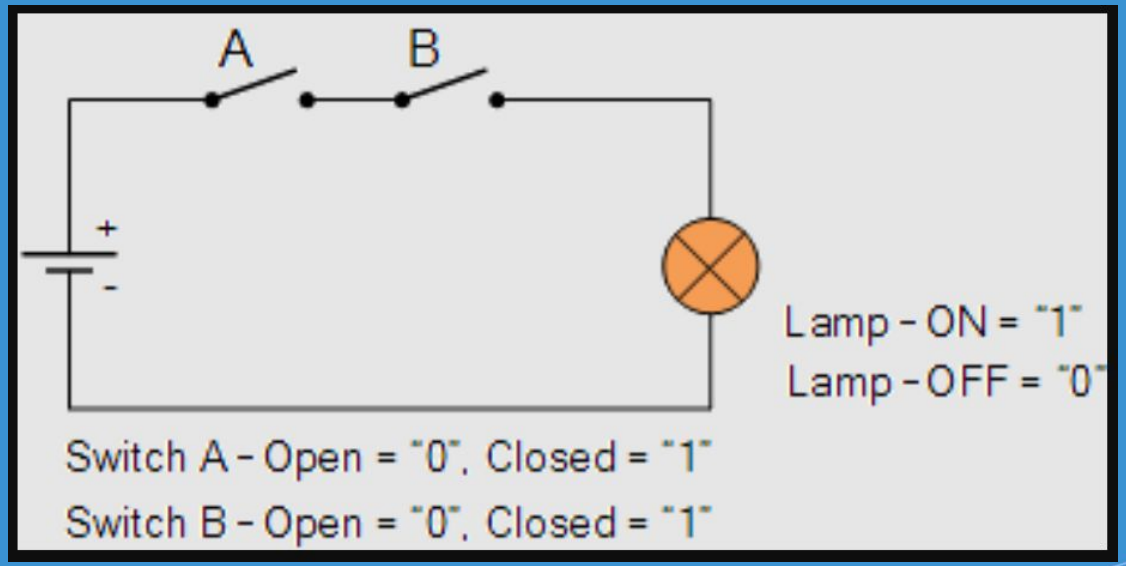
Learning Outcomes

1. Explain the concept of Boolean Algebra, and its importance in Computer Science and Programming.
2. Learn about common the Laws of Boolean Algebra.
3. Implement a simple JavaScript to show how Boolean Algebra can be used to simplify conditions.

Introduction to Boolean Algebra

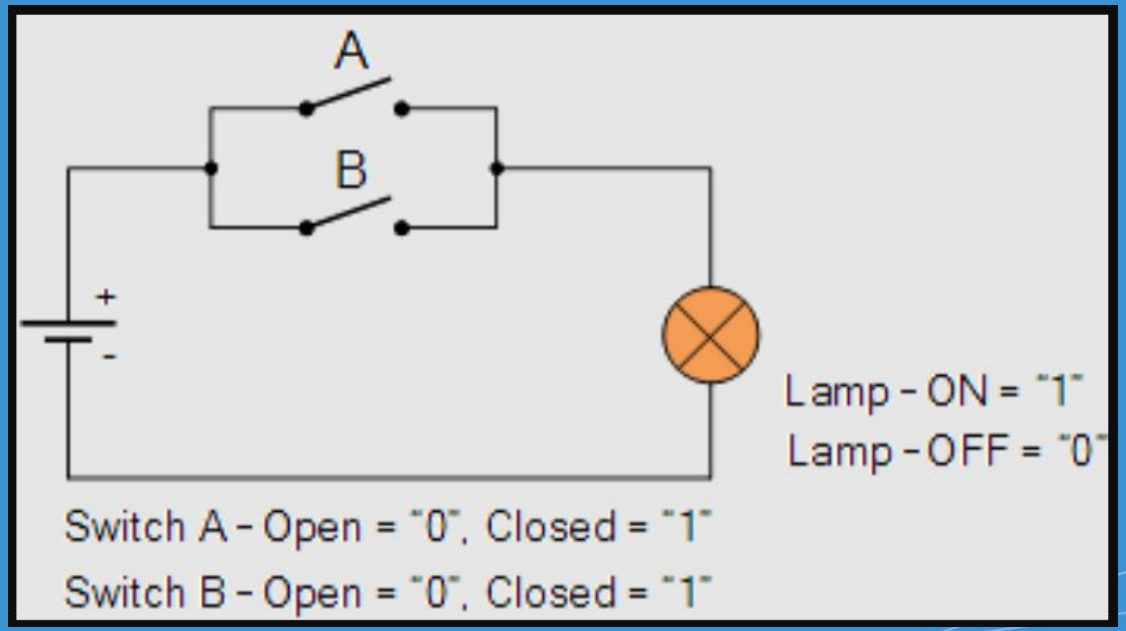
- Boolean algebra is a system of **algebraic operations** that deals with Boolean values, which can be true (1) or false (0).
- Boolean algebra is used in logic gates for digital circuits and in programming for decision-making (if-statements, loops, etc.).

Logical AND



Source: https://www.electronics-tutorials.ws/wp-content/uploads/2018/05/boolean-boo1.gif

Logical OR



Source: https://www.electronics-tutorials.ws/wp-content/uploads/2018/05/boolean-boo2.gif

Laws of Boolean Algebra

Name	AND form	OR form
Identity law	$1A = A$	$0 + A = A$
Null law	$0A = 0$	$1 + A = 1$
Idempotent law	$AA = A$	$A + A = A$
Inverse law	$A\overline{A} = 0$	$A + \overline{A} = 1$
Commutative law	$AB = BA$	$A + B = B + A$
Associative law	$(AB)C = A(BC)$	$(A + B) + C = A + (B + C)$
Distributive law	$A + BC = (A + B)(A + C)$	$A(B + C) = AB + AC$
Absorption law	$A(A + B) = A$	$A + AB = A$
De Morgan's law	$\overline{AB} = \overline{A} + \overline{B}$	$\overline{A + B} = \overline{A}\,\overline{B}$

Source: https://www.electronics-tutorials.ws/wp-content/uploads/2022/09/boolean-algebra-table.jpg

Which of the following is the correct result of the Boolean expression TRUE AND FALSE?

A. TRUE
B. FALSE
C. UNDEFINED
D. ERROR

Given the Boolean expression A AND (B OR C), which of the following simplifies to the same result?

A. (A AND B) OR (A AND C)
B. A OR B AND C
C. A AND B AND C
D. A OR (B AND C)

Questions and Answers

Questions around Boolean Algebra

Thank you!