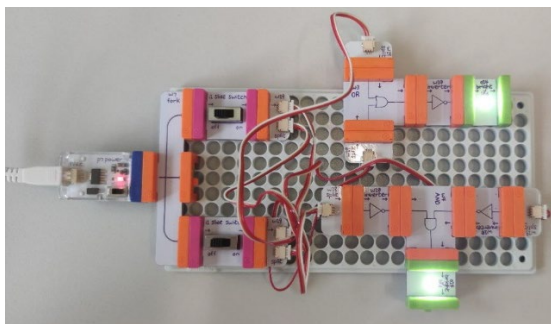


Mathematics Day Camp

Boolean Algebra and its Applications

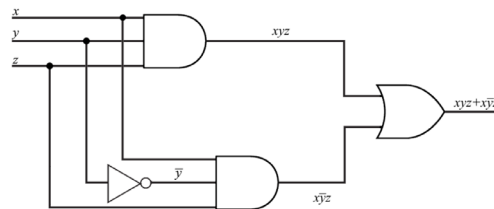
What else can a STEM activity be apart from VR, robots and programming?

The Department of Mathematics at the Chinese University of Hong Kong will organize a day camp, Boolean Algebra and its Applications, for secondary students. The day camp will cover the basics of mathematics such as sets, functions and logic, and give an introduction to Boolean Algebra. Participants will apply mathematics knowledge acquired to circuit design and minimization. They will also construct circuits to solve real-life problems in the hands-on activities provided.



▲ Visualization of De Morgan's Law in logic by circuits

▼ Boolean Algebra and circuit minimization



$$\begin{aligned}
 xy\bar{z} + x\bar{y}z &= (y + \bar{y})(xz) \\
 &= 1 \cdot (xz) \\
 &= xz
 \end{aligned}$$

Details

Duration: 5 hours

Date and Time: To be confirmed upon communication

Target: 24-32 senior secondary students (4 or 8 students from each participating school)

Objective:

1. Understanding the basics of mathematics including sets, functions and logics.
2. Introducing Boolean Algebra and its applications to circuit design.
3. Appreciation of mathematics.

Students are divided into groups of four (one or two groups from each participating school) and finish the group activity. The activities are guided by lecturers and undergraduate students of the Department of Mathematics at CUHK.

Schedule:

Time	Activities
A.M.	
30min	<p>1. Introduction to the Basics of Circuits</p> <ul style="list-style-type: none"> Circuits, logic gates and circuit diagrams <p>Hands-on activities:</p> <ul style="list-style-type: none"> Construction of basic circuits Explore electronic components and logic gates
45min	<p>2. Sets, Functions and Logic</p> <ul style="list-style-type: none"> Set Notations Functions Logic, Truth table and logical equivalence
45min	<p>3. Boolean Algebra and Truth Table</p> <ul style="list-style-type: none"> Complement (not), sum (or) and product (and) Boolean expressions and Boolean functions Verifying Boolean identities by truth tables Visualization of Boolean identities Exercises in simplifying Boolean expressions <p>Hands-on activities:</p> <ul style="list-style-type: none"> Double negation De Morgan's Law Associative Laws
60min	Lunch with student helpers from CUHK
P.M.	
60min	<p>4. Representing Boolean Functions</p> <ul style="list-style-type: none"> Sum-of-products expansions Functional completeness Karnaugh maps Circuit design <p>Hands-on activities:</p> <ul style="list-style-type: none"> Majority voting (for 3) 2-to-1 multiplexer 1-to-2 demultiplexer Half Adder Full Adder
30min	5. Summary (Introduction to Modern Algebra)
30min	6. Tea gathering