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colloquium

Interesting Problems and Results on Polyominoes and Polycubes

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地 點：應用數學系多媒體教室（理 408 室）

摘 要：

Consider the Cartesian plane, which is a two-dimensional Euclidean space with a chosen Cartesian coordinate system of two fixed mutually perpendicular directed lines, commonly referred to as the x-axis and the y-axis. We let the Cartesian plane be divided into *unit squares*, that is, the four corners of a square have coordinates (x, y), $(x+1, y)$, $(x, y+1)$, and $(x+1, y+1)$ for some integers x and y. Then a *polyomino* is defined as a finite, nonempty, and connected set of unit squares.

Similarly, we also consider a three-dimensional Euclidean space with a chosen Cartesian coordinate system of three fixed mutually perpendicular directed lines, commonly referred to as the x-axis, the y-axis, and the z-axis. Without loss of generality, let $\mathbb{R}^3$ denote such a space, and we also let $\mathbb{R}^3$ be divided into *unit cubes*, that is, the eight corners of a cube have the coordinates (x, y, z), $(x+1, y, z)$, $(x, y+1, z)$, $(x+1, y+1, z)$, $(x, y, z+1)$, $(x+1, y, z+1)$, $(x, y+1, z+1)$, $(x+1, y+1, z+1)$ for some integers x, y, and z. Then a *polycube* is defined as a finite, nonempty, and connected set of unit cubes.

In fact, polyominoes and polycubes are sources of combinatorial problems. For example, the most basic one is to enumerate polyominoes of N unit squares or polycubes of N unit cubes for a given positive integer N. Another popular problem to arise in the subject is the following: Given a polyomino or a polycube, can this polyomino tessellate the Cartesian plane or this polycube tessellate $\mathbb{R}^3$? And so far, quite a few results have been obtained in the literature.

In this talk, we will give a more detailed introduction to polyominoes and polycubes.