Al-Mustaqbal University
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جامعة المستقبل
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Lecture: (4)

Geographic Information Systems (GIS)

Subject: Tessellations
Level: Third
Lecturer: MS.C Ali Haider Alazam

Regular tessellations:

A tessellation (or tiling) is a partitioning of space into mutually exclusive cells that together make up the complete study space.

With each cell, some (thematic) value is associated to characterize that part of space.

We will discuss two types of tessellations:

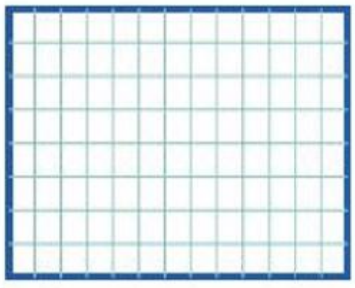
- Regular tessellation
- Irregular tessellation

What is raster tessellation?

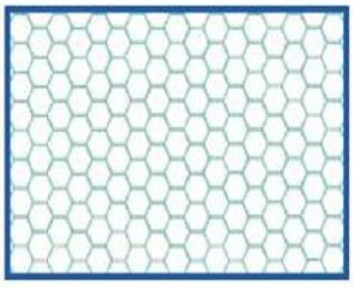
In a regular tessellation, the cells have the same shape and size; a simple example of this is a rectangular raster of unit squares, represented in a computer in the 2D case as an array of n ÃŠ m elements. These tessellations are known under various names in different GIS packages: Rasters or raster map

Regular tessellation :

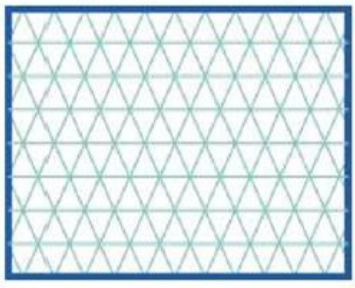
The cells in a regular tessellation are the same shape and size. The simplest example is a rectangular raster of unit squares, represented in a computer in the 2D case as an array of n × m elements



Squares
4.4.4.4



Hexagons
6.6.6



Triangles
3.3.3.3.3.3

Look at a Vertex ...

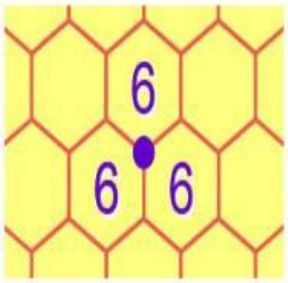
A vertex is just a "corner point".

tessellation vertex

What shapes meet here?

Three hexagons meet at this vertex,
and a hexagon has 6 sides.

So this is called a **"6.6.6"** tessellation.



For a regular tessellation, the pattern is identical at each vertex!

regular tessellation:

In all regular tessellations, the cells have the same shape and size, and the field attribute value assigned to a cell is associated with the entire area occupied by the cell.

The square cell tessellation is by far the most commonly used.

These tessellations are known under various names in different GIS packages, but most frequently as raster.

Sometimes, the word grid is also used, but strictly speaking, a grid refers to values at the intersections of a network of regularly spaced horizontal and perpendicular lines.

The size of the area that a single raster cell represents is called the raster's resolution

What do you mean by raster data model?

Raster data models present information through a grid of cells. Raster grids are usually made of square or rectangular cells. Unlike vector data models, which show geographic data through points, lines, or polygons, raster data is displays one value in each cell.

To improve on this continuity issue, we can do two things:

- Make the cell size smaller, so as to make the continuity gaps' between the cells smaller, and/or.
- Assume that a cell value only represents elevation for one specific location in the cell, and to provide a good interpolation function for all other locations that has the continuity characteristic.

Advantage of regular tessellations is that

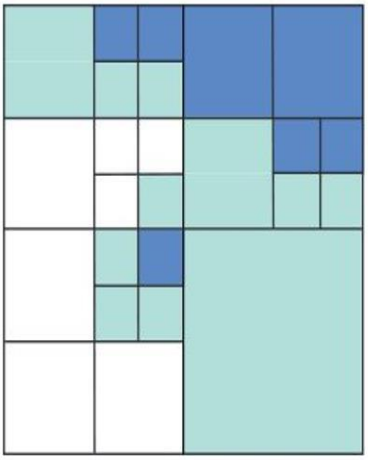
- We know how they partition space.
- We can make our computations specific to this partitioning. This leads to fast algorithms.

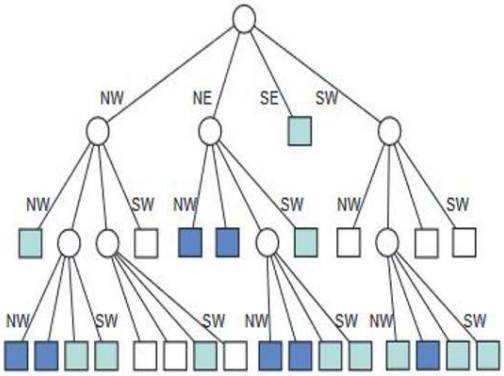
Disadvantage of regular tessellations is that

- They are not adaptive to the spatial phenomenon.
- The cell boundaries are both artificial and fixed.

Irregular tessellations

Irregular tessellations are more complex than the regular ones, but they are also more adaptive, which typically leads to a reduction in the amount of memory used to store the data.



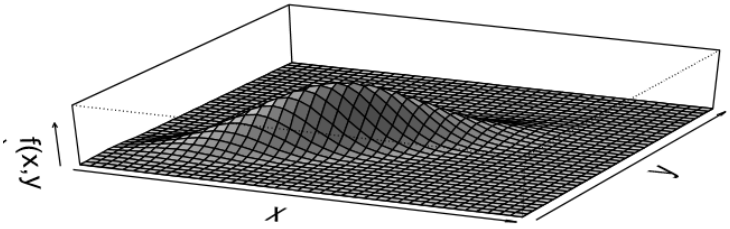


Two fundamental ways of representing geography are discrete objects and fields.

The **discrete object view** represents the real world as objects with well defined boundaries in empty space.

Points Lines Polygons

The **field view** represents the real world as a finite number of variables, each one defined at each possible position.



Continuous surface