GIS and CAD

(Computer Aided Design)
What is the difference between Geographic Information Systems (GIS) and Computer Aided Design (CAD) anyway?

ما هو الفرق بين نظام المعلومات الجغرافية وأنظمة التصميم بمعونة الحاسوب؟
CAD vs. GIS

GIS Description:

GIS is a computer system capable of capturing (when paired with a GPS), storing, analyzing, and displaying geographically referenced information.

The power of a GIS comes from the ability to relate different information in a spatial context and to reach a conclusion about this relationship.

Power of GIS:

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CAD and GIS

GIS and CAD have similar data content but have:

• Different fundamental philosophies
  – CAD sees the world as a cube
  – GIS sees world as a sphere

• Different primary applications
  – Detailed construction design (larger scale)
  – Real world representation and modeling (smaller scale)

• Different data models
  – As we shall see

• Different editing environments
  – Editing is CAD’s speciality
  – But ArcGIS editing is becoming more “CAD-like”
CAD vs. GIS

GIS Examples:
CAD vs. GIS

GIS Examples:

This vector data model represents real-world features as points, lines, and polygons whose boundaries are defined by x,y coordinate pairs.
Commonly encountered CAD file extensions

.dxf - Autocad DXF (digital exchange format) arcddxf
      also a pseudo standard for the exchange of CAD data
      (equivalent to a shapefile)
.dwg - AutoCAD drawing file format
.dgn - Intergraph’s Interactive Graphics Design Software (IGDS) and MicroStation Design format
CAD Description: CAD software is used to create precision drawings or technical illustrations. CAD software can be used to create two-dimensional (2-D) drawings or three-dimensional (3-D) models.

Often partnered with a CAM (Computer Aided Machine) or Mill for precision fabrication.
Data Layer Examples:

GIS vs. CAD
How CAD Differs?

• Lacks database environment
• Lacks spatial analysis
• Lacks topological information
  – connectivity, congruency and contiguity (adjacency)
• Lacks layering within point, line and polygon classes
  – All line features (e.g. roads and streams) are in same layer
• Features are not “segmented”
• “Cartographic” information is often present in layers, undifferentiated from true geographic features
  – Symbology, legends, etc..
• Limited support for real world positioning (map projections, etc.)
what’s the difference between the two?

• GIS is a **database program**, and
• CAD is a **graphics program**.
• With GIS, the lines are just presentation of the data behind it.
• With CAD, it's the lines that are important, i.e. the drawing is the information.
what’s the difference between the two?

- In CAD, real-world entities are represented symbolically as points, lines and polygons.

- CAD data model is different from GIS data models:
  - CAD models uses local drawing coordinates rather than real-world coordinates.
  - Individual objects in CAD do not have unique identifiers and attributes.
  - CAD data model does not store details of relationships (e.g., topology) between objects.
الخلاصة:

رسومات نظم المعلومات الجغرافية ذات دلالات أقوى من أنظمة التصميم بمعونة الحاسوب. وتتجلى هذه الدلالات في:

1) المعلومات الوصفية أغنى بالمعلومات

2) العلاقة الطبولوجية بين الكائنات المكانية أكثر

3) البيانات أكثر شمولية
CAD vs. GIS

يتم تشغيل نظام المعلومات الجغرافية واستخدامه معرفة البيانات المكانية والبيانات الوصفية التي تؤلف قوام هذا النظام. تتضمن البيانات المكانية (Spatial Data) المعلومات عن موقع وشكل المعالم الجغرافية وتخزين عادة في أحداثيات بينما تتضمن البيانات الوصفية وهي السمات أو الأوصاف (attributes) الخصائص المرتبطة بتلك المعالم، وتخزين في جداول منفصلة عادة. وهكذا تتميز نظام المعلومات الجغرافية بقدرتها على ربط البيانات المكانية بالبيانات الوصفية وإجراء عمليات التحليل المكاني.

رابط العناصر المكانية بقواعد البيانات بشكل محدود ولا يوجد تفاعل بين المخطط وقواعد البيانات في حال تحقق الربط.

GIS

CAD vs.

CAD
How does it apply to Architecture?

GIS has many potential uses in architectural research and practice, especially in the areas of urban design, community planning, and the site selection process.

GIS can also be used in conjunction with other visualization tools, such as AutoCAD, Google Earth, Adobe Illustrator, and Google Sketch up, to create dynamic and complex models. The benefit of GIS lies in its analytical capabilities, wherein multiple phenomena can be linked by location and viewed through a spatial analysis. Information on an area's geology, soil type, infrastructure, and demographic information, for example, can all be taken into consideration when planning a structure or selecting a site.
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