Characteristics of data in geographical information system (GIS)

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Prerequisite – Constraints in geographical information system (GIS)
There are particular characteristics of geographic data that makes the modeling more complex than in conventional applications. The geographic context, topological relations and other spatial relationship are fundamentally important in order to define spatial integrity rules. Several aspects of the geographic objects need to be considered. We summarise them as follows:

1. Location –

- (a) The spatial location of features are defined by coordinates in a specific reference system.
- (b) Those features are represented by points, lines or polygons.
- (c) The geometry of the features refers to the three dimensional representation in space.

2. Temporality –

- (a) The database model should consider both existence and change over time of this features.
- (b) This is crucial with dynamic data such as land parcels, since we need to represent current, valid data.

3. Complex spatial –

- (a) Features comprise several spatial representations that include point, lines, polygons and rasters.
- (b) The complex representation allows one to associate, for example, a three dimensional object with different polygon of its facets.

4. Thematic Values –
The different properties and qualities of an object may be represented as attributes.

5. Fuzzy objects –

- (a) Fuzziness deals with the uncertainty of an objects's location and thematic classification.
- (b) The location of the object is represented by coordinates and is associated with

a degree of error.
- (c) The thematic aspect is represented by relating an object to a class with a degree or percentage of certainity.
- (d) One can never guarantee that these databases are 100% accurate in terms of topological features.

6. Entity versus field based data –

- (a) The world can be represented as a set of discrete entities such as forests, rivers, roads and buildings.This is refereed to as the *Entity based approach*
- (b) *The field-based approach* represents the world as a continuous function with attributes that vary in space. Natural phenomena such as air pollution distribution and terrain may be the best represented using this approach.

7. Generalization –
Generalization relates to the level of scale and details associated with the object. Objects may be aggregated from larger to lower scale, while the opposite process is very limited. For example, if the countries layer can be aggregated into a states layer but opposite cannot be accomplished without external data.

8. Roles –
An objects within a data model may assume different roles according to the universe of discourse. Hence the role is application dependent.

9. Object ID –
Objects should be uniquely identified within the data model. Moreover for data exchange purpose between organization universal objects id may be necessary.

10. Data Quality –

- (a) Data quality refers to the credibility and accuracy of the data or more generally how good the data is.
- (b) Quantitative quality relates to measurable components such as spatial accuracy.
- (c) The qualitative quality consists of those non-measured components, which usually relates to the entire data set and not to specific objects.