Conceptual modelling of real estates for the purposes of mass appraisal

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Mass appraisal in Poland
- legislative works are taking place on elaboration of detailed regulations concerning mass appraisal
- necessity of valuation of several million properties
- comparative approach
- need for the information about real estates similar to appraised

Characteristic attributes that influence the cadastral value (1)
- location
- intended purpose specified in the local spatial development plan or, in the case of lack of this plan, the manner of using
- level of outfitting with technical infrastructure equipment
- state of development
- the soil-based land classification, if specified in the land and buildings cadastre

Characteristic attributes that influence the cadastral value (2)
- area
- location (the zone)
- geometrical conditions (the shape, the form of the ground)
- surroundings (neighbourhood)
- communication accessibility
- popularity of given location

Main information sources
- land and buildings cadastre
- land and mortgage registers
- local spatial development plans
- basic maps
- spatial registration of utility infrastructure
- registers of building permits
- builder’s records
- resources of the Central Statistical Office

The problem – data availability
- data sources – distracted and managed by different institutions
  - land and buildings cadastre – districts
  - local spatial development plans – communes
  - topographical database – provinces
- data ≠ attributes
  - real estate spatial attributes
  - relationships to other objects
The solution – geodatabase
- all attributes of objects (including position and shape) are recorded in a table of relational or object-relational database
- allows the application of relational databases design methods also for geographic information

Three stages of database design
- construction of conceptual data model (acquisition of information about objects, relationships and attributes)
- creation of logical model of a database (transformation of a conceptual data model into logical database structure)
- physical implementation of a logical data model

Conceptual modelling
- definition of objects of interest (e.g. streets, parcels, buildings, owners)
- identification of relationships among objects (e.g. "located on", "owned by", "is a part of")
- may exist only in the minds of people and be communicated verbally and often imprecisely
- may also be written down using conceptual schema language and stored for wider dissemination

From real world to conceptual schema

Unified Modelling Language (UML)
- language for specifying, visualizing, constructing, and documenting the elements of software systems, as well as for business modelling and other non-software systems
- set of readable symbols and signatures, which can be understood even by persons with the minimum knowledge of computer science
- approved as the standard language for object-oriented methods

Basic definitions
- Object – concrete entity which can be univocally identified and compared to the real or material entity.
- Class – the group of objects which have identical set of attributes, operations and methods.
- Inheritance, generalization – the relationship between object classes describing the transfer of characteristics (attribute definitions, methods) from the superclass to its subclasses.
- Association – the kind of relationship between classes projecting the existing relationship between appropriate entities in analyzed objective domain.
- Aggregation – the relationship between object classes modelling proportion of the whole to its part.
Sets of objects

- subjects of valuation
  - parcels, buildings, dwellings
  - having the influence on the cadastral value of real estates
  - spatial development plan
  - soil-based land classification
  - land use
  - shape of the terrain (form of surface)
  - utility networks
  - road network
  - nearby objects, both increasing and decreasing real estate value

From conceptual model to geodatabase

Conclusion

the database creation process is (technologically) straightforward ...

but ...

... first stage – conceptual modelling – has to be carried out correctly, with regard to all objects, their attributes and relationships important for the given problem ...

... and it strongly depends on knowledge and experience of the designer