GDMS: An abstraction layer to enhance Spatial Data Infrastructures usability

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2. implementation details,
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Context

Urban remote sensing

Urban microclimatology

Urban data
  ➤ Spatial Data Infrastructure
  → OrbisGIS

Urban sound environment

Sustainable Urban Project

Pluri-disciplinary workshop sector
The IRSTV's SDI

Knowledge repository

Data repository

Unified platform

SDI
Motivations

- deals with several formats (some of them are mandatory due to existing simulation softwares),
- respect users practices constraints,
- provides pre-processed data for the SDI,

⇒ *GDMS*: Generic Data source Management System
State of the art: relative works

- the need for spatial query formalism has been clearly identified by and answered in
  - Spatial SQL (Max J. Egenhofer),
  - geoPOM (Nittel and al.),
  - GeoSQL (Wang and al.)…

- there are also efficient implementations that spatially enabled RDBMS (PostgreSQL/PostGIS, Oracle Spatial…).
GDMS

- independence of data source type,
- match SQL and OGC standards,
- provide a mixed semantic (vectorial/raster),
- great extensibility and customization ability,
- pre-processor phase,
- optimization phase,
  - spatial & alphanumeric indexes.
Data model
GDMS internal architecture

- a layered architecture that stacks:
  - a driver layer,
  - an adapter layer,
  - an application layer...

- That can be extended
  - I/O,
  - functionalities.
GDMS in action...

- simple spatial semantic use cases,
- the need of a Semantic repository,
- UrbSAT plugin.
Simple semantic use case (1)

```
select Buffer(the_geom, 6) from roads;
```

before...

... and after
Simple semantic use case (2)

```
select b.* from buildings b, isle_of_nantes i
where Contains(i.the_geom, b.the_geom);
```

before...

... and after
The semantic repository (1)
The semantic repository (2)

The tabular data source

- Click & drag

```sql
select Buffer(the_geom, 30, 'round') from multilinestring2d;
select Buffer(the_geom, 20, 'square') from multilinestring2d;
select Buffer(the_geom, 10, 'butt') from multilinestring2d;
```

Compute a buffer around a geometry. Usage: `Buffer(the_geom, bufferSize[, 'butt'/'square'/'round'])`
GDMS in action: *UrbSAT* plugin (1)
From oriented rectangular grid to radio-concentric one...

Automated tool to extract urban tissue's main directions
GDMS in action: UrbSAT plugin (2)

```sql
select register('buildings_explode');
create table buildings_explode as select Explode() from buildings;
select register('ground');
create table ground as select GetZDEM('NantesDEM', the_geom) from buildings_explode;
select register('d:/tmp/IsleOfNantesIn3D.cir', 'r3d');
create table r3d as select Extrude(id, height, the_geom) from ground;
```
Conclusion – enhancements (1)

1. query builder,
2. spatial SQL on server side: *OrbisGIS* server;
Conclusion – enhancements (2)

3. mixed semantic: process raster & vectorial data with the same spatial SQL engine;

```sql
-- slopes directions computation and registration
select register('directions');
create table directions as select D8Directions(raster) from sample;
-- slopes accumulations computation
select register('accumulations');
create table accumulations as select D8Accumulations(raster) from directions;
-- Strahler Stream Order computation
select D8StrahlerStreamOrder(50,d,raster,a,raster) from directions d, accumulations a;
```
Why not try it by yourself?

- GDMS is included in the OrbisGIS project. A beta version (1.0b4) of it is available for public download at:
  
  http://sourcesup.cru.fr/projects/orbisgis/

- If you need some more information, just have a look at:
  
  http://orbisgis.cerma.archi.fr/