UCL

Lecture 7

3D Queries and Advanced Topics 1 - 3D GIS

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Assignment Progress

- By now you should have:
  - Created your system specification
  - Created your conceptual and logical diagrams and written the documentation
  - Written the DDL, DML and the non-spatial queries
  - Added any 2D spatial information and queries
  - Created your 3D geometry
  - Made good progress on your 500 word assignment
- Last piece of information this week – 3D queries

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Overview

Assignment Project Exam Help

- 3D Queries
  - **Metric**
  - Topological
  - Returning a Geometry
- Advanced Topics 1 - 3D GIS
  - What is driving 3D
  - Some 3D research
  - GeoBIM – integrating 3D GIS and BIM

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3D Analysis

- PostGIS functions that support 3D
  - http://postgis.net/docs/manual-dev/PostGIS_Special_Functions_Index.html#PostGIS_3D_Functions

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Add a Polyhedral Surface as a Roof

```
drop table if exists assets.roof;
create  table assets.roof
(id serial,
name character varying(50));
alter table assets.roof add constraint roof_pk
primary key (id);

-- add the geometry column - NB dimension = 3
select AddGeometryColumn('assets','roof','location',0,
'geometry',3);
```


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Add a Polyhedral Surface as a Roof

```
-- insert some roof data as a polyhedral surface (not closed,
also can't use extrusion as a roof is not a box)
insert into assets.roof(name, location)
values
('Chadwick',st_geomfromtext('POLYHEDRALSURFACE
(((3 22 12, 3 2 12, 9 8 20, 9 16 20, 3 22 12)),
((16 22 12, 9 16 20, 9 8 20, 16 2 12, 16 22 12)),
((3 22 12, 9 16 20, 16 22 12, 3 22 12)),
((3 2 12, 16 2 12, 9 8 20, 3 2 12)))',0));
```

2D and 3D Area

select '2D',st_area(location), name from assets.roof
union all
select '3D',st_3darea(location), name from assets.roof;

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2D and 3D perimeter

select '2D',st_perimeter(location), name from assets.roof
union all
select '3D',st_3dperimeter(location), name from assets.roof;

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Objects within a given 3D distance

- Is geometry A within a certain distance of geometry B (0 means it touches)
  - ST_3DDWithin = "For 3d (z) geometry type Returns true if two geometries 3d distance is within number of units"

select st_3DDwithin(a.location, b.location,0),
a.building_name,b.building_name
from assets.buildings a, assets. buildings b;

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Creating 3D Data in SQL

- Find the distance between the sensors – compare 2D and 3D

select st_3DMaxDistance(a.location, b.location) as distance3d,
st_distance(a.location, b.location) as distance2d,
a.sensor_name, b.sensor_name
from assets.temperature_sensor a,
assets.temperature_sensor b;

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2D and 3D Distance – Vertical Distance

- Distance of the sensors to the UCL polygon

select st_distance(a.location,b.location) as Distance2D,
st_3ddistance(a.location,b.location) as Distance3D
from assets.university a, assets.temperature_sensor b;

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3D and 3DMax Distance

- Distance of the sensors to the Pearson Building

select st_3ddistance(a.location,b.location) as Distance3D,
st_3dmaxdistance(a.location,b.location) as Distance3DMax
from assets.buildings a, assets.temperature_sensor b where a.building_name = 'Pearson';

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3D Volume

- Volume of each building

select st_volume(location), building_name from assets.buildings;

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3DDWithin

- Identify geometry within a specific distance e.g. rooms within each building

select b.room_id,a.building_name, b.room_number,st_3ddwithin(a.location, b.location,0) as within3D
from assets.buildings a, assets.rooms b

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ST_ZMax

- What is the maximum height of the roof

select st_zmax(location)
from assets.roof where name = 'Chadwick';

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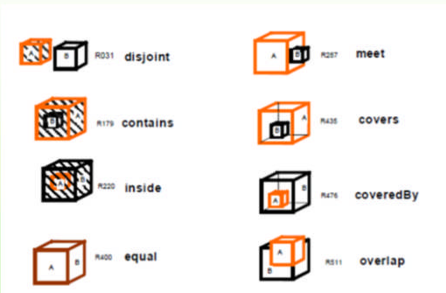
3D Analysis - Topological Queries



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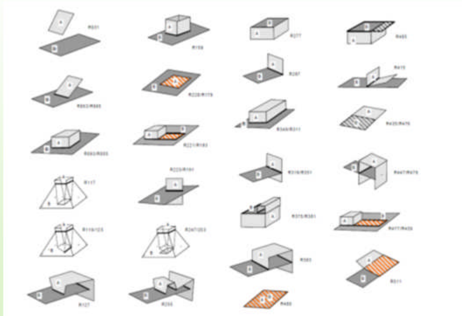
3D Analysis - Topological Queries



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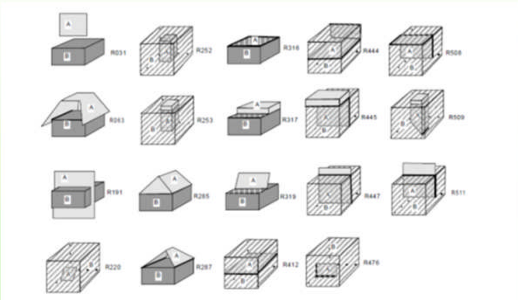
3D Analysis - Topological Queries

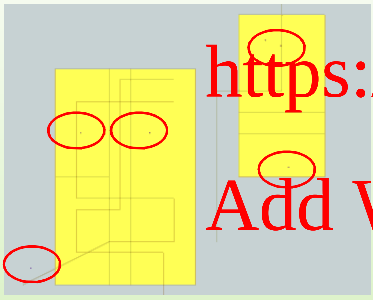


3D Analysis - Topological Queries

ST_3DIntersects
- Returns TRUE if the Geometries "spatially intersect" in 3d - only for points and linestrings

ST_3DIntersection
- Perform 3D intersection and return the geometry (any geometry type)

3D Intersection - Temperature Sensors and Buildings



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2D Intersection

- Temperature sensors in a building

select a.building_name, b.sensor_name,st_intersects(a.location, b.location) as intersects2D, st_intersects(a.location,b.location) as intersects3D

from assets.buildings a, assets.temperature_sensor b

Error: Unknown geometry type: 13 - PolyhedralSurface

3D Intersection

select a.building_name, b.sensor_name, st_3dintersects(a.location,b.location) as intersects3D

from assets.buildings a, assets.temperature_sensor b

- Doesn't work, as our 3D building is a polyhedral surface – and the sensors don't touch the walls
  - In spatial data, a "surface" is just the walls, and doesn't enclose the space in between

3D Intersection

- We could turn the polyhedral surface into a solid that would then contain the sensors so INTERSECTION would be true

select a.building_name, b.sensor_name, st_3dintersects(st_makesolid(a.location),b.location) as intersects3D

from assets.buildings a, assets.temperature_sensor b

3D Intersection

- However …
- You get the same results as ST_3DIntersects just breaks the solid back down into the individual surfaces

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3D Intersection

- Add a sensor that touches the walls

```
insert into assets. Temperature_sensor
(sensor_name, sensor_make,sensor_installation_date,room_id, location)
values
('Sensor 8','Siemens','12-12-2018',(select room_id from assets.rooms
where room_use = 'classroom' and room_number='1.02'
and building_id = (select building_id from assets.buildings where
building_name = 'Chadwick')),
st_geomfromtext('POINT(6 22 2.5)'));
```

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3D Intersection

- Run the query again with the polyhedral surface

```
select a.building_name, b.sensor_name,
st_3dintersects(a.location,b.location) as intersects3D
from assets.buildings b, assets.temperature_sensor a
```

- This time you get a match as the point does in fact intersect the surface

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3D Intersection – a Workaround

- Use ST_3DDistance to measure the distance to the solid – if it is 0 then the point is on or inside the solid

```
select a.building_name, b.sensor_name
from assets.buildings a, assets.temperature_sensor b
where st_distance(st_makesolid(a.location),b.location) = 0
```

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3D Union

- Get the Chadwick Building, including the roof

```
select st_astext(st_3dunion(a.location,b.location))
from assets.buildings a, assets.roof b
where a.building_name = 'Chadwick' and b.name =
'Chadwick';
```

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3D Union - Chadwick Building + Roof

- GEOMETRYCOLLECTION Z (TIN Z (((9 16 20,3 2 12,9 8 20,9 16 20)),((9 16 20,3 22 12,3 2 12,9 16 20)),((3 22 12,9 16 20,16 22 12,3 22 12)),((3 2 12,16 2 12,9 8 20,3 2 12)),((16 2 12,9 16 20,9 8 20,16 2 12)),((16 2 12,16 22 12,9 16 20,16 2 12))),POLYHEDRALSURFACE Z (((3 2 0,3 22 0,16 22 0,3 2 0)),((16 2 0,3 2 0,16 22 0,16 2 0)),((3 22 12,16 2 12,16 22 12,3 22 12)),((3 22 12,3 2 12,16 2 12,3 22 12)),((3 2 0,3 2 12,3 22 12,3 2 0)),((3 22 0,3 2 0,3 22 12,3 22 0)),((3 22 0,3 22 12,16 22 12,3 22 0)),((16 22 0,3 22 0,16 22 12,16 22 0)),((16 22 0,16 22 12,16 2 12,16 22 0)),((16 2 0,16 22 0,16 2 12,16 2 0)),((16 2 0,16 2 12,3 2 12,16 2 0)),((3 2 0,16 2 0,3 2 12,3 2 0))))
- Note 12 faces for the building – the surface has been triangulated

3D Intersection

- Find the geometry that is shared between the main Chadwick building and the roof

select st_astext(st_3dintersection(a.location,b.location))
from assets.buildings a, assets.roof b
where a.building_name = 'Chadwick' and b.name = 'Chadwick';

A box made of two lines: MULTILINESTRING Z ((16 2 12,3 2 12,3 22 12),(16 2 12,16 22 12,3 22 12))

3D Intersection

- Convert the lines into a box which will give the upper ceiling of the Chadwick building.

select st_astext(st_extent(st_3dintersection(a.location,b.location)))
from assets.buildings a, assets.roof b
where a.building_name = 'Chadwick' and b.name = 'Chadwick';

-- POLYGON((3 2,3 22,16 22,16 2,3 2))

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3D Difference

- Compare Chadwick and Pearson

select st_astext(st_3ddifference(a.location,b.location))
From (select location from assets.buildings where building_name ='Chadwick') a,
(select location from assets.buildings where building_name ='Pearson') b

3D Centroid

- Not available in 3D
- Can 'collapse' the geometry to 2D
- For a polyhedral surface, first break into parts using st_forcecollection

select st_astext(st_centroid(st_force2d(st_forcecollection(location)))), building_name from assets.buildings

3D Buffer

- Find the Volume of Insulation if we want to insulate Chadwick with 0.25cm of outside insulation
- Buffer not available in 3D or for polyhedral surfaces
- You could –
  - force your data into a GEOMETRY COLLECTION – i.e. split all the walls apart,
  - Force the collection into 2D
  - Buffer, then extrude back to 3D

3D Buffer

- Create a temporary table so that we can visualise the results:

```
create table assets.tempblds
(id serial,
name character varying(50));

alter table assets. tempblds add constraint tempblds_pk
primary key (id);

-- add the geometry column - NB dimension = 3
select AddGeometryColumn('assets','tempblds','location',0, 'geometry',3);
```


Assignment Hint

- Creating a temporary table to test out some SQL and visualise the results is very useful
- But …
  - Don't include it in your assignment as it won't correspond to the entities listed on your logical ER diagram!

3D Buffer

- Step 1 - we have to st_force3D the geometry to insert it as the column is a 3D column – as this is a 2D geometry, it will just add height of 0

```
insert into assets.tempblds  (name,location)
values('Chadwick2D',
          (select
st_force3d(st_buffer(st_force2d(st_forcecollection(
                    b.location)),0.25)) from assets.buildings b
                    where b.building_name = 'Chadwick'));
```


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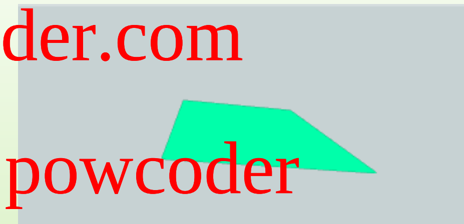
3D Buffer

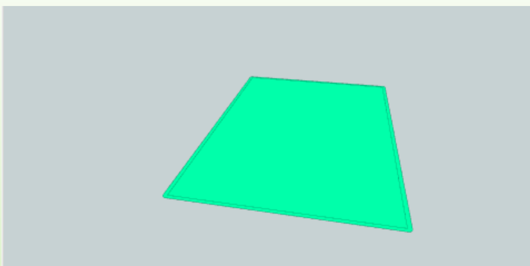


3D Buffer

Step 2 - now we can cookie cut (using st_difference) to just get the outer buffer, and then extrude back to the height of the building

```
insert into assets.tempblds  (name,location)
values('Chadwick2Dring',
          st_force3d(st_difference(
(select st_force2d(c.location) from assets.tempblds c where c.name =
'Chadwick2D'), (select st_force2d(st_forcecollection(
                    b.location)) from assets.buildings b where building_name =
'Chadwick') )));
```


3D Buffer



3D Buffer

Step 3 – now calculate the area of the ring and multiply it by the height of the Chadwick building to get a volume

```
select st_zmax(location) * (select st_area(b.location)
from assets.tempblds b where name = 'Chadwick2Dring')
from assets.buildings
where building_name = 'Chadwick';
```


3D Buffer

- Note: it is also possible to extrude the buffer back to the height of the building and then calculate the volume- this gets the right answer but the extrude function does not keep the 'hole' in the middle

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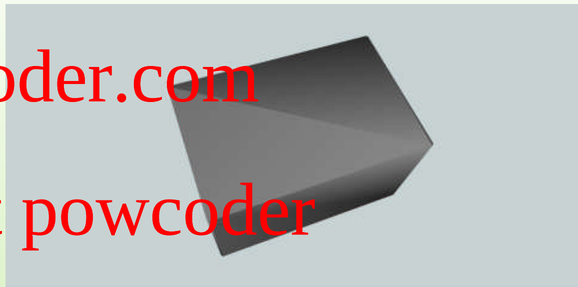
3D Buffer – Alternative using ST_Extrude

- Alternative approach – use st_extrude

```
insert into assets.tempblds(name, location) values
('Chadwick3DRing',
(select st_extrude(st_force2d(a.location), 0,0,(select st_zmax(b.location)
from assets.buildings b where
b.building_name = 'Chadwick'))
from assets.tempblds a where a.name = 'Chadwick2Dring'));
```


3D Buffer – st_extrude loses the hole



3D Buffer – alternative using ST_Extrude

- Calculate volume and compare with the previous value

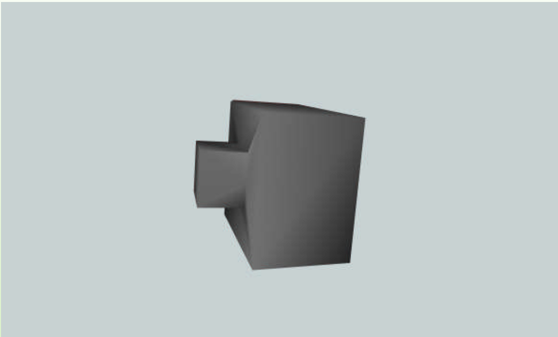
```
select st_volume(location), name
from assets.tempblds
where name = 'Chadwick3DRing'
union all
select st_zmax(location) * (select st_area(b.location)
from assets.tempblds b where name = 'Chadwick2Dring'), '2D buffer * height'
from assets.buildings
where building_name = 'Chadwick';
```


The Flying Freehold

- Building with the freehold area that belongs to it added

```
insert into practical4.freehold(name, geom) values
('building2 minus freehold',
(select st_3dunion(a.geom,b.geom)
from practical4.freehold a, practical4.freehold b
where a.name = 'building2' and b.name='freehold'))
```

The Flying Freehold



The Flying Freehold

- Building minus the freehold area that belongs to next door

insert into practical4.freehold(name, geom) values
('building2 minus freehold',
(select st_3ddifference(a.geom,b.geom)
from practical4.freehold a, practical4.freehold b
where a.name = 'building2' and b.name='freehold'))

The Flying Freehold

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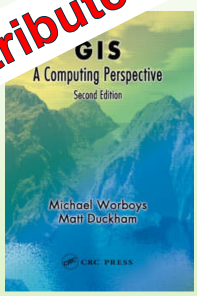
What is (3D) GIS?

- Worboys and Duckham (2004) define a GIS as a "computer-based in… system that e… …ure, **modelli… …ing, ret… …ing, …ation, analysis, and p…entation** of geographically referenced data".

Geometry + Attributes



3D has been around for a while ..

1989 2004 2006 2014

3D GIS

- What is driving it forwards?
  - Applications
  - Government policies
  - Hype curves/future technological trends

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Why do we need 3D GIS?

- Current Applications of 3D GIS
  - City Modelling – walk-throughs or fly-throughs
    - What will a new building look like in position with surrounding buildings?
    - Will a view or light be blocked?
    - Augmented reality
  - Flood modelling
  - Satellite signal modelling
  - Modelling changes in the urban landscape over time
    - Densification studies (Koomen et al 2004)
  - Also integration with 2D datasets
    - Virtual London Land Use (2007)

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3D GIS – line of sight

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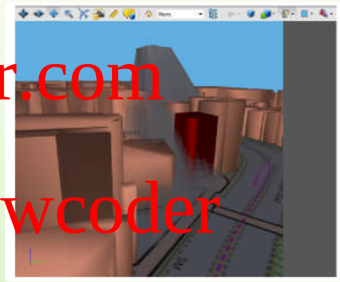
3D GIS - shadows



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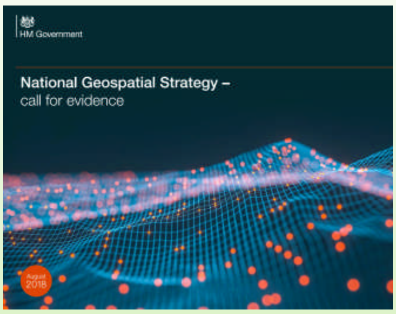
Government Policy Priorities



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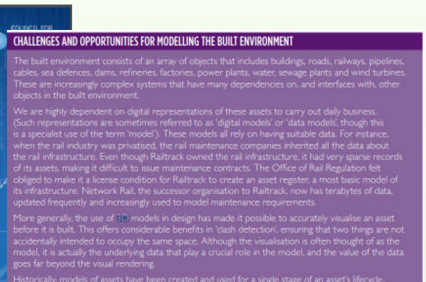
Government Policy Priorities


CHALLENGES AND OPPORTUNITIES FOR MODELLING THE BUILT ENVIRONMENT

The built environment consists of an array of objects that includes buildings, roads, railways, pipelines, cables, sea defences, dams, refineries, factories, power plants, water, sewage plants and wind turbines. These are increasingly complex systems that have many dependencies on, and interfaces with, other objects in the built environment.

We are highly dependent on digital representations of these assets to carry out daily business. (Such representations are sometimes referred to as 'digital models' or 'data models', though this is a specialist use of the term 'model'). These models all rely on having suitable data. For instance, when the rail industry was privatised, the rail maintenance companies inherited all the data about the rail infrastructure. Even though Railtrack owned the rail infrastructure, it had very sparse records of its assets, making it difficult to issue maintenance contracts. The Office of Rail Regulation felt obliged to make it a license condition for Railtrack to create an asset register, a most basic model of its infrastructure. Network Rail, the successor organisation to Railtrack, now has terabytes of data, updated frequently and increasingly used to model maintenance requirements.

More generally, the use of 3D models in design has made it possible to accurately visualise an asset before it is built. This offers considerable benefits in 'clash detection', ensuring that two things are not accidentally intended to occupy the same space. Although the visualisation is often thought of as the model, it is actually the underlying data that play a crucial role in the model, and the value of the data goes far beyond the visual rendering.

Historically, models of assets have been created and used for a single stage of an asset's lifecycle.

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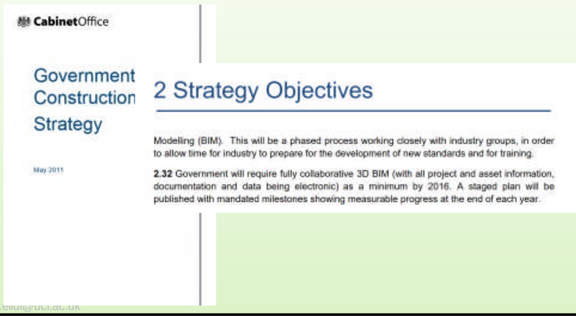
Government Policy Priorities


Cabinet Office

Government Construction Strategy

May 2011

2 Strategy Objectives

Modelling (BIM). This will be a phased process working closely with industry groups, in order to allow time for industry to prepare for the development of new standards and for training.

2.32 Government will require fully collaborative 3D BIM (with all project and asset information, documentation and data being electronic) as a minimum by 2016. A staged plan will be published with mandated milestones showing measurable progress at the end of each year.

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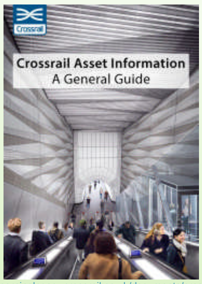
Government Policy Priorities



https://learninglegacy.crossrail.co.uk/documents/crossrail-asset-information-guide/
http://www.stobartrail.com/item/health-safety-environment

Hype Curves

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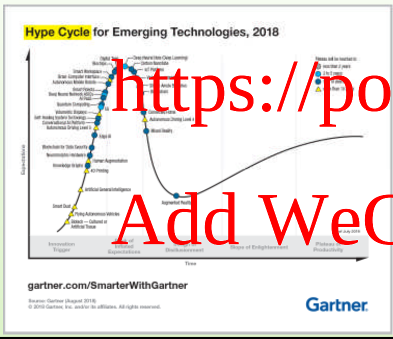
- https://www.gartner.com/smarterwithgartner/5-trends-emerge-in-gartner-hype-cycle-for-emerging-technologies-2018/



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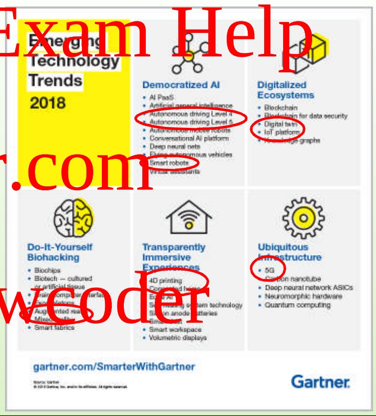

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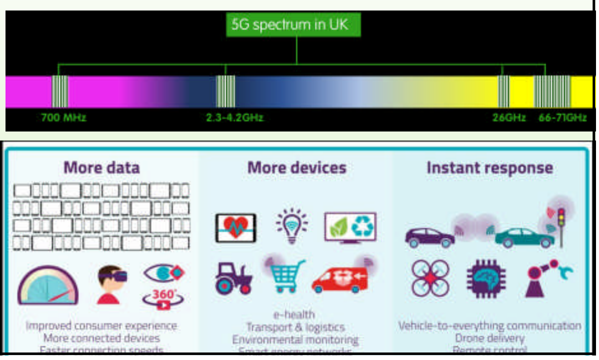
https://futurecities.catapult.org.uk/2018/10/16/learning-from-city-wide-5g-demonstrators/

5G



Autonomous Vehicles

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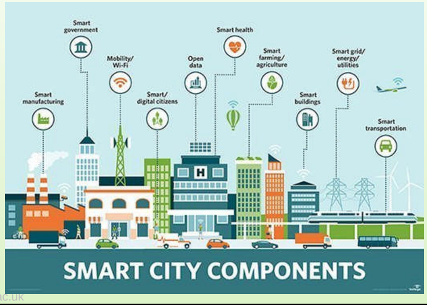
Smart Cities and the Internet of Things



https://cdn.ttgtmedia.com/rms/onlineImages/iota-smart_city_components_mobile.jpg

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Digital Twins

- https://www.youtube.com/watch?v=F_yHjILEELQ
- (video from the Netherlands)

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Other Potential Applications

- Multi-layer building models, and their corresponding usage and ownership at different layers (Grinstein 2003)
- 3D Cadastral Systems (Stoter and Salzmann 2003)
  - Finding neighbours
  - Identifying which buildings are located on top of or under another one (e.g. for noise transmission)
- Noise studies of cities in 3D by locating observer points in 3D space (Stoter et al. 2008)
- Integrated above ground and below ground information model of a city

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Other Potential Applications

- Utility infrastructure
  - 'call-before-you-dig' and infrastructure design and maintenance
- Compare the existing buildings with regulations
- Modelling changes in multi-level land use
- Locating all available office space on the 3rd, 4th and 5th floors of buildings
- Modeling usage and mixed use
  - problem with uptake of commercial space under/around residential buildings
- In-building navigation
- Emergency Planning in Buildings
  - Routing through 3D models of buildings for rapid determination of emergency exit paths (Kwan and Lee 2005, Takino 2000)

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Other Potential Applications

- Others
  - Robot guidance in mining (Silver *et al.* 2006)
  - Archaeology – which artefacts found within / on top of a particular layer of stratigraphy?
  - Routing for 3D pipeline integrity using a 'pig' (pipeline inspection gauge)
  - As-built modelling
    - do pipelines connect, are they correctly embedded in the required walls

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Overview

- 3D Queries
  - Metric
  - Topological
  - Returning a Geometry
- Advanced Topics 1 - 3D
  - What is driving 3D
  - **Some 3D research**
  - GeoBIM – integrating 3D GIS and BIM

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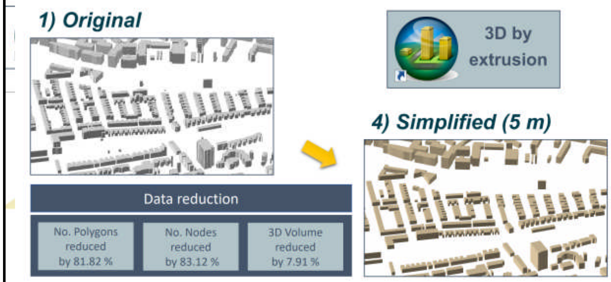
Research: What Should a National 3D Dataset Look Like?

Research: 3D Generalisation



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Research: 3D Interpolation and Visualisation

https://powcoder.com

Research: Schema Modelling and Matching

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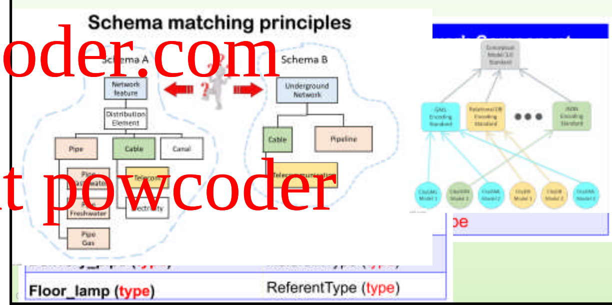
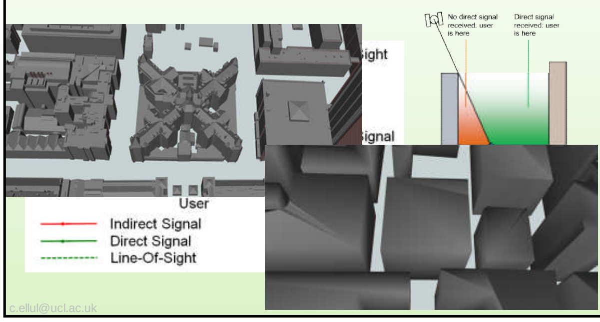
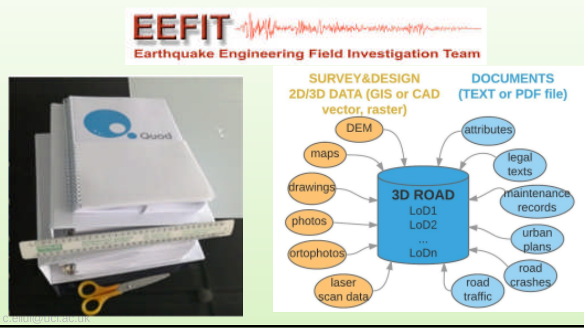


Research: Using 3D City Models to Improve GNSS



Research: 3D as a Data Index



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What is BIM?

NBS

- A digital-based building design process that uses a single comprehensive system of computer models rather than separate sets of drawings.
- The models are more than just 3D CAD, they are rich in added information.
- At the core of BIM success is collaboration
- The aim of BIM is to improve the performance of infrastructure, reduce waste, increase resource efficiency, reduce risk, increase resilience and increase integration (Kemp 2011).

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What is BIM?

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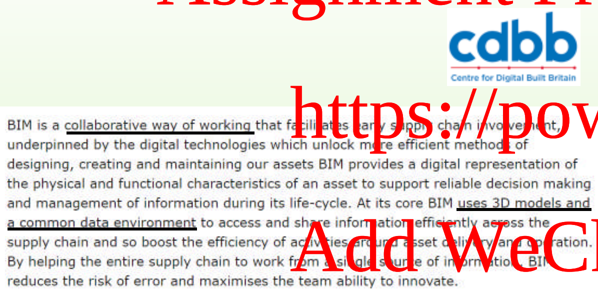
cdbb
Centre for Digital Built Britain

BIM is a collaborative way of working that facilitates early supply chain involvement, underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining our assets BIM provides a digital representation of the physical and functional characteristics of an asset to support reliable decision making and management of information during its life-cycle. At its core BIM uses 3D models and a common data environment to access and share information efficiently across the supply chain and so boost the efficiency of activities around asset delivery and operation. By helping the entire supply chain to work from a single source of information BIM reduces the risk of error and maximises the team ability to innovate.

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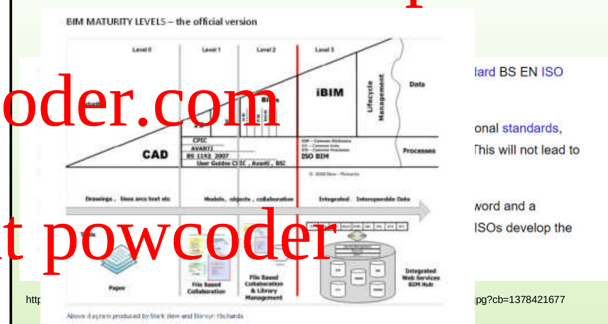
What is BIM?



http://www.bimtaskgroup.org/wp-content/uploads/2012/06/pasdiagram.jpg

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GIS and BIM - Similarities

	BIM	GIS
Model the built environment in 3D	✓	✓
Model indoor and outdoor features	✓	✓
Data can e managed in a database management system	✓	✓
Spatial and non-spatial data editing and management tools provided	✓	✓
2D and 3D visualization	✓	✓
Represent the word as is, but also model historic and future representations	✓	✓
Model at varying scales and detail	✓	✓

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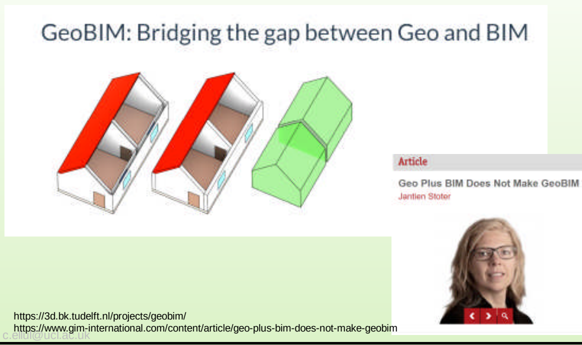
GeoBIM



https://3d.bk.tudelft.nl/projects/geobim/
https://www.gim-international.com/content/article/geo-plus-bim-does-not-make-geobim

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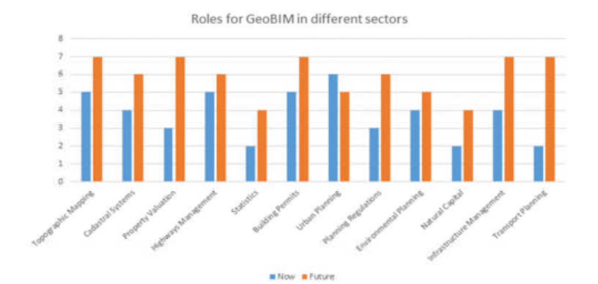
GeoBIM – Why Integrate?



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GeoBIM – Why Integrate: Site Access

MULTIPLEX
Built to outperform.

HOME COMPANY PROJECTS CAREERS NEW

The floor slabs are composite cellular beams, providing a diaphragm action restraint to the perimeter columns. There are three column positions on either side of the core to act as outrigger stability structures, connected to the core through storey deep trusses at two positions up the building. The basement is three levels deep with a network of supporting columns and transfer structures taking loads down to piled foundations. The façade is a closed-cavity glazed curtain wall system which circulates air within the cavity and allows the building to have very clear glazing whilst meeting the environmental performance.

Due to access constraints, and the large amount of materials that will be needed for this project, it has been decided to use an off-site consolidation centre to reduce traffic and deliveries. Materials will be distributed at night to avoid traffic congestion and to allow workers arriving on-site to start work immediately. This system will be used throughout the construction phase, as well as the lifecycle of the building, thus reducing delivery vehicles at peak hours, lowering both cycling incidents and pollution in the long term.

https://www.multiplex.global/projects/22-bishopsgate

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GeoBIM – Why Integrate: Emergency Planning

1. Access and Facilities for the Fire Service

If the application involves the construction of a building you will be required to provide reasonable facilities for the Fire Service. In most circumstances this will mean providing vehicular access for fire appliances.

It is important to remember that failure to do so may prevent the applicant from obtaining a completion certificate under the Building Regulations but more importantly, the lives of the occupiers will be put at risk.

Appliance type	Pump	High Reach
Minimum width of road between kerbs(m)	3.7	3.7
Minimum width of gateways(m)	3.1	3.1
Minimum turning circle between kerbs (m)	16.8	26.0
Minimum turning circle between walls (m)	19.2	29.0
Minimum clearance height(m)	3.7	4.0
Minimum carrying capacity (tonnes)	12.5	17.0

Table 1: Typical fire service route access specifications

https://www.shropshirefire.gov.uk/sites/default/files/planning-and-developers_0.pdf

http://www.newsandstar.co.uk/news/16750328.concerns-over-emergency-access-at-proposed-housing-development-in-west-cumbrian-village/

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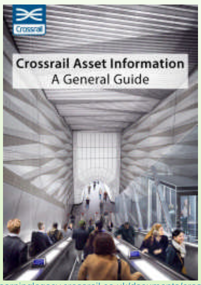
GeoBIM – Why Integrate: Planning and Enforcement

https://www.dailymail.co.uk/news/article-2612073/Family-ordered-demolish-dream-500-000-home-builders-6ft-high-4ft-wide.html

https://www.bbc.co.uk/news/uk-england-stoke-staffordshire-44068562

GeoBIM – Why Integrate: Asset Management



https://learninglegacy.crossrail.co.uk/documents/crossrail-asset-information-guide/

http://www.stobartrail.com/item/health-safety-environment

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GeoBIM: Relevant Data Standards

CityGML

IFC

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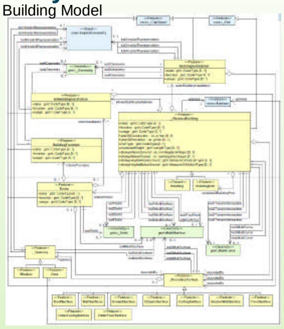
CityGML

Building Model



Street Space Model

https://www.researchgate.net/profile/Siddique_Baig/publication/272565062/figure/fig11/AS:294730651979788@1447280671650/UML-diagram-of-CityGMLs-building-model-Prefixes-are-used-to.png

http://filip.biljecki.com/phd.html
https://www.isprs-ann-photogramm-remote-sens-spatial-inf-sci.net/IV-4-W5/9/2017/isprs-annals-IV-4-W5-9-2017.pdf

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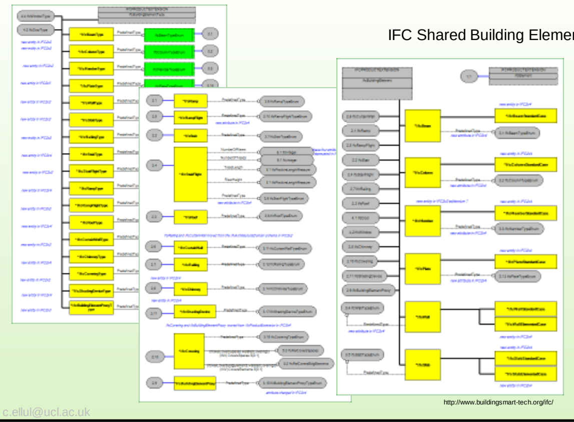
IFC Shared Building Elements



http://www.buildingsmart-tech.org/ifc/

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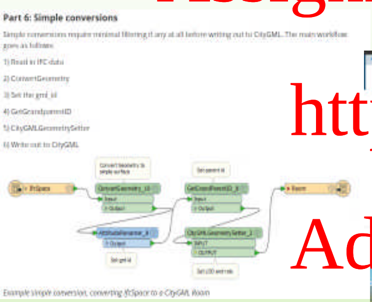
Convert IFC to CityGML


Part 6: Simple conversions

Simple conversions require minimal filtering if any at all before writing out to CityGML. The main workflow goes as follows:

1) Read in IFC data
2) ConvertGeometry
3) Set the gml_id
4) GetGrandparentID
5) CityGMLGeometrySetter
6) Write out to CityGML

Example simple conversion, converting IfcSpace to a CityGML Room

https://knowledge.safe.com/articles/1025/bim-to-gis-intermediate-ifc-lod-300-to-lod-4-cityg.html

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GeoBIM

Problem Solved!

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Geo and BIM - Differences

BIM	Geo
Single house contains 1000 elements	House contains a few elements only
Spatial data digital plan design & construction	Spatial data is source of information
Data management for project sites/ Focus on data functionalities in native software	Focus on data flows within Spatial Data Infrastructure (data quality, validation, responsibilities)
Industry dominated	Government dominated
Sharing data complex; benefits for sharing are not always clear	Open data/sharing data is seen as public good
Geometry is designed (parametrized, CSG)	Geometry is measured (B-Rep)

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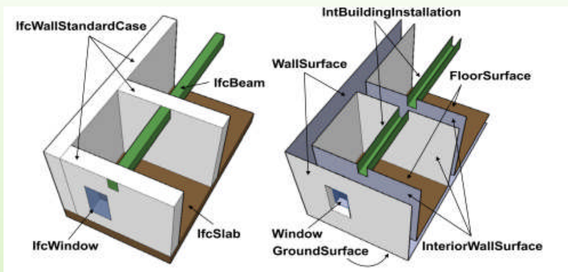
Different Conceptual Models



http://www.isprs.org/proceedings/XXXVIII/3_4-C3/Paper_GeoW09/paper26_Nagel_Stadler_Kolbe.pdf

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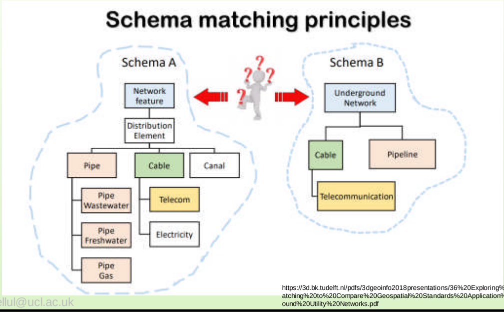
Different Conceptual Models



https://3d.bk.tudelft.nl/pdfs/3dgeoinfo2018presentations/36%20Exploring%20Schema%20Matching%20to%20Compare%20Geospatial%20Standards%20Application%20to%20Underground%20Utility%20Networks.pdf

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Lack of Software that supports BIM and GIS

- Single, integrated database and software ("single source of truth")?

vs:

- Keep the software people are used to using?
  - Expensive learning curve
  - Software and data 'fit for purpose'

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GeoBIM – Current Work

EuroSDR

- 2-year project working with EuroSDR (organisation of European National Mapping and Cadastral Agencies) investigating GeoBIM
  - Currently in Phase 2 – developing case studies
  - Particularly interested in:
    - Constraints relating to planning/construction - can they be automatically validated
    - Asset management!
      - Contact me if you have case studies or are working as an asset manager

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