Report

1. UNSW Lower Campus

1.1 Datasets

Raw Type	Data	Size	#Voxels	Description
GIS	dtmbot.xyz	9.22 GB	641,624,355	A terrain with holes, in which the buildings fit
	tree.xyz	906 MB	59,640,000	Tree in lower campus
	bld1-54.xyz (except for 26 and 46)	3.52GB	241,613,693 in total and 4,646,418 per building	52 buildings in lower campus
BIM	be.xyz	249 MB	17,460,029	Built Environment (H13)
	blockhouse.xyz	45.4 MB	3,392,202	Blockhouse (G6)
	dalton.xyz	25.5 MB	1,887,512	Dalton (F12)
	quadrangle.xyz	43.9MB	3,161,733	Quadrangle (E15)
	roundhouse.xyz	79.9MB	6,037,174	Roundhouse (E6)
	scithe.xyz	17.2MB	1,231,821	Science Theatre (F13)

Note that:

- For GIS-based voxels, its resolution is 20cm. All voxels are recorded in same relative coordinate with offset (336000, 6245250, 20).
- For BIM-based voxels, its resolution is 10 cm. Each building is in its own relative coordinate with MINXYZ.

1.2 Database Schema

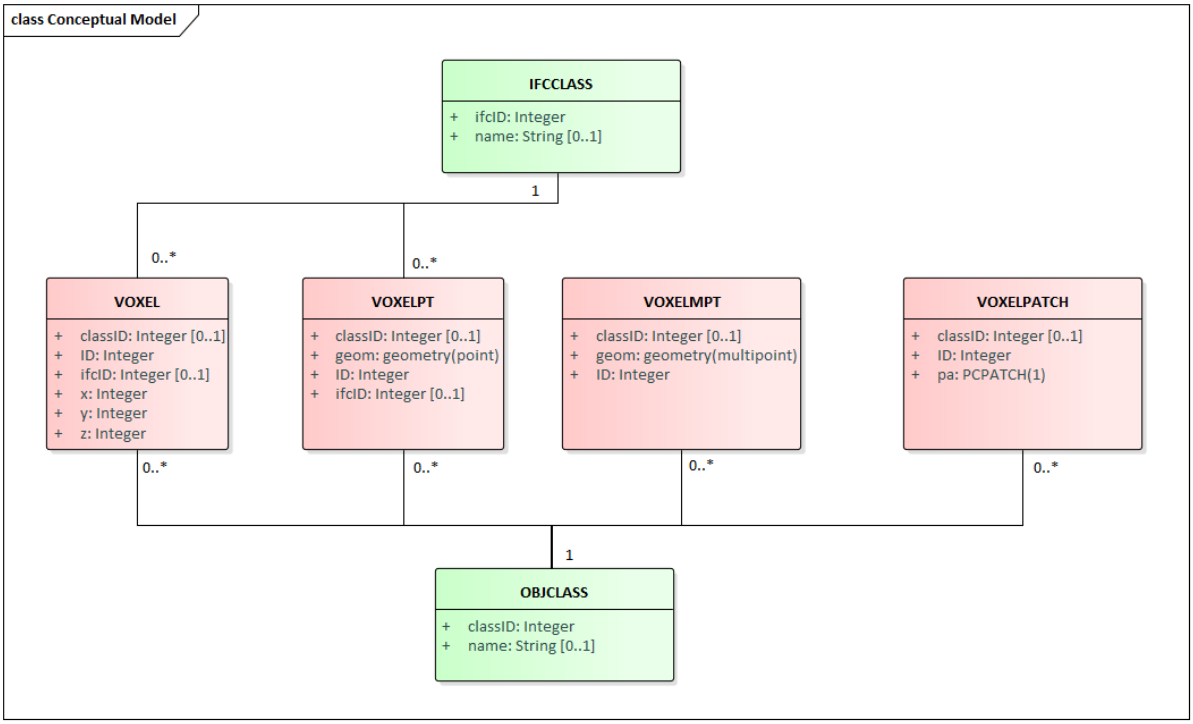


Figure 1. Conceptual Model

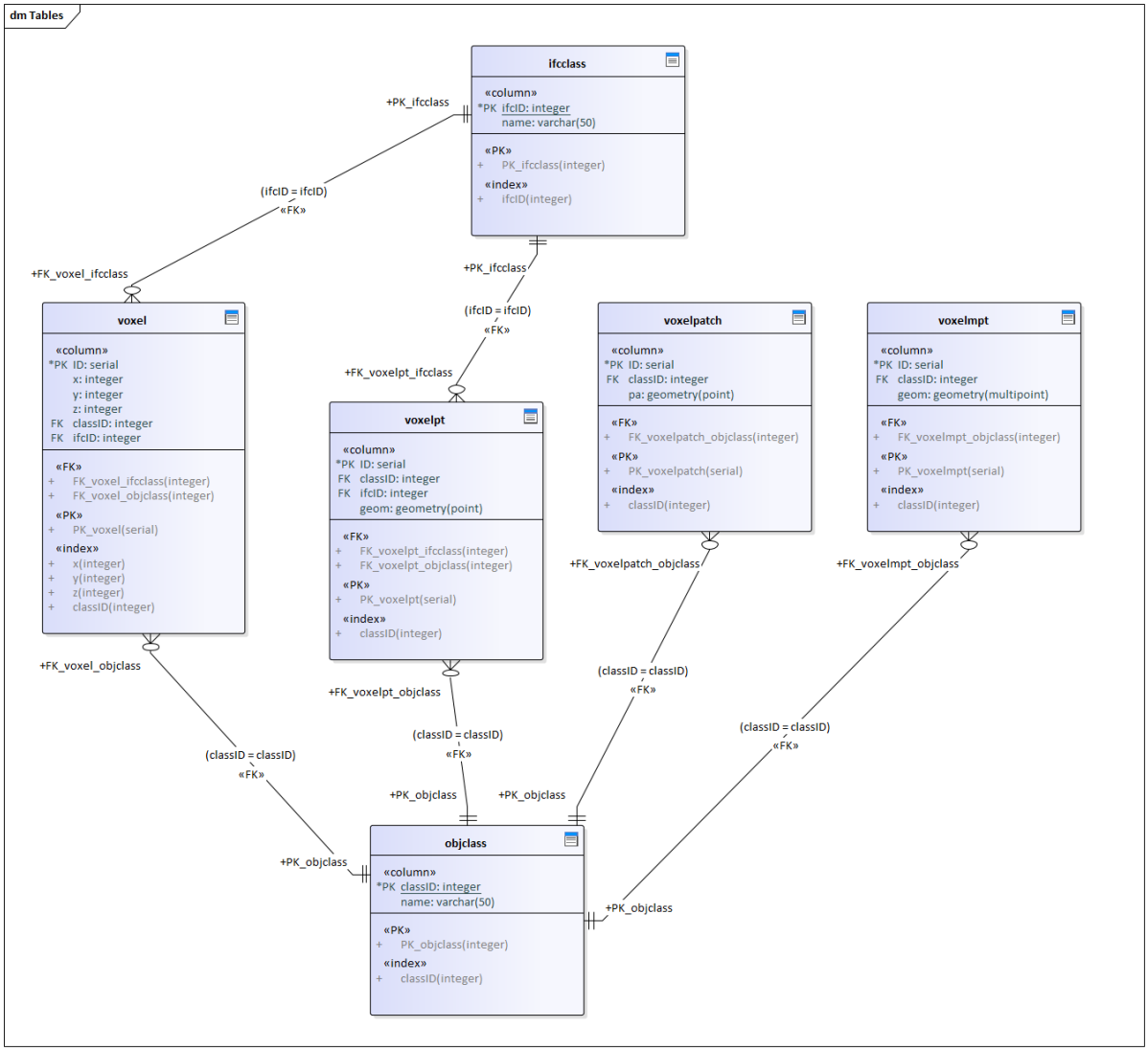


Figure 2. Physical Model

1.3 Data Layout in PostgreSQL

Four Main Tables for voxel storage:

Table	Columns	Geometry	Description
voxel	id, x, y, z, classid, ifcid	N/A	One voxel per row/record.

	id [PK] integer	x integer	y integer	z integer	classid integer	ifcid integer
1	1	1925	391	35	1	[null]

voxelpt	id, classid, ifcid, geom	POINT(x,y,z)	One voxel per row/record with geometry.

	id [PK] integer	classid integer	ifcid integer	st_astext text
1	1	56	[null]	POINT Z (2646 411 84)

voxelmpt	id, classid, geom	MULTIPOINT	One building per row/record. 20,000,000 point per row/record for “tree” and “dtm”.

	id [PK] integer	classid integer	st_astext text
1	55	54	MULTIPOINT Z (1125 2612 31,1125 2612 32,...

voxelpatch	id, classid, pa	PCPATCH(1)	One building per row/record. 20,000,000 point per row/record for “tree” and “dtm”.

	id [PK] integer	classid integer	pc_astext text
1	52	54	{"pcid":1,"pts":[[1125,2612,31],[1125,2612,32],[1125,261...

Two Semantic Tables for IFC and class info:

Table	Columns	Description
ifcclass	ifcid, name	26 IFC class with corresponding name

	ifcid [PK] integer	name character varying (50)
1	1	IfcBeam
2	2	IfcBuildingElementPart
3	3	IfcBuildingElementProxy

objclass	classid, name	classid 1-54 (except for 26 and 46) are building ID. classid 55 is tree ID. classid 56 is dtmbot ID.

	classid [PK] integer	name character varying (50)
1	55	tree
2	56	dtmbot

2. QGIS Visualization

The data query is processed using a HP laptop. Its processor is Intel(R) Core (TM) i7-7600 CPU @ 2.80GHz and its installed memory is 16.0 GB. Its operating system is 64-bit Windows 10. And the test is performed on PostgreSQL (11.2), PostGIS (2.5.2), and QGIS (3.6.1).

2.1 Simple Visualization

Considering bld52 (we don't have building name at this moment), 29.6MB and 1,881,847 voxels, we extract "geom" first, and then convert its coordinate into EPSG:28356.

```
1. SELECT ST_MakePoint(336000+ST_X(geom)*0.2, 6245250+ST_Y(geom)*0.2, 20+ST_Z(geom)*0.
   2) AS geom
2. FROM voxelpt
3. WHERE classid=52;
```

Figure 3 shows how to execute query in QGIS.

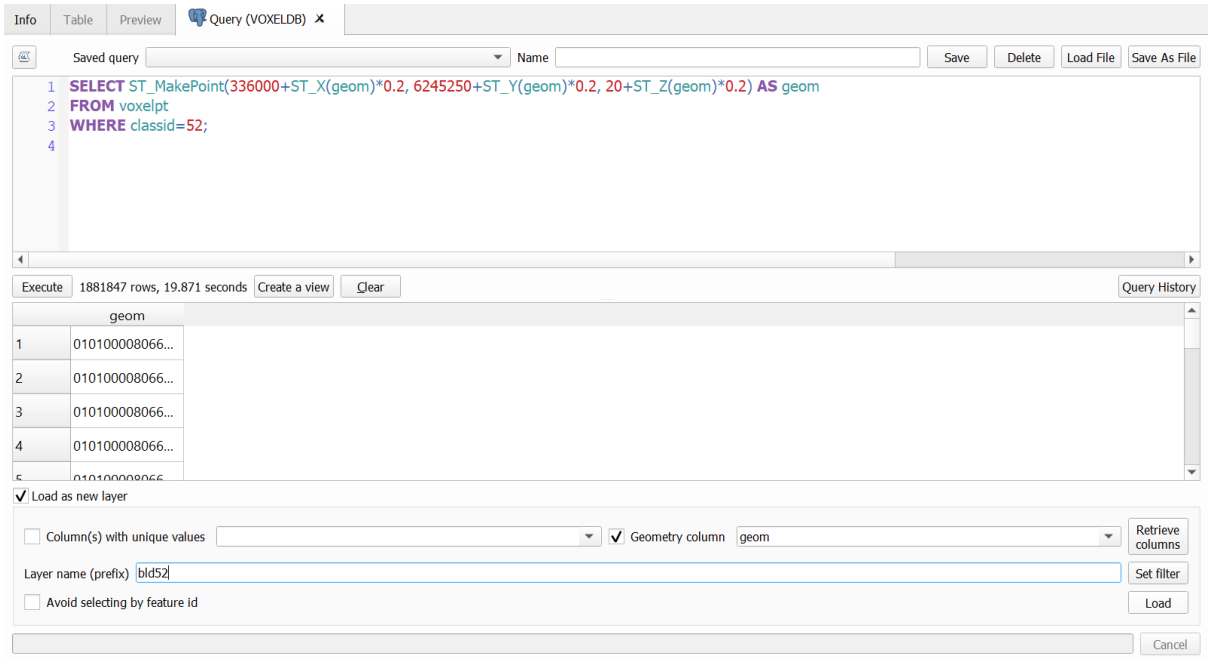
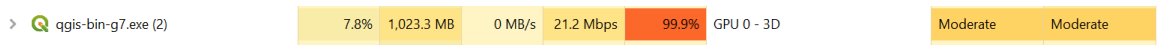


Figure 3. Query execution in QGIS

Note that, loading the above query result as a new layer in QGIS may take several minutes and 3D view is as well. Once choosing 3D view, please keep an eye out for your GPU and memory changes, if you crash, kill the task or stop doing the work at hand and continue to wait patiently. If not necessary or you are not confident in your PC, don't try 3D view.



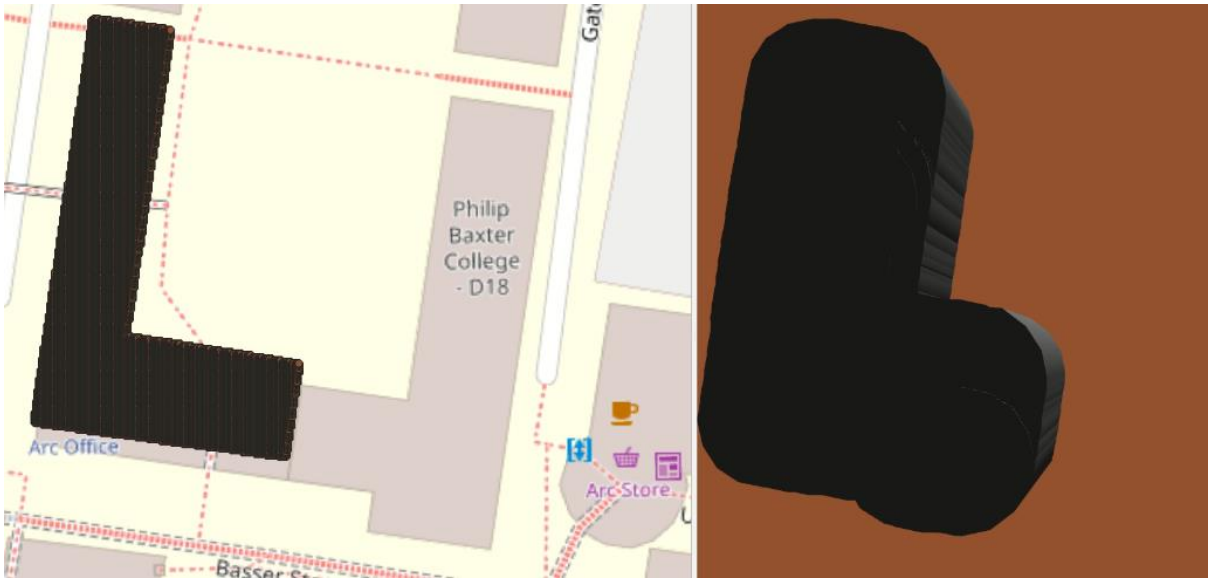


Figure 3. 2D and 3D visualization of "bld52" in QGIS