Assignment – Spatial Data and Asset / Facilities Management

Submission Date:
Wednesday 11th January 2021 at 13:00

Submission Method:

- *Completing an online form with information about your system*
- *A PDF of your pyramid uploaded via Moodle/Turnitin*
- *A PDF of your map uploaded via Moodle/Turnitin*
- *Three (optionally four) separate SQL scripts via Moodle/Turnitin*

Note that I may also require you to use an additional online submission process for the SQL scripts – I will let you know if this is the case.

This assignment is worth 70% of the marks for the module.

- *An assignment is an independent piece of work – your work should not be identical to, or similar to, that of any other student or the work we do in class. If two assignments are very similar we will follow UCL procedures for plagiarism – see the guidelines here: https://www.ucl.ac.uk/students/exams-and-assessments/plagiarism*

- *If you have questions about this assignment, please post them on Moodle*
  - *That way everyone is given the same information*
  - *That way I remember what I've said to you and don't mark you down for doing something that I wasn't expecting*
  - *Any questions should be generic – as this is an assessment which will gauge how much you've learned during the module I won't be able to solve very specific assignment-related problems for you.*

- *This is a digital submission – it is up to you to ensure that the files you upload to Turnitin are not corrupt in any way (you might be able to do this by downloading the uploaded files to check them)*

Database Design and Build (70%)

Overview

The assignment involves the selection of a system (topic) of your choice, which you will then describe in brief and for which you will create a hierarchical pyramid to show how the features (e.g. assets) and decisions based on information about those features nest upwards.

Your system – and the pyramid - should have 3 levels of spatial nesting

You will first describe the system and make a list of 7 decisions that the system will be used to make. You must have at least one decision at each level of the pyramid.

You will then create the physical database for your system, insert some data and demonstrate how this data can be used as evidence for the decisions.

This component of the assignment is divided into three parts:

- A1 – Topic description, pyramid and decisions
- A2 – Database

Part A1 – Topic description, pyramid and decisions (complete an online form)

Step 1 - Selecting a Topic

You are required to select a system (topic). To give you an idea of the types of assets/facilities that you might think about, in the past we have had assignments relating to mountain rescue huts, zoos, cycle hire, logistics/delivery organisations, holiday letting, infrastructure management companies, lost property offices, forest maintenance, highways agencies, water supply companies and many more. You may also find some case studies online using search terms such as built asset management, GIS, key performance indicators, KPI.

Your system may relate to your work, MSc degree, research or another area of interest. You could include decisions related to condition surveys, to short term replacement costs for an asset, to long term asset portfolio costs and purchasing / upgrade decisions. You could look at fire prevention, reactive building repairs, planned maintenance, human comfort. You could also look at information that would be useful to users of a facility.

You should not use a university or school example, or a sensor/waiting room/bus station example as these would be too similar to the examples we covered in class and would be plagiarism

Step 2 - fill in a questionnaire on Moodle to document your topic

1. Title (2 or 3 words)
2. A short list of the aims of the organisation that this decision support system will be used for (between 3 and 5 short sentences, max 250 characters per aim)
3. Any additional information that you are using in your queries – e.g. costs, regulations of #people in a space, healthy air quality limits (as a numbered list)
4. The names of the spatial asset/features that are at the bottom, middle and top levels of your pyramid
    a. These names must be IDENTICAL to the name of the table that stores data for this feature (max length 50 characters, no spaces).
    b. All table names should be lower case
    c. All three tables (assets) must have a location column
    d. All three features must be spatial – i.e. mappable (they can be 2D or 3D)
    e. The features must nest – i.e. features at the lowest level must be contained inside features at the middle level, and features at the middle level contained inside features at the upper level.

5. A description of the 7 decisions that your system will support
    a. For each decision, a list of the names of the **all the tables** that you will use to provide evidence for each of these decisions (separated by a ;). Use schemaname.table name for this list.
    b. The SQL query used to provide the evidence for each decision
    c. The level of pyramid that the decision corresponds to

6. You should have at least 1 decision for each level of the pyramid

Step 3 – PDF and Screenshot

7. Upload a PDF to Moodle containing a QGIS screenshot showing the spatial data you create

Part A2 - Database creation (3 script files, optional views scripts)

For this part of the assignment:

1. Create an SQL script that contains the SQL used to create the tables in your system. Call this script: **createtable_ucfsxxx.**txt (where ucfsxxx is your UCL login). All table names should be lower case, use _ to separate out any words (not spaces or -)

2. Create a separate SQL script for all the constraints including primary keys and foreign keys. Call this script: **createconstraints_ucfsxxx.txt**

3. Create a separate SQL script to populate each table with a minimum of THREE rows of data. The data should be sufficient to allow you to test out the SQL for your listed functional requirements. So that we can test your work independently, your SQL must create ALL the data required from scratch – don't use any data that has been imported via QGIS / sourced from third parties. The spatial data you create does not need to be very sophisticated in terms of geometry complexity. Call this script **insertdata_ucfsxxx.txt.** **All data should use a projected coordinate system (i.e. not lat/lng[1] – if you don't know the projected coordinate system for your location use British National Grid)**

4. Optionally – upload a script that creates a series of views that will help to simplify your queries.

5. (As part of Part A1, fill in the online form with the 7 SQL queries that provide evidence needed to support the decisions you listed in the first part of the assignment.)

Some hints for part A2

- The SQL scripts should be manually created – i.e. typed by you
- You must use the provided PostGIS database
- The first line of the createtable script should drop the ucfsxxx schema (if it exists) and create it again
- All the SQL should work in your schema – e.g. your create table scripts should be similar to: *create table ucfsxxx.buildings (……)*, your insert scripts *insert into ucfsxxx.buildings* and queries *select from ucfsxxx.buildings*
- Include comments in your scripts to make them easy to read – use -- to mark the comments
- Make sure that the filename that is on the system is correct – check the submission receipt for each file and re-download the file. The filename should contain the text createtable_ucxxxxx etc with your UCL username and all files should be .txt format (not rtf or doc or similar)

Marking Process

This assignment will be marked semi-automatically (nearly fully automatically), so it is very important that you follow instructions to the letter. Automated marking includes (but is not limited to):

- Running all the SQL scripts you upload and creating your database – this will NOT be done on the system we use in class, as we have a separate test database for the purpose so it is important to make sure your scripts run from beginning to end
    - Don't forget to drop and create the schema in the createtable script
    - Don't forget to use your UCL login ucxxxxx as the schema name

[1] As lat/lng units are degrees/minutes/seconds when you try and measure a length or area you get a very strange answers

    - Make sure that all your tables and views are created in the schema

- Checking that the list of tables for each decision matches the tables used in the query for that decision
    - Make sure the list is separated by ; in the form
    - Make sure you use the exact table names in the form schemaname.tablename
- Checking that the geometry for the three levels of your pyramids actually does nest as expected
- Checking that all your tables have
    - Primary keys
    - Unique constraints
- Checking that your data is valid – e.g. that you have 3 rows of data in all the tables, that primary/foreign key constraints are enforced, that geometry is correct

Marking Scheme

Marks will be awarded as follows:

** NB – if your system is too close to that covered in class we may reduce your overall mark. If your filenames are incorrect or your files don't work with the automated marking system we may reduce your mark **

Component	Maximum Mark out of 70	Comment/Hint
System description	6	Make sure you fill in all the boxes in the form.
Pyramid diagram, list of decisions and names of the tables providing data to support these decisions	20	Marks may be deducted if your list of tables doesn't correspond to the tables actually used in your queries.
Map	5	QGIS screenshot is sufficient. The map must show all three of your spatial features each nested within the other.
SQL – CREATE TABLE	3	0 if the script does not run as an entire script OR you do not use the correct schema.
SQL – CONSTRAINTS	3	0 if the script does not run as an entire script OR you do not use the correct schema. This means that if your CREATE TABLE script has not worked, you could also get 0 for this component.
SQL – INSERT DATA	5	0 if the script does not run as an entire script OR you do not use the correct schema. This means that if your CREATE TABLE or CONSTAINTS scripts have not worked, you could also get 0 for this component. Maximum of 5 marks if your data includes 3D spatial data. The data does not need to be complex – e.g. you can create simple boxes for the geometry.
7 queries	28	Maximum of 4 marks per query depending on complexity. Queries that don't work will be awarded 0 marks. Examples of complexity include (but are not limited to): - Queries that join information from 5 tables or more - Advanced spatial queries including 3D queries - Use of SQL that we didn't cover in class