



08 april 2024

Planlagt: 16:30-19:30

Eksamensnr: 16

Plads: ITXM-234

Side 1 af 4

Short Questions

1. a) WMS (World Map Service). The WMS provides geodatasets for maps in raster format.
b) WFS (World Feature Service). The WFS provides geodatasets for features in vector format.
2. a) A pixel resolution of 10cm in terms of a raster geodataset means that a single pixel in the map represents an area of 10cm.
b)

0	0	80
0	0	0
20	20	0
3. a) GNSS stands for Global Navigation Satellite Systems.
b) One example of GNSS is GPS (Global Positioning System) that is a US-based system and has a minimum of 31 satellites for its global system.
4. We may claim that digital maps generally are user-centric, whereas analog maps are producer-centric because digital maps contain data that can be manipulated in various ways for user to observe. For example, users can adjust the scale of the map to view a feature better, Analog maps however do not provide the options for manipulations and contain contents that are more easily interpreted by map producers and professionals.
5. a) No, the following claim is not correct.
b) The size of geodata in raster format depends on pixel resolution. The relationship between pixel resolution and the size of the geodata is inverse. For example, a raster geodata with 10cm of pixel resolution has a greater size than a raster geodata with 50cm of pixel resolution.
6. The methodology for how AI may be used in GIS for land cover mapping using aerial imagery begins with a learning phase for the AI. In the learning phase, different types of land covers are presented to the AI with values assigned to them. These land covers are extracted from every part of the aerial images. The AI then learns to recognize the land covers through a process of trying to assign correct values to aerial images and comparing it to the actual values. This process lasts until the AI achieves a set level of accuracy and precision. In the end, the AI is able to correctly map aerial images with its corresponding land covers.
7. a) The acronym SQL stands for Structured Query Language.
b) The following SQL statement would select all the rows from the 'National_Roads' table that contain value 3 and 4 for the field 'Road_class'.
c) The output of this SQL statement would be none because there should be only one value for the field 'Road_class' when this SQL statement demands it to have both 3 and 4. As such, it will yield no result.
8. a) The 'degrees, minutes and seconds' coordinates format is (55° 40'17", 12 ° 32'10").
b) The recalculation: $55^{\circ} 40'17" = 55 + 40/60 + 17/3600 = 55 + 0.66 + 0.00472 = 55,66472$
 $12^{\circ} 32'10" = 12 + 32/60 + 10/3600 = 12 + 0.53 + 0.00277 = 12,53277$
9. a) The 'Travelling Salesman's Problem' and the 'Shortest/Fastest Path' differs in that the 'Travelling Salesman's Problem' is an algorithmic problem that can be solved using a greedy solution while the 'Shortest/Fastest Path' is the solution selects the path that has the least travel time and distance.
b) There are 12 possible routes. $(5-1)! / 2 = 12$.

10. The obvious area distortions of maps based on the classic Mercator projection is because the classic Mercator projector maps the earth that is likened to a sphere on a cylindrical surface. Naturally, the top and bottom of the cylinder would be extended to cover the area around the earth's polarities and thus create major distortions around these area, Hence, the maps based on the classic Mercator projection would appear normal in the middle but distorted in the top and bottom.

Extended Questions

- A) (i) The real world features that the semi-transparent geodata layers in figures 1-7 represent are:

Figure 1: Metro Stations

Figure 2: Noise Levels

Figure 3: Airstrip

Figure 4: Recreation

Figure 5: Coastal Areas

Figure 6: Property Values

Figure 7: Roads

(ii) Explanation:

Figure 1: The features seem to resemble the layout of metro station or other public transports.

Figure 2: The features may indicate the noise levels around the area

Figure 3: There is an airstrip

Figure 4: The features seem to be gardens or other recreational areas

Figure 5: The features seem to cover all coastal areas

Figure 6: The features seem to indicate property value, the properties in the coastal area should be more expensive for their view while the inland areas are cheaper

Figure 7: The features seem to cover all roads

- B) (i) The five other spatial entities which I think would be relevant to include in this overlay analysis are bus stations, office buildings, crime rate, existing hotels and land use.

(ii) Motivation:

Bus Stations: Buses are popular modes of transport along with metro stations and accessibility to the hotel is important.

Office Buildings: The areas near office buildings might attract more customers because of the proximity with the workers. A conference hotel is the best place where office workers from all around can have a place to stay and hold conferences.

Crime Rate: The crime rate around the conference hotel must be low so that it will not repel potential customers. Any crime that happens near the property will discourage potential customers to stay,

Existing Hotels: Existing Hotels are competitions to be avoided, potential customers might choose other hotels in the vicinity.

Land Use: The distinction between different areas is important to look at. Commercial districts should be prioritized while industrial districts should be avoided.

(iii) I would be able to collect such geodata from government websites, research institutes, citizen science projects and public participatory GIS. There should be geodata on bus stations, crime rate and land use on government websites and for office buildings and existing hotels it might be worth it to consult the local municipality or visit research institutes. If all else fails, the company should consider acquiring data by using commercial GIS services.

- C) Data Quality:

Figure 1: The geodata layer is complete since it covers the whole of Armager Island, however, in the case of metro stations it seems to have missed a single metro station. If the layer represents the metro station, then it would not be complete. Otherwise, the layer also seems to be consistent and is ready to be used. The production method of the layer is consistent.

Figure 2: The geodata layer is incomplete since there are some areas that are not covered by red, yellow and black areas that are indicator of values. It also only covers a portion of Armager Island. The production method of the layer is consistent.

Figure 3: The geodata layer has high resolution but it is incomplete since it does not cover the whole feature that appears, only a part of it. It is not fit for use.

Figure 4: The geodata layer is incomplete as it does not show the whole of Armager Island. However, it has a high resolution and it is consistent in the way that it outlines its features. It seems to be fit for use for the particular area and is trustworthy,

Figure 5: The geodata layer is consistent in the fact that the feature consistently showed all the coastal area. However it is incomplete as it does not show the whole Armager Island.

Figure 6: The geodata layer is untrustworthy as the borders between the features seem to be random. There are no indicators of which factors are taken into consideration and it might be biased. On top of that, it only covers a part of Armager Island, it is incomplete and not fit for use,

Figure 7: The geodata layer is consistent in the fact that the feature consistently showed all the roads on the map. The resolution is also high and the layer is trustworthy and fit for use.