GEO1003 - Shared Notes

Master Geomatics Students

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Contents

Introduction

This is the introduction to the notes.

Example

Introduction to the example

The goal of this chapter is just to demonstrate how things should be organized. It will be removed from the notes in the end.

Markdown Basics

Resources and Helpers

A nice cheat sheet about Markdown can be found at this link: https://www.markdownguide.org/cheat-sheet/.

On VS Code, there are some nice extensions that can help you write Markdown files:

- Markdown All in One to provide useful shortcuts and commands
- markdownlint to properly format your Markdown files

Feel free to ask me if you have questions about Markdown.

Headers

```
# Level 1

## Level 2

### Level 3

#### Level 4

##### Level 5

###### Level 6
```

Level 1

Level 2

Level 3

Level 4

Level 5 Level 6

Bold and Italic

```
- Normal text
- **Bold text**
- _Italic text_
- **_Bold and italic text_**
```

- Normal text
- **Bold text**
- *Italic text*
- ***Bold and italic text***

Lists

Unordered list:

```
- Unordered list item 1
- Unordered list item 2
  - Nested unordered list item
```

```
Ordered list:
```

```
1. Ordered list item 1
2. Ordered list item 2
   1. Nested ordered list item
```

Unordered list:

- Unordered list item 1
- Unordered list item 2
  - Nested unordered list item

Ordered list:

1. Ordered list item 1
2. Ordered list item 2
   1. Nested ordered list item

Links

```
[Example link](https://www.example.com)
```

Example link

Images

```
![Example image](../../images/example.jpg){ width="250" }
```

Figure 1: Example image

Blockquotes

```
> This is a blockquote.
```

> This is a blockquote.

Code

```
Inline code: `print("Hello, World!")`

Code block:

```python
def hello_world():
    print("Hello, World!")
```
```

Inline code: `print("Hello, World!")`

Code block:

```python
def hello_world():
    print("Hello, World!")
```

Tables

```
Table: A simple table

| Header 1 | Header 2 |
| -------- | -------- |
| Cell 1   | Cell 2   |
| Cell 3   | Cell 4   |
```

Table 1: A simple table

Header 1	Header 2
Cell 1	Cell 2
Cell 3	Cell 4

Empty Section

An other section that is empty.

Exams Overview

How does GNSS work? (~20%)

Definitions

- Ephemeris
- Time-To-First Fix (TTFF) / Cold, warm hot
- Receiver clock bias
- Code-based differential
- C/A-Code (PRN)
- Pseudorange measurements
- Differential GNSS
- Carrier phase
- GPS spoof
- GPS jamming

Example questions

- What is the role of GNSS in timing information (think critical economic infrastructure)?
- How does the GNSS space segment effectively enable navigation?
- Why is it important to synchronise the GPS clock with ground-based clocks?
- Where are the ground-based clocks located?
- What is the cause of the receiver ‘clock bias’, and how is it resolved through the code-based positioning solution?

- How does code-based Differential GNSS 'solve', among other error sources, the travel-time delay of the signals through the ionosphere?
- What is the difference between GPS jamming and GPS spoofing?
- How do GPS jamming devices work?
- Is ... description of ... correct? Rephrase if not.

GNSS performance (~20%)

Definitions

- Dilution of precision (DOP)
- Horizontal dilution of precision (HDOP)
- Vertical dilution of precision (VDOP)
- Geometric dilution of precision (GDOP)
- Accuracy
- Precision
- Availability
- Continuity
- Integrity
- Real Time Kinematic (RTK)
- Network RTK
- Precise Point Positioning (PPP)
- PPP-RTK
- DGNSS
- Error sources
- 06-GPS

Example questions

- How can the Time-to-First-Fix (TTFF) be significantly improved in GNSS-enabled, Wi-Fi/4G-connected, smartphones compared to stand-alone code-based, GPS receivers?
- What influences the fluctuation in DOP values?
- What are the reasons behind the higher values of VDOP throughout the day compared to HDOP?
- Which real-time positioning corrections have to be provided to obtain higher accuracy? Why are these corrections not just incorporated into the standard GNSS Services?
- Which fundamental issues cause the difference in horizontal and vertical accuracy of (e.g.) 20 cm versus 40 cm?
- How can the performance of each of the following parameters be improved: a) accuracy, b) precision, c) availability, and d) integrity?
- For positioning, does it matter where you are: a) at the North Pole, b) in the centre of a city in the Netherlands, c) somewhere at the Equator?
- What kind of corrections does 06-GPS offer, how are these corrections obtained, and how do they reach centimeter accuracy?
- Is ... description of ... correct? Rephrase if not.

GNSS in the built environment (outdoor, indoor and in between) (~20%)

Definitions

- Shadow matching
- Urban canyon
- Multipath

Example questions

- Why is Wrong-Side-of-the-Street accuracy preferable for GPS precision over a general indication like '10 meters anticipated accuracy'?
- What features of Assisted GPS (A-GPS) enable achieving a time-to-first-fix (TTFF) of 1 second?
- What is shadow matching?
- Is ... description of ... correct? Rephrase if not.

CRS (~10%)

Definitions

- Geocentric CS
- Topocentric CS
- Ellipsoid
- Epoch
- Map projection
- Terrestrial Reference System
- Terrestrial Reference Frame
- Datum
- Coordinate system
- Coordinate reference system
- Transformation
- Conversion
- International Terrestrial Reference Frames (ITRF)
- Normaal Amsterdams Peil (NAP)
- Rijksdriehoeksmeting (RD)

Example questions

- What could go wrong when users exchanging geoinformation in RD coordinates do not use the official RDNAPTRANS™ procedure between ETRS89 and RD?
- What are the needed operations for a transformation from ETRS89 to the Rijksdriehoeksstelsel?
- For what purposes is a more accurate geoid useful?
- What are the factors you would consider when choosing between different CRSs?
- What are the current issues concerning CRS?
- Is ... description of ... correct? Rephrase if not.

Wi-Fi-monitoring / Fingerprinting (~20%)

Definitions

- Wi-Fi-Monitoring
- Wi-Fi-Fingerprinting
- Location
- Position
- Yield
- Consistency
- Overhead
- Power consumption
- Latency
- Roll-out and operating costs
- Time of Arrival (ToA)
- Time Difference of Arrival (TDoA)
- Received Signal Strength (RSS)
- Angle of Arrival (AOA)
- Trilateration
- Path-Loss
- Fine Timing Measurement (FTM)
- Radio Frequency Identification (RFID)
- Inertial Navigation Systems (INS)
- Visual Based Indoor Localisation
- Isovists

Example questions

- What is Wi-Fi Monitoring and Fingerprinting?
- What is Wi-Fi Triangulation?
- How would you redesign the layout and/or the way of working of a Wi-Fi-based solution inside the Faculty of Architecture and the Built Environment, such that you optimize the localisation/positioning of Wi-Fi performance?
- What is an opt-in and an opt-out?
- Is ... description of ... correct? Rephrase if not.

Location awareness and privacy (~10%)

Definitions

- IndoorGML
- I-Space
- sI-Space
- sO-Space
- O-space

Example questions

- What does the significance of decimal places mean in Lat/Long coordinates?
- Why is it useful to have detailed information about the surroundings?
- Can you navigate using only information of the route (not the surroundings)?
- How can IndoorGML help with indoor navigation?
- Is it legal for a hospital to get a real-time overview map of all visitors and employees?
- What is an opt-in and an opt-out?
- Is ... description of ... correct? Rephrase if not.