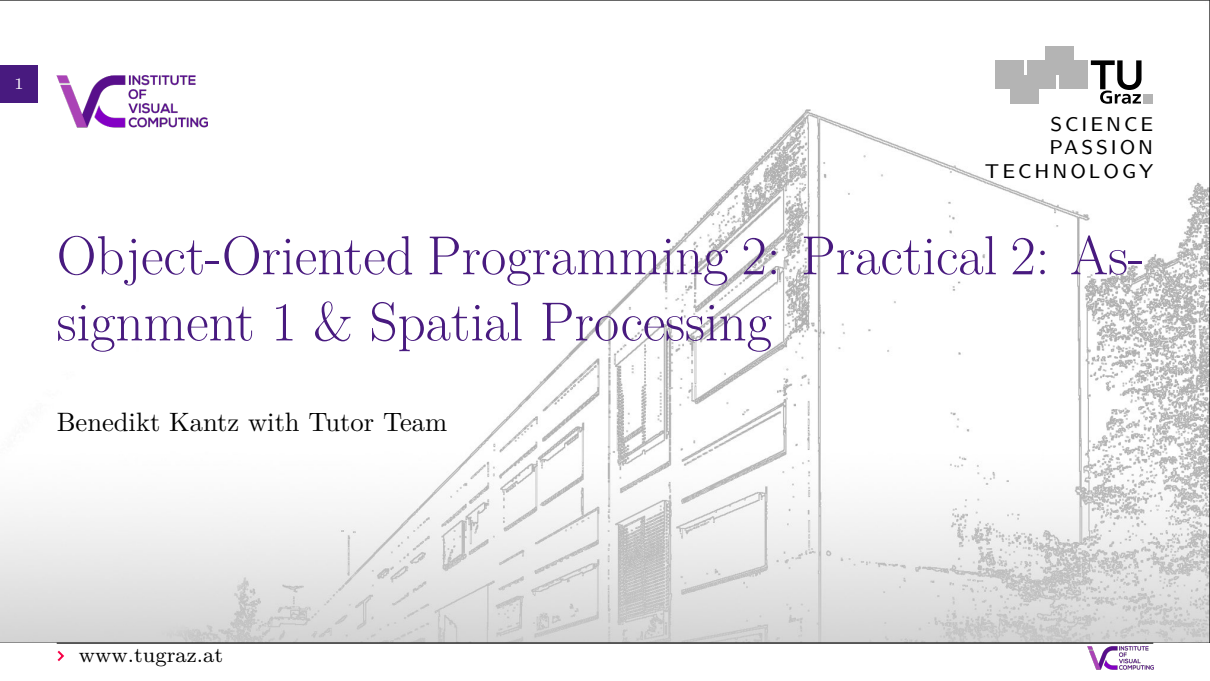
INSTITUTE OF VISUAL COMPUTING

TU Graz
SCIENCE
PASSION
TECHNOLOGY

Object-Oriented Programming 2: Practical 2: Assignment 1 & Spatial Processing

Benedikt Kantz with Tutor Team



Slido Q&A

Organizational matters

- Today: Deadline Team Selection (midninght!!)
- Tomorrow: Assignment 1 starts!

Practical Schedule

KW	Date	#	KU Topic
40	2.10.2025	00	Modalities
41	9.10.2025	01	Introduction to A0
42	16.10.2025	-	Q&A A0
43	23.10.2025	-	Q&A A0, Deadline A0, A1 Group Sign-Up
44	30.10.2025	02	**Intro to A1, Deadline A1 Group Sign-Up**
45	6.11.2025	03	Libraries Usage, Q&A A1
46	13.11.2025	-	Q&A A1
47	20.11.2025	-	Q&A A1
48	27.11.2025	-	Q&A A1
49	4.12.2025	-	Q&A A1
50	11.12.2025	04	Deadline A1, Introduction to A2
51	17.12.2025	-	Q&A A2
2	8.1.2026	-	Q&A A2
3	15.1.2025	-	Q&A A2, A2 Deadline
4	23.-29.1.2026	-	Assignment Interviews (AG)

Assignment 1 Overview I

- Data Loading (10P)
  - Load the XML data from the `osm` file.
  - Parse it into the correct format (Geometries!)
- Amenities and Roads (20P)
  - Return the correct data using the middleware.
  - Requires correctly parsed data and communication to backend.

Assignment 1 Overview II

- Review and Ranking requests (15P)
  - Implement a Google-style review system.
  - Allow users to fetch the reviews of places.
- Error handling (5P)
  - Further error handling for tasks in this assignment.

Which XML loading systems/frameworks do you know?

Data Loading: XML Format

- The OSM data is provided as XML.

```
<osm>
    <node id="1" lat="47.0707" lon="15.4395"/>
    <node id="2" lat="47.0710" lon="15.4400"/>
    <way id="10">
        <nd ref="1"/>
        <nd ref="2"/>
        <tag k="building" v="yes"/>
    </way>
</osm>
```

Data Loading: XML Format

- The OSM data is provided as XML.
- You need to parse it - two ways:
  - **SAX Parser**
  - DOM Parser

```
// SAX Parser example
SAXParserFactory factory = SAXParserFactory.newInstance();
SAXParser saxParser = factory.newSAXParser();
//has to be implemented...
DefaultHandler handler = new MyOsmHandler();
saxParser.parse("map.osm", handler);
```

Data Loading: XML Format

- The OSM data is provided as XML.
- You need to parse it - two ways:
  - SAX Parser
  - **DOM Parser**

```
// DOM Parser example
DocumentBuilderFactory factory =
↪  DocumentBuilderFactory.newInstance();
DocumentBuilder builder = factory.newDocumentBuilder();
Document doc = builder.parse("map.osm");
NodeList nodes = doc.getElementsByTagName("node");
```

Which geometric shape would best represent the TU building(s)?

A short introduction into GIS's (and OSM) [1], [2]

- Data Types
  - 1D: Points: (OSM: Nodes)
  - 2D: Lines - Polylines - Polygon: (OSM: Ways)
  - 2D: Multiple Polygon (holes) - Multiple Geometries: (OSM: Relations)

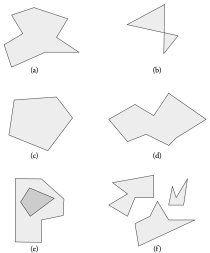


Figure 2.2 Examples of 2D objects: simple polygon (a), non-simple polygon (b), convex polygon (c), monotone polygon (d), polygon with hole (e), and region (f).

Figure: Possible Shapes [1]

[1] P. Rigaux, **Spatial databases : With application to gis /,** eng, San Francisco, 2002

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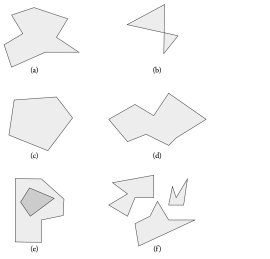

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Java Topology Suite (JTS)

- Simple & fast system to apply geospatial concepts from above
- Code time!

Open Questions?

Bibliography I

References

[1] P. Rigaux, **Spatial databases : With application to gis /,** eng, San Francisco, 2002.

[2] S. Shekhar, **Spatial databases : a tour** (An Alan R. Apt book), eng. 2003, ISBN: 0130174807.