

IMSS016 Advanced Topics in Computer Science (II)
“Data Visualization -- Principles and Practice”

Course Description

Now it is an era of data explosion. Huge amount of data are being rapidly generated in industry and in science and technology areas, so representation and understanding to the data become increasingly crucial. The main topic of this course is to study the transform of large quantities of raw data into graphical representations by exploiting the superior visual processing capability of the human brain to detect patterns and draw inferences. The goal is to improve interpretation and communication of data.

The data sets can be results of numerical computations or measurements, in scientific visualization, or other large data collections such as databases in information visualization. The emphasis of the course is on visualizing the scientific and engineering data, from various application fields such as fluid and solid dynamics computation, seismic exploration, weather data analysis and broadcasting, medical image processing and virtual operation etc. Theory and general principles will be studied, and illustrated by practical examples from the application fields. Related topics in the fields of visual perception, mathematics, and computer science will be involved in order to derive more effective visualization solutions for complex problems. Practice will be also made on visualization systems.

Syllabus

- **Introduction to data visualization**
- **Transformation of data into graphics**
- **Data representation**
- **Data visualization pipeline**
- **Scalar data visualization**
- **Vector and tensor data visualization**
- **Volume visualization**
- **Information visualization**

Textbook

Alexandru C. Telea, *Data Visualization – Principles & Practice*, A K Peters, 2008.

References

1. Markus Hadwiger et al., *Real-Time Volume Graphics*, A K Peters 2006.
2. Barthold Lichtenbelt et al., *Introduction to Volume Rendering*, HP 1998.
3. Donald Hearn and M. Pauline Baker, *Computer Graphics with OpenGL*, 3rd Edition, Pearson Prentice Hall, 2004.

Assessment

Assignment and Projects	20%
Mid-term test	30%
Final Examination	50%