

INFS4205/7205 Spatial and Multimedia Databases
Course Introduction
 Semester 1, 2009
 University of Queensland

+ About Us

- **Students**
 - 4th year undergraduate students
 - Coursework postgraduate students
 - PhD students
- **Lecturer**
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INFS4205/7205: Spatial and Multimedia Databases

+ About This Course

- **What we will learn?**
 - The latest in large-scale data management and processing: complex data types and similarity-based queries
 - How to represent and manage complex data to enable efficient processing of advanced queries
 - Applicable to a wide range of applications, including spatial and multimedia data, text and web data, scientific data...
- **How will we learn?**
 - Attending lectures
 - Studying selected research papers
 - Doing individual assignments
 - Participating group work and presentations

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+ Modern Database Applications

Multimedia Databases	Data Warehouses
<ul style="list-style-type: none"> • large data sets • content-based search • feature-vectors • high-dimensional data 	<ul style="list-style-type: none"> • large data sets • data mining • many attributes • high-dimensional data

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+ Multidimensional Data

- An object is k -dimensional means that the object is described by k attributes.
- **Examples:**
 - point(x, y) - 2D: geographic data (GIS, LIS...)
 - point(x, y, z) - 3D: the universe, brain, molecule structure...
 - Point(x, y, t) - 3D: spatiotemporal
 - person(age, weight, height) - 3D
 - color(c_1, c_2, \dots, c_{128}) - 128 D
 - image(texture, shape, colour) - high dimension!
 - video - a sequence of image frames

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+ How About Relational DBMS?

- **Highly successful**
 - The relational model
 - Non-procedural query
 - Indexing and query optimization
 - Transaction management
 - ...
- **With obvious limitations**
 - Limited data types - no support for multidimensional data!
 - Limited query types
 - How much data managed by RDBMS today?

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+ What's Special about Spatial?

- *Store it, Find it, Use it - Informix*
- Spatial Queries
 - "Where is Building 78" - aspatial query
 - "Which building is adjacent to the lake" - spatial selection
 - "Which building is adjacent to a lake" - spatial join
- Spatial Data
 - Has extension, no total order
 - What is "extension"? What is "total order"?
- DBMS Functions
 - Query processing
 - Data integrity and consistency
 - Transaction processing...

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+ From Spatial to Multimedia

- Very different on the surface, but many similarities fundamentally
 - Data represented as multidimensional vectors
- Keywords-based vs content-based search
 - Keywords-based: using text annotations
 - Content-based: using automatically extracted features such as colors, textures and shapes
 - Both have advantages and disadvantages
- Applications of content-based multimedia search

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+ What to be Covered

- Spatial data types, data structures and spatial databases
- Spatial indexing mechanisms
- Spatial algorithms and query processing
- Multidimensional indexing and search
- Content-based image and video search

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+ Technology Providers and Players



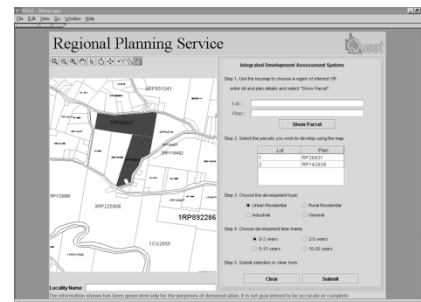
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+ Technology Users

- | | |
|---|---|
| <ul style="list-style-type: none"> ■ Spatial <ul style="list-style-type: none"> ■ Government Agencies such as AUSLIC, ACRES, ERIN, DSTO and State/Local governments ■ Utilities such as telecommunications, water and electricity ■ Mining, insurance, real estate, agriculture, marine ■ Business consulting | <ul style="list-style-type: none"> ■ Multimedia <ul style="list-style-type: none"> ■ ACNelson ■ YouTube ■ Multimedia authoring ■ Entertainment and media industry ■ Copyright enforcement ■ Broadcast monitoring ■ Libraries and museums |
|---|---|

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+ The QUEST Project (1998)



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+ UQLiPS (2006)

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+ Subject Overview

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Week	Lectures	Assessment
1	Course introduction	
2	Introduction to spatial databases	
3	Spatial indexing structures (1)	Assignment 1 out
4	Spatial indexing structures (2)	
5	No lecture this week (self-study)	
6	Spatial query processing	
10-19/4	Mid-term break	
7	Advanced spatial database topics (1)	Assignment 1 due
8	Advanced spatial database topics (2)	Assignment 2 out
9	High-dimensional indexing and search	
10	Introduction to multimedia processing	
11	Content-based image and video retrieval	
12	Student oral presentation	Assignment 2 due
13	Current trends; Course review	
8-12/6	Revision Period	
13-27/6	Exam Period	

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+ Why Study This Course?

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- For prospect researchers
 - Spatial and multimedia databases are still a new area with many open problems
- For job seekers
 - Spatial DBMS (GIS) evolving rapidly from a specialised area to a "commodity" skill
 - Multimedia data management an emerging area with great demand
- For a IT graduate from UQ
 - What you have learnt about relational DB may be not applicable to some applications, but...

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+ A Big Picture

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- State-of-the-art in spatial data management = extending RDBMS
- User-defined types (Abstract Data Types)
 - Index extensions
 - User-defined functions
- Applicable to many of advanced data-intensive applications
 - Including multimedia databases

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