

The Relational Model

csc343, winter 2011
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Recap

- There are different data models, including network, hierarchical, and relational.
- The relational model is based on concept of a relation or table.

Name	Home Field	Coach
Rangers	Runnymede CI	Tarvo Sinervo
Ducks	Humber Public	Maeve Mahar
Choppers	High Park	Tom Cole

Home Team	Away Team	Home Goals	Away Goals
Rangers	Ducks	3	0
Ducks	Choppers	1	1
Rangers	Choppers	4	2
Choppers	Ducks	0	5

Relations in Math

- Example of a relation:
 $\{ \langle \text{leafs, habs, 3, 0} \rangle, \langle \text{sanjose, leafs, 1, 4} \rangle, \langle \text{nj, habs, 1, 1} \rangle \}$
- Suppose D_1, D_2, \dots, D_n are domains – sets of values.
- The Cartesian product $D_1 \times D_2 \times \dots \times D_n$ is: the set of all tuples $\langle d_1, d_2, \dots, d_n \rangle$ such that $d_1 \in D_1, d_2 \in D_2, \dots, d_n \in D_n$.
- A (mathematical) relation on D_1, D_2, \dots, D_n is a subset of the Cartesian product.

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- We call the elements of the relation tuples.
- "Tuple" just means ordered list.
- It can be pronounced 2 ways: "oo" or "uh".
- Comes from: single, double, triple, quadruple, quintuple, sextuple, ...

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Non-positional structure

- Relations in math are positional.
- E.g., in a relation for "parent-of",
<Tom,William> is not same as <William,Tom>
- In relational DBs, we name the attributes (columns) so position doesn't matter.
- But positional notation is still an option in the relational model, and in fact is supported by DBMSs.
- Eg, in SQL, you can refer to a field by position number rather than attribute name.

Some terminology

- relation schema:
Teams(Name, HomeField, Coach)
- attribute/field/column.
- optionally, domain (of each attribute):
like type in a programming language
- key: attributes for which no two rows can have the same values
- tuple/record/row
- relation/table

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- A relation is a set of tuples, which means:
 - there can be no duplicate tuples (but in practise, commercial DBMSs allow duplicate rows)
 - order of the tuples doesn't matter
- arity/degree: number of fields/columns
- cardinality: number of tuples
- database schema: a set of relation schemas
- database instance

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Roadmap

We will learn how to

- Define a database's structure
- Put data into it
- Query the data

In general we will learn things
first: in the relational model
then: in SQL

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Why not go straight to SQL?

- The relational model and algebra are the foundation for SQL.
- Other important concepts, like query optimization, are defined in terms of RA.
- (Because RA is much more simple and elegant than SQL.)

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