Relations

Relations

Prof Hans Georg Schaathun

Høgskolen i Ålesund

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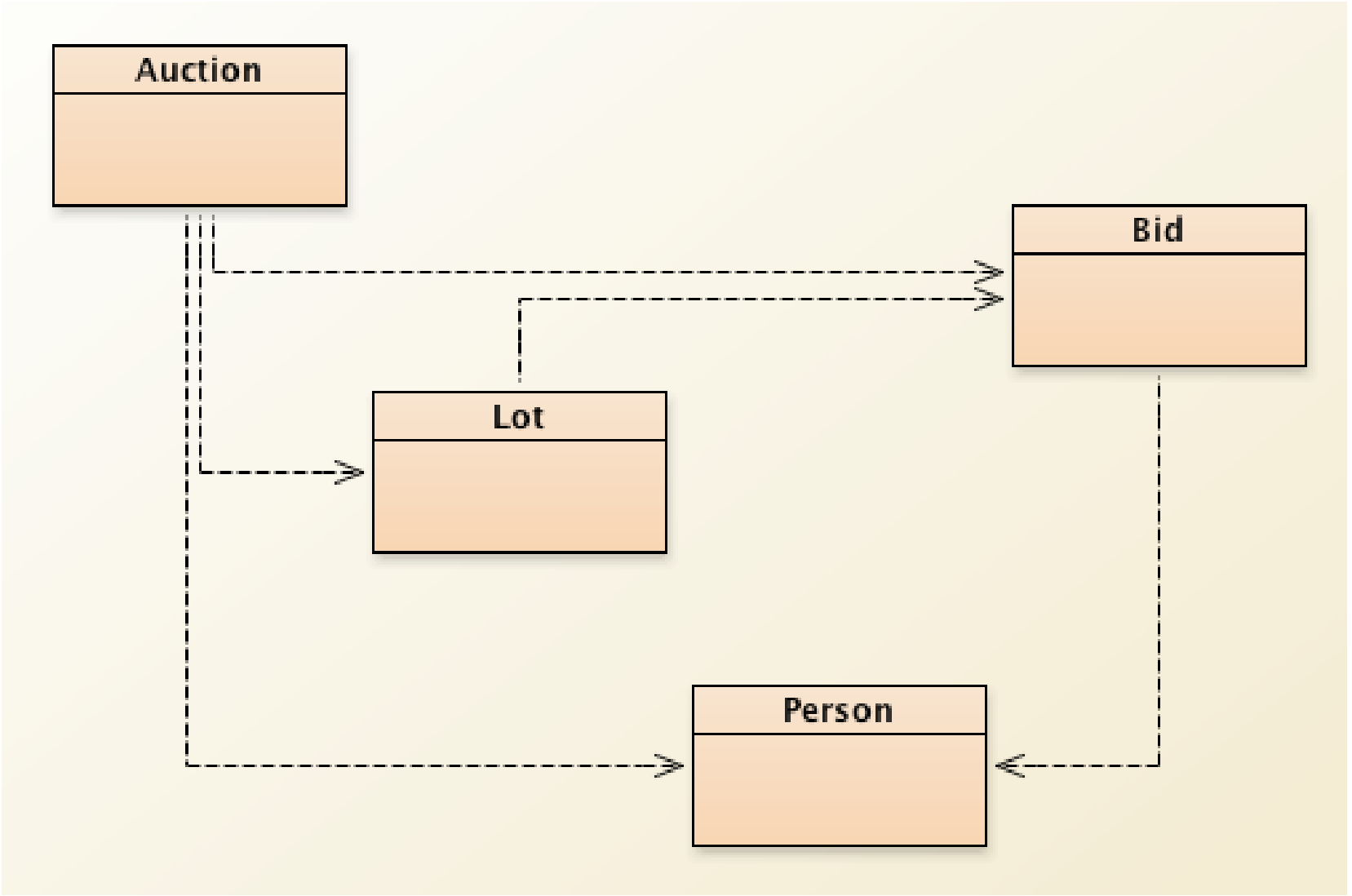
Information System Modelling



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Relations

- Relations between classes (or database tables)
- E.g. e-commerce system
  - A person has a (billing) address
  - A person has made an order
  - An order contains an item
  - An item concerns a product
  - A product is made by a manufacturer

How do we model the information system mathematically?

Abstracting classes and objects

- View a class as a set
  - of possible instances which can be created
- An object O is an instance of some class C
  - i.e. element of the set C, $O \in C$
- Also discuss subsets $S \subset C$ of existing instances
- Or lists of instances
  - e.g. ArrayList,

Abstracting a database

Consider again the data model for an auction system.

- A database table is a set T of rows
- A row *represents* an object O
  - Bijection $T \to C$, where C is the class of O
  - We can write $O \in T$ (by abuse of notation)

In short, set theory provides modelling framework for information systems.

- How do we model relations?

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Abstracting a relational database

- A bid is a row in a *bid* table, T_B
- A lot is a row in a *lot* table, T_L
- How do you relate the *bid* and *lot* tables?

- A special relational table R
- Each row is a pair (*bid*,*lot*)
- The table R is also a set, $R \subset T_B \times T_L$

The subset $R \subset T_B \times T_L$ is called a relation from T_B to T_L.

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Relations in Set Theory

Definition

A relation from X to Y is a set R of ordered pairs (x, y) where $x \in X$ and $y \in Y$.

- If $(x, y) \in R$, we write xRy
  - x is related to y

Definition

A relation on X is a set R of ordered pairs (x_1, x_2) where $x_1, x_2 \in X$.

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Examples of relations

- $a = b$
- $a < b$ (a relation on any ordered set)
- $a|b$ (a is divisible by b)
- $A \subset B$ (for subsets of some universe)

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Exercise

Consider the class diagram in Slide 2. Describe each relation using common words such as has a, contains, belongs to, or any other phrase you deem appropriate.

Your answer should be a list on the form

- *Class A phrase Class B*