

Software Design
CSE 335, Spring 2006

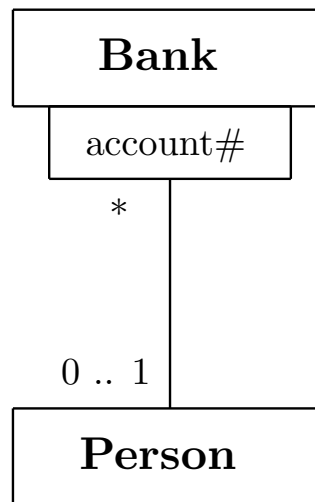
Static Data Modeling

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Some more UML notation

- Qualifiers and associations
- We often identify which attribute is used to partition the set of objects associated with an object across an association



Generalization

- Defn: relationship between class and one or more refined versions of it
- Benefits
 - Powerful abstraction for sharing similarities among classes, while preserving their differences
 - Inheritance is helpful as a vehicle for reusing code
 - Benefits during static modeling
 - * Consolidation of common properties
 - * Identification of *discriminators* that suggest how objects of a given class vary

Exercise

An airline's flight operations has employees that are either pilots or flight attendants. Pilots can be either in the left seat, which designates they are in command, or in the right seat, which designates them as copilot. FAA rules require a pilot and copilot on each flight.

Similarly, there is a lead flight attendant who manages the other flight attendant(s) (if any).

Flights operate on a scheduled basis, as usual, and a flight might be serviced by multiple aircraft, due to size limitations and availability

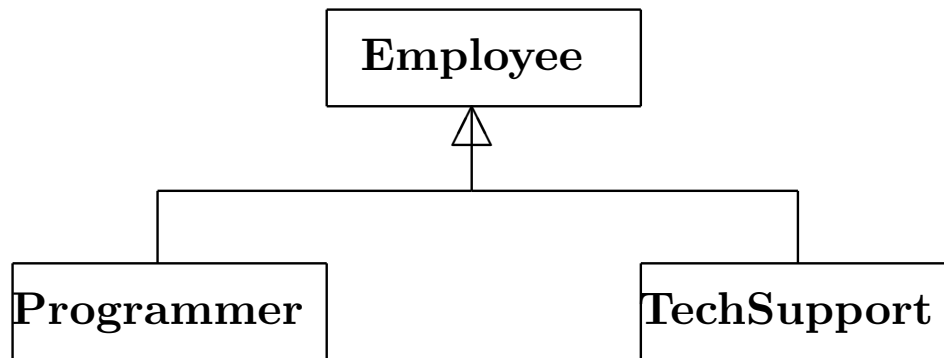
What would the class diagram that models the flight operation look like?

Generalization versus roles

- Common mistake: confusing a derived class with a role in an association
- Examples
 - PIC and co-pilot are two roles that might be played by the same Pilot on different flights
 - The same FlightAttendant may be the lead on one flight, but not on another
 - Separate classes for Pilot and FlightAttendant make sense because these objects do not switch roles.

Other Examples

- If we are not careful, the only way to change a role is to destroy the object and then recreate it
- “.. I’m sorry, the only way the computer can change your status is to terminate you and then rehire you. ”



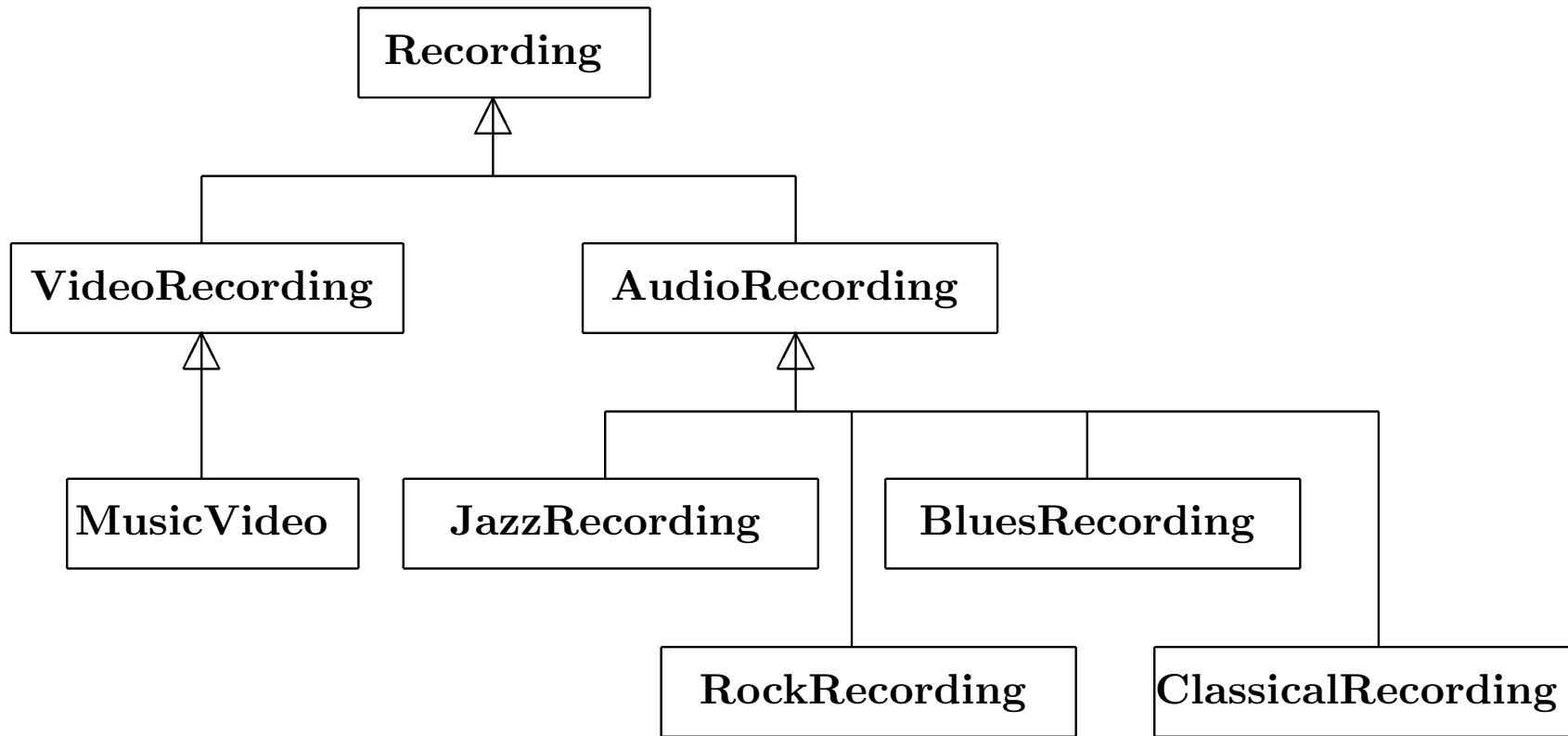
Analysis

- During analysis associations tend to be more important than generalizations
 - Generalization consolidates shared information, but does not change the instances of a model
 - Associations add information to the model

Exercise

For the airline data model, draw an instance diagram of a flight with a pilot, copilot and two flight attendants, one of whom is the head attendant.

Overuse of Generalization

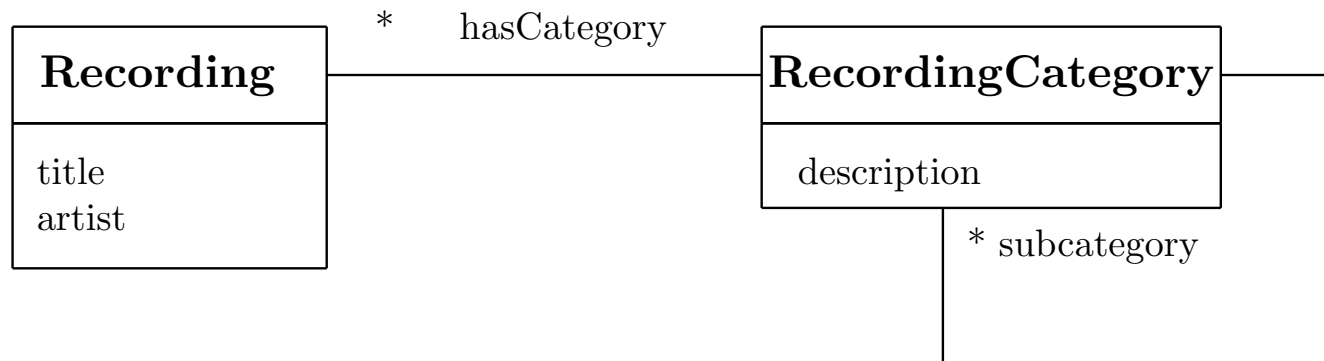


Answer

- Might make sense to distinguish between AudioRecording and VideoRecording
- What attributes or associations could be consolidated through the specialization of AudioRecording?
- Probably better to use an attribute

Alternate Solution

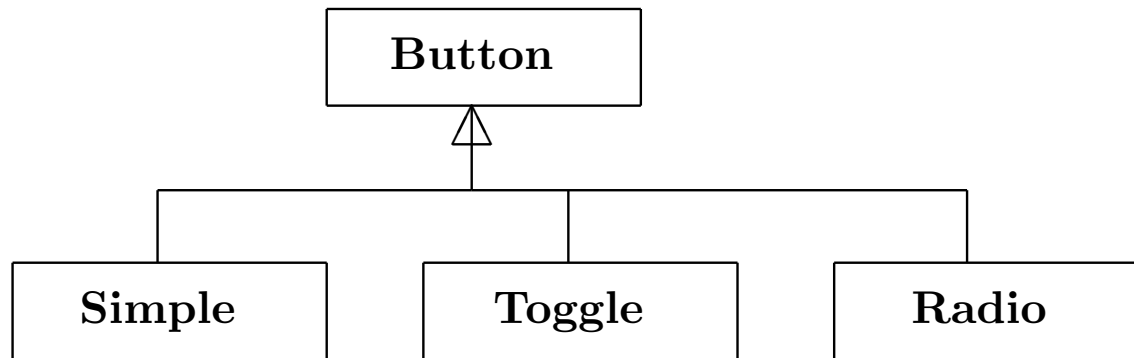
- If there is very little variation in the derived classes, this design models the same data and is more extensible



- Point: if derived classes do not differ substantially consider modeling another way

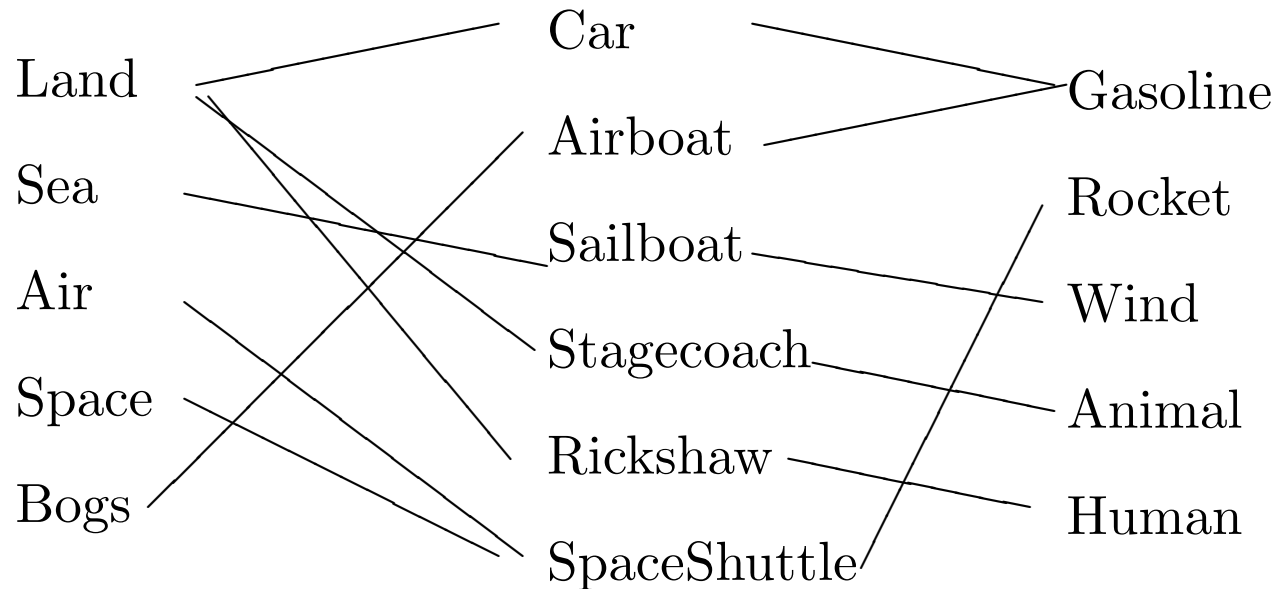
Specialization and Discriminators

- Specialization usually occurs along some characteristic (e.g. behavior)



- Choosing characteristics can be hard
- Derived classes or disjoint (or), but can have multiple dimensions (and)

Example: Multiple Characteristics



Useful to document these characteristics with a *discriminator*

Discriminators

- Special kind of attribute that names a specialization characteristic and documents its various values
- Example
 - Environment = { Land, Sea, Air, Space, Bogs }
 - propulsionMechanism = { Gasoline, Rocket, Wind, Animal, Human }
- Essential to identify discriminators for data with multiple specialization characteristics