Seminar 3: Inheritance
24292-Object Oriented Programming

1 Introduction

The objective of this seminar is to design an object oriented application using the concept of inheritance. The application in question is an online store selling a variety of items, both new and used (i.e. second-hand). In this seminar, the exercise is to design classes that represent users connecting to the online store as well as items being sold. The solution is a class diagram illustrating the relationships between the respective classes, and each class should be fully specified in terms of its attributes and methods. The solution to this exercise will be implemented in Java during Lab session 3.

2 Items

Each item has a name, a type (e.g. a book, a pair of shoes, etc.) and an approximate size (bounding box: width, height, depth). There are three categories of items, classified according to how the price and benefit of the item is calculated:

- Unit item: has a fixed unit price, so the price depends on how many units of the item a buyer wants to purchase. The online store buys the item at a lower unit price, and the benefit of each unit is the difference in price.
- Weighed item: has a price per weight, so the price depends on how much weight of a given item a buyer wants to purchase. The actual price depends on how much weight of the product a buyer wants to purchase. The online store buys the item at a lower price per weight, and the benefit of each unit is the difference in price.
- Auction item: usually a second-hand item, the price is determined by the highest bid among buyers interested in purchasing the item. An auction item has a deadline, i.e. a date and time at which the highest bid is frozen and the item sold to the corresponding buyer at that price. The benefit of the online store is a fixed fee for putting up an item for auction, plus a percentage of the final price.

3 Packaging

Items will be sent in a package. There exists two types of packages; boxes and envelopes. Boxes have different shapes (width, height, depth) and there exists a predefined set of boxes. Envelopes have a fixed size related to their paper size A3,A4,A5 (of known sizes 29x42cm, 21x29cm, 21x11cm, respectively). if the depth of the item is less than 3 centimeters, the item can be sent in an envelope (a book for example). Items have a method that given the available packages returns the best package for that item.

4 Users

There are three types of users interacting with the online store: buyers, sellers and administrators. Each user has a name, an identifier used to log on, and a password.

- Buyers are users that connect to the online store because they want to purchase items from the store. A buyer has to provide an account number, and each time they buy an item the appropriate amount is deducted from their account.
- Sellers are users that want to put up a second-hand item for auction. A seller also has to provide an account number, and each time they sell an item their account is credited with the appropriate amount. At any time a seller may have multiple items up for sale.
- Administrators are users that administer the online store. Possible actions are to expel users whose behavior is inappropriate, manage auctions (e.g. in case the highest bidder refuses to pay for an item), and perform an inventory of the stock (i.e. the physical items sold by the store).

Think about the methods (i.e. functionalities) that each user requires.

5 Online Store

We will design a class corresponding to the online store which manages all users and all items and all packages. The store permanently maintains the total price and total benefit of items that have already been sold.

Draw the class diagram that includes all classes identified so far. Include all relations between classes, including those between users and items.