

Semester-Long Data Abstraction Project

Each group of students will be responsible for developing a full application utilizing object-oriented techniques that are taught in this class. Specifically, the following elements must be incorporated into your project design:

1. Polymorphic collections
2. Abstract classes
3. Interfaces
4. Swing GUI
5. Customized Error Handling
6. File input
7. File output

You will be graded on the following dimensions:

- Good usage of all seven elements above
- Good project design
- Good project documentation (UML, etc.)
- Presentation of your project to the class
- Creativity
- Critical review of another team's project

Project A: The Real Estate Agency

Acme Realty Agency consists of appraisers and realtors that work with various types of properties, such as single family homes that may be one-story (Ranch, Bungalow) or multi-story (Cape Cod, Colonial, Victorian), townhouses, condominiums, apartment buildings which contain multiple units, commercial buildings, and so on. Properties may be rentable if the zoning laws allow. Each building will have a number of rooms, and a variety of features (e.g., swimming pools, fireplace(s), garage, security systems, etc.). When contacted to list a property, the agency will register the property and place it in list of properties to be appraised. Appraisers will select a property from the list which they will compare to a file of similar properties (which may or may not have been handled by Acme) and their recent sales value. They will use that information to set the proper sales price for the property. After a property is appraised, it is placed in a listing and subsequently assigned to a realtor. When properties are sold by Acme realtors, they are placed in a historical file.

Project B: The Security System

Acme Security wants to develop an online alarm system for businesses. There will be different kinds of alarms: e.g., fire alarms, door/window alarms, chemical spill alarms, etc. When an alarm goes off, it needs to be registered into a log. Some alarms are considered critical, and will automatically alert a responding organization. For example, all fire alarms will always alert the fire and police departments, but not all door alarms will (only the ones where the potential loss is very high). Rooms may have multiple or no alarms. The Security department needs to know the status of rooms and be able to view or printout the alarm log. The security system should also be able to read a log of room inspections, which can update the room data with the latest inspection date.

Project C: The Bike Shop

Acme Bike Rentals manages rentals for various kinds of bikes. They keep track of such information as the bike's number, make, model, type (racer, mountain bike, tandem, etc), gender (men's/women's), rental deposit, daily rental charge, renter information, etc. The shop sells or rents various accessories, such as bike helmets and detachable baskets. They also maintain customer records. When a bike is rented, the renter will specify the rental duration and will pay the bike's deposit fee and the rental cost for the estimated rental duration. When the bike is returned late, additional rental charges are applied at the time of return. The shop will print a receipt for a rental which may consist of multiple items. When new bikes are ordered, an electronic list is provided to the bike shop to correspond to the shipment.

Project D: The Airline

Acme Airlines maintains a fleet of airplanes. Some planes are 12-seaters where each row has two seats, with an aisle between them. Odd-numbered seats are on the right (starboard) side of the airplane. Even-numbered seats are on the left (port) side of the airplane. First-class passengers go in the first two rows in the front section of the airplane; coach-class passengers go in the rear section of the airplane. Other planes are 6-seaters with only one seat on each side of the aisle and no first class. Customers who fly with Acme may be "members" of the airline, i.e., either platinum, gold or silver members. Platinum members can register their seats 30 days in advance; gold members 15 days; silver members 7 days. All other passengers pick their seats on the day of the flight. You should enable a graphical display showing all the seats, with passenger names after currently reserved seat numbers and "null" after currently available seat numbers for the attendants, and have another display that distinguishes available and non-available seats for the customers. Seats in an exit row need to display a warning to passengers that they might need to assist the crew in case of an emergency. You will need to print boarding passes for the passengers and be able to upload files of new members.

Project E: The Online Trading Card Game

Acme Gaming, Inc. is preparing to launch its own creature-battle game modelled after its successful physical card game, *Ackemon*. This game will keep track of player information, such as wins, losses, and collected cards. There are two card types: Creature cards and Enhancement cards. On each turn, a player will play a creature card and an enhancement card. You can establish the rules on how many cards of each type players are allowed to hold. Creatures come in different categories, but all of them can inflict damage on their attack and receive damage on the opponent's attack. Some creatures of all categories are considered "rare." You should also establish attack effectiveness rules, e.g. Fire attacks against Water creatures have their effectiveness diminished. Enhancement cards will either increase damage to the opponent or decrease damage to the current creature, but enhancement cards can only work on rare creatures. Players should be able to print out all the cards of their deck and also upload new cards as they purchase new packs.

Project F: The Radio Station

WACM radio station (an Acme subsidiary) has asked you to create an application to keep track of its programming. DJ's will create an online playlist from: a list of the current week's hot songs, a selected list of older songs, sponsored commercials, news reports, traffic reports, and radio station spots. They should have a user interface to select items to fill out a four hour shift. The news and traffic should run periodically. The older songs should not be repeated too frequently, so they need to maintain a date last played so they will not be repeated in a single month. Commercials and spots should have different attributes than songs, which should be different from the reports. A DJ's shift should be printed to a file after he has selected his set for General Manager approval. New songs need to be read from a file so then can be added to the "hot list." All broadcast items should implement a Radio Data System method (see Wikipedia) to display information on what is currently playing

Project G: Extreme Aquariums

Acme Aquarium, Inc. creates custom aquarium setups for the most particular customers. It lets customers pick from a wide variety of fish. Fish are categorized in several ways - by behaviour (i.e., peaceful, semi-aggressive, and aggressive), by preferred swimming areas (i.e., top swimmers, mid-level swimmers, bottom swimmers) and of course fresh water or salt water. Different fish should, therefore, swim and behave differently. In addition to fish selection, the aquarium specialists will create a complete tank including live plants, decorations, and other needed tank components. Of course, at Acme, they will not allow customers to over-populate a tank or build an ecosystem that will not function. With each purchase, Acme will provide an environmental meter which will monitor the percent of chemical substances such as CO₂, O₂ and NH₄; the pH of the tank, and the water hardness and alert customers if something is out of balance. Once a tank has been configured, Acme Aquariums will produce an output file describing the system.

Project H: Online Matchmaking

Why just surf through endless pages of photos and profiles to find a date, when you can use the latest technology at Acme Matchmakers? Simply log into our website and answer a series of questions so we can predict your behaviours, your desires and your dislikes. Once you answer the questions, we will be able to classify your personality type. Since each personality type behaves differently, we will be able to gauge your perspective's response to one of several simulated situations, e.g., "I forgot to text you on your birthday" or "I just booked us a surprise get-away weekend trip for tomorrow" or "I don't really want to have children - EVER". You will be able to see a list of potential dates and put them through situations like these and watch them respond. Acme will also provide you with an output file that lists potential matches and their characteristics - sorted by suitability to you. Once you select your perfect match, Acme will recommend the perfect date for you both, based on your preferences - such as a picnic in the woods, or binge-watching Sci-Fi movies, or ...