ENPM808X - Week 2

Tanuj Thakkar
Master of Engineering in Robotics
University of Maryland - College Park
tanuj@umd.edu

1. **Software Engineering 3.13**
   What is inheritance in object-oriented technology? Give an example.

   The capability of a class to derive properties and characteristics from another class is called Inheritance. Inheritance is one of the most important features of Object-Oriented Programming. Inheritance is a feature or a process in which new classes are created from the existing classes. The new class created is called “derived class” or “child class” and the existing class is known as the “base class” or “parent class”. The derived class now is said to be inherited from the base class.

   Consider a class Vehicle defined to represent all types of vehicles that exist. Now, there are child classes for Bus, Cars, Trucks, etc, which can derive from the parent class Vehicle which represents the broad category of vehicles.

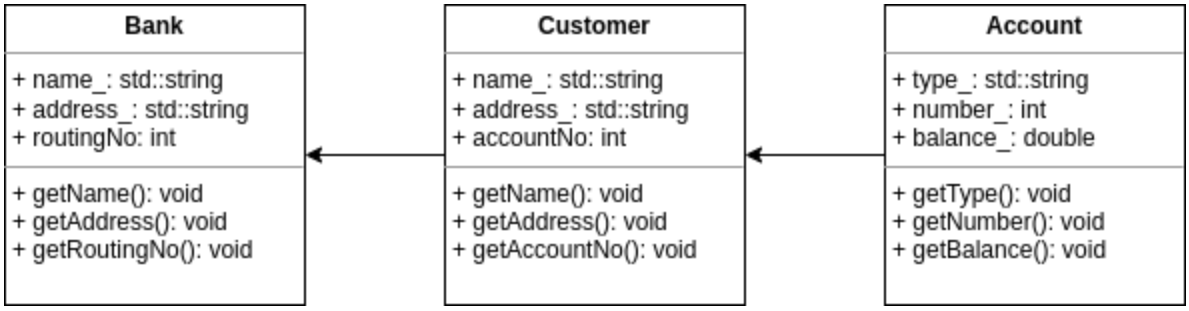
2. **Software Engineering 3.14**
   What is the difference between an object and a class in OO technology?

   Class is a structure that represents a category or type of entity with various attributes. An object is just an instance of the class. There can be multiple objects for the same class.

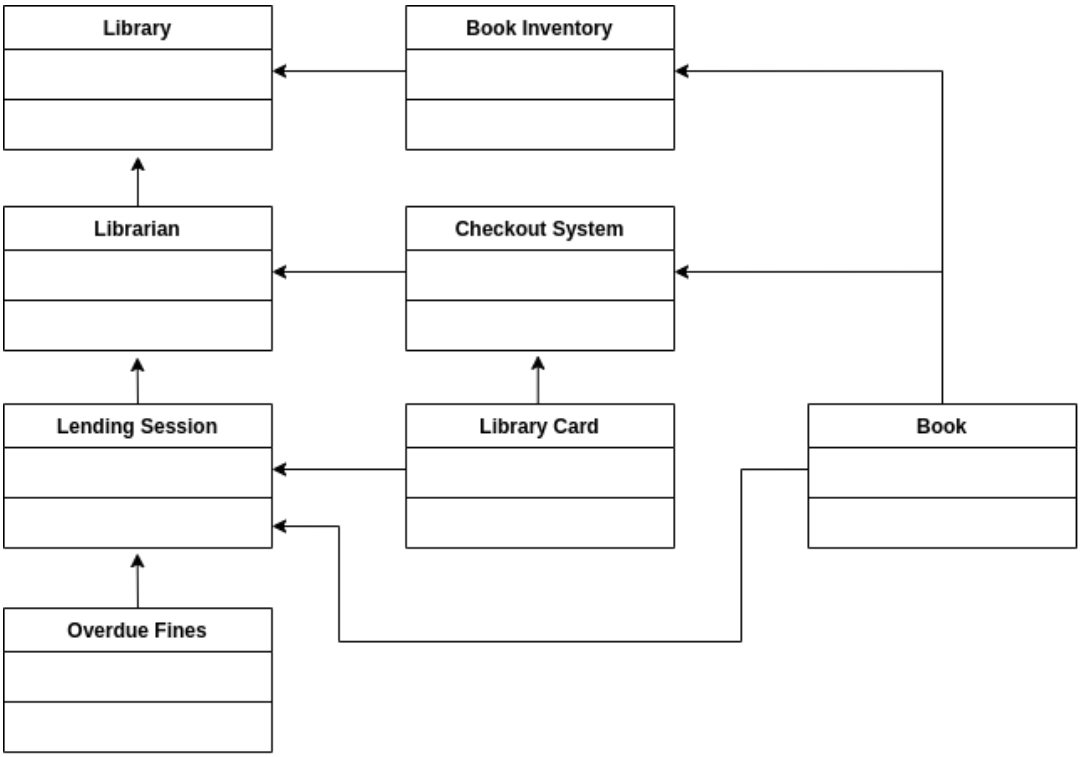
3. **Software Engineering 3.15**
   Describe the role of polymorphism in object-oriented technology. Give an example.

   Polymorphism can be defined as the ability of a message to be displayed in more than one form. In object-oriented terms, Polymorphism is a that allows the use of a derived type in the place of the base type. For example, a person who at the same time can have different characteristics.

4. **Software Engineering 4.1**
   Draw a class diagram of a small banking system showing the associations between three classes: the bank, customer, and the account.



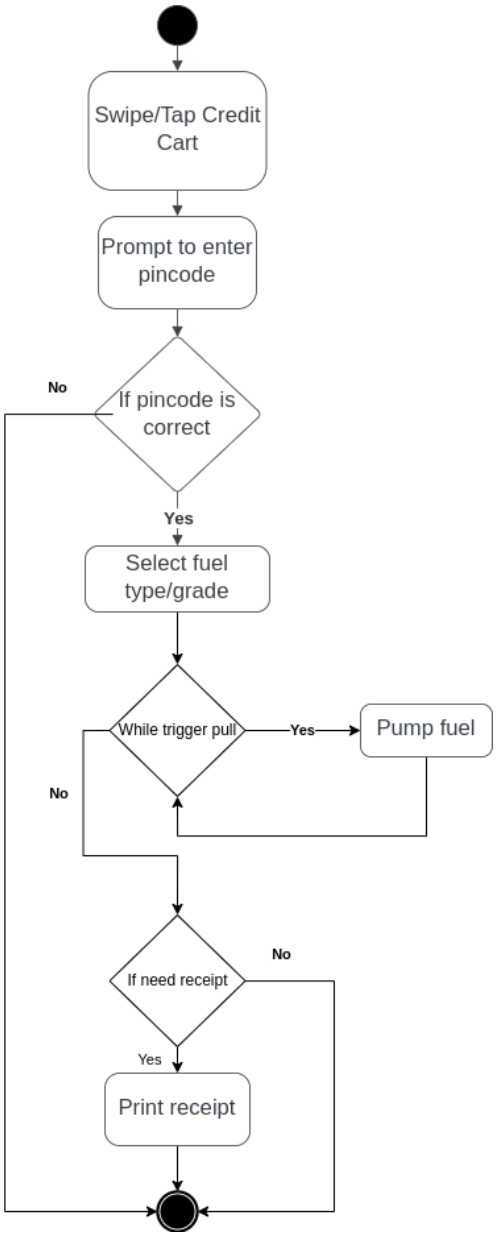
5. **Software Engineering 4.2**
   Draw a class diagram of a library lending books using the following classes: Librarian, Lending Session, Overdue Fine, Book Inventory, Book, Library, Checkout System, and Library Card.



• Library: The main agency for software development. For identification, it has characteristics like an address and a name.
• Librarian: The official who has the power to lend books. Using the name and librarian ID, it can be located.
• Library card: Each user will receive a card that they can use to prove who they are while borrowing and returning books.
• Lending Session: Controls the checking out of book items and precise calculations.
• Book: The most fundamental component is the book, which contains all the information (ISBN, title, author, etc.).

• Book Inventory: This list of books and the information it contains are used to determine whether a certain book is available and where it is.
• Overdue Fees: This section handles accurate calculation from the date the book is issued until it is returned.
• Checkout System: This tool is in charge of handling books.

6. **Software Engineering 4.3**
Draw an activity diagram of pumping gas and paying by credit card at the pump. Include at least five activities, such as "Select fuel grade" and at least two decisions, such as "Get receipt?"



7. **Software Engineering 4.5**
   Explain how a class dependency graph differs from a UML class diagram.

   Class dependency graph represents classes and more specifically, their dependencies whereas UML class diagrams represent the classes and their relationships. Class dependency graph is similar in graphical notation to UML diagrams but represented as a directed graph.