

Practical No : 6

Aim : Modeling UML Class Diagrams and Sequence Diagrams on Agriculture Product Management System

Introduction

Unified Modeling Language (UML) is a standard modeling language used to visualize, design, and document software systems. It provides a set of diagrams that help developers understand both the **structural** and **behavioral** aspects of a system.

In this practical, UML is applied to the **Agriculture Product Management System (APMS)**. This system helps in managing farmers, companies, products, loans, and orders in an agricultural ecosystem. By creating UML Class and Sequence Diagrams, the system can be analyzed, designed, and implemented more effectively.

Objective

- To understand the role of UML in software engineering.
 - To model the **structural** aspects of APMS using Class Diagrams.
 - To model the **behavioral** aspects of APMS using Sequence Diagrams.
 - To study how UML supports system analysis, design, and documentation.
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Theory

- **UML (Unified Modeling Language):** A visual modeling language that defines a standard way to design and document systems.
- **Class Diagram (Structural Diagram):** Represents the static structure of the system, showing classes, attributes, methods, and relationships.

- **Sequence Diagram (Behavioral Diagram):** Represents the dynamic behavior of a system by showing how objects interact in a time sequence.
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Structural Aspects (Class Diagram)

The **Agriculture Product Management System** consists of multiple entities:

- **Farmer:** farmer_id, farmer_name, contact, address
- **Company:** company_id, company_name, address
- **Product:** product_id, product_name, product_type
- **Loan:** loan_id, loan_amount, loan_date, completion_date
- **Order:** order_id, order_date, quantity, total_amount

Relationships:

- A Farmer can place multiple Orders.
- A Farmer can take multiple Loans.
- A Company supplies Products.
- An Order contains Products.

★ UML Class Diagram Structure:

- Farmer ↔ Order (1..* relationship)
 - Farmer ↔ Loan (1..* relationship)
 - Company ↔ Product (1..* relationship)
 - Order ↔ Product (.. relationship, via association)
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Behavioral Aspects (Sequence Diagram)

The **Sequence Diagram** illustrates the interaction between system entities when a farmer places an order.

Steps:

1. Farmer logs into the system.
2. Farmer searches for available products.
3. System fetches product details from database.
4. Farmer selects a product and places an order.
5. System processes the order and updates records.
6. Confirmation message is sent to the farmer.

✦ Sequence Diagram Components:

- Objects: Farmer, System UI, Product, Order, Database
 - Messages: login(), searchProduct(), displayProducts(), placeOrder(), confirmOrder()
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Composition

- **Structural Composition:** Classes (Farmer, Company, Product, Order, Loan) with attributes and operations.
- **Behavioral Composition:** Interactions between Farmer and System during order placement.
- **Integration:** Both diagrams complement each other – the class diagram defines the system's static model, while the sequence diagram defines its dynamic workflow.

References

1. Booch, G., Rumbaugh, J., & Jacobson, I. (1999). *The Unified Modeling Language User Guide*. Addison-Wesley.
2. Sommerville, I. (2016). *Software Engineering (10th Edition)*. Pearson.
3. UML 2.5.1 Specification – Object Management Group (OMG).

