OBJECT MODELLING USING UML

Model

A model captures aspects important for some application while omitting (or abstracting) the rest. A model in the context of software development can be graphical, textual, mathematical, or program code-based. Models are very useful in documenting the design and analysis results. Models also facilitate the analysis and design procedures themselves. Graphical models are very popular because they are easy to understand and construct. UML is primarily a graphical modeling tool. However, it often requires text explanations to accompany the graphical models.

Need for a model

An important reason behind constructing a model is that it helps manage complexity. Once models of a system have been constructed, these can be used for a variety of purposes during software development, including the following:

- Analysis
- Specification
- Code generation
- Design
- Visualize and understand the problem and the working of a system
- Testing, etc.

In all these applications, the UML models can not only be used to document the results but also to arrive at the results themselves. Since a model can be used for a variety of purposes, it is reasonable to expect that the model would vary depending on the purpose for which it is being constructed.

Unified Modeling Language (UML)

UML, as the name implies, is a modeling language. It may be used to visualize, specify, construct, and document the artifacts of a software system. It provides a set of notations (e.g. rectangles, lines, ellipses, etc.) to create a visual model of the system. Like any other language, UML has its own syntax (symbols and sentence formation rules) and semantics (meanings of symbols and sentences). Also, we should clearly understand that UML is not a system design or development methodology, but can be used to document object-oriented and analysis results obtained using some methodology.

UML Diagrams

UML can be used to construct nine different types of diagrams to capture five different views of a system. Just as a building can be modeled from several views (or perspectives) such as ventilation perspective, electrical perspective, lighting perspective, heating perspective, etc.; the different UML diagrams provide different perspectives of the software system to be developed and facilitate a comprehensive understanding of the system. Such models can be refined to get the actual implementation of the system. The UML diagrams can capture the following five views of a system:

- User’s view
- Structural view
- Behavioral view
- Implementation view
- Environmental view

UML Diagrams

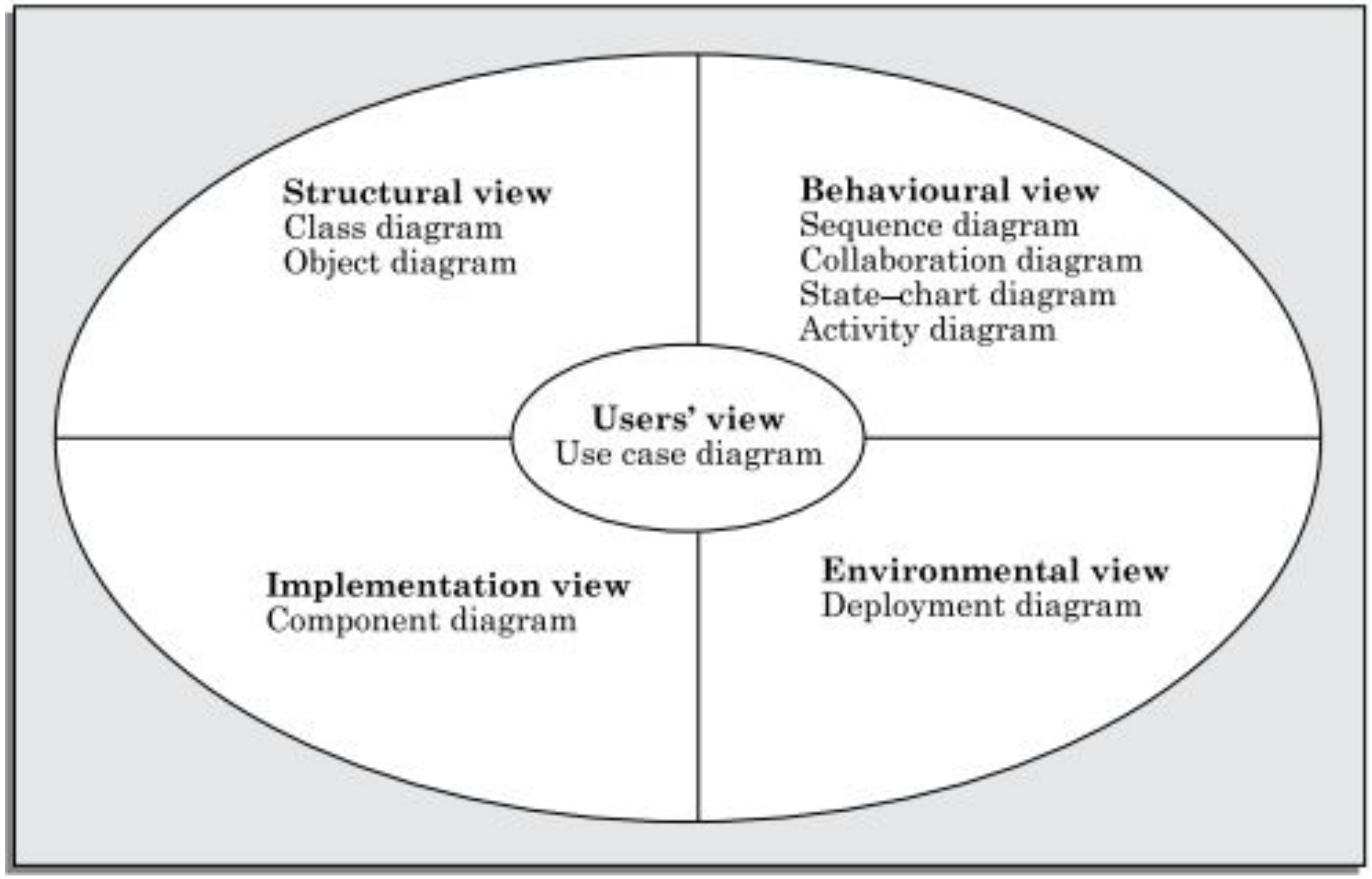

FIGURE: Different types of diagrams and views supported in UML.

UML Diagrams

User's view: This view defines the functionalities (facilities) made available by the system to its users. The users' view captures the external users' view of the system in terms of the functionalities offered by the system. The users' view is a black-box view of the system where the internal structure, the dynamic behavior of different system components, the implementation etc. are not visible. The users' view is very different from all other views in the sense that it is a functional model compared to the object model of all other views. The users' view can be considered as the central view and all other views are expected to conform to this view.

Structural view: The structural view defines the kinds of objects (classes) important to the understanding of the working of a system and to its implementation. It also captures the relationships among the classes (objects). The structural model is also called the static model, since the structure of a system does not change with time.

UML Diagrams

Behavioral view: The behavioral view captures how objects interact with each other to realize the system behavior. The system behavior captures the time-dependent (dynamic) behavior of the system.

Implementation view: This view captures the important components of the system and their dependencies.

Environmental view: This view models how the different components are implemented on different pieces of hardware.

Use Case Model

The use case model for any system consists of a set of “use cases”. Intuitively, use cases represent the different ways in which a system can be used by the users. A simple way to find all the use cases of a system is to ask the question: “What the users can do using the system?”

Example: For the Library Information System (LIS), the use cases could be:

- issue-book
- query-book
- return-book
- create-member
- add-book, etc

Use Case Model

- Use cases correspond to the high-level functional requirements.
- The use cases partition the system behavior into transactions, such that each transaction performs some useful action from the user’s point of view.
- To complete each transaction may involve either a single message or multiple message exchanges between the user and the system to complete.
- The purpose of a use case is to define a piece of coherent behavior without revealing the internal structure of the system.
- The use cases do not mention any specific algorithm to be used nor the internal data representation, internal structure of the software.
- A use case typically involves a sequence of interactions between the user and the system.

Use Case Model

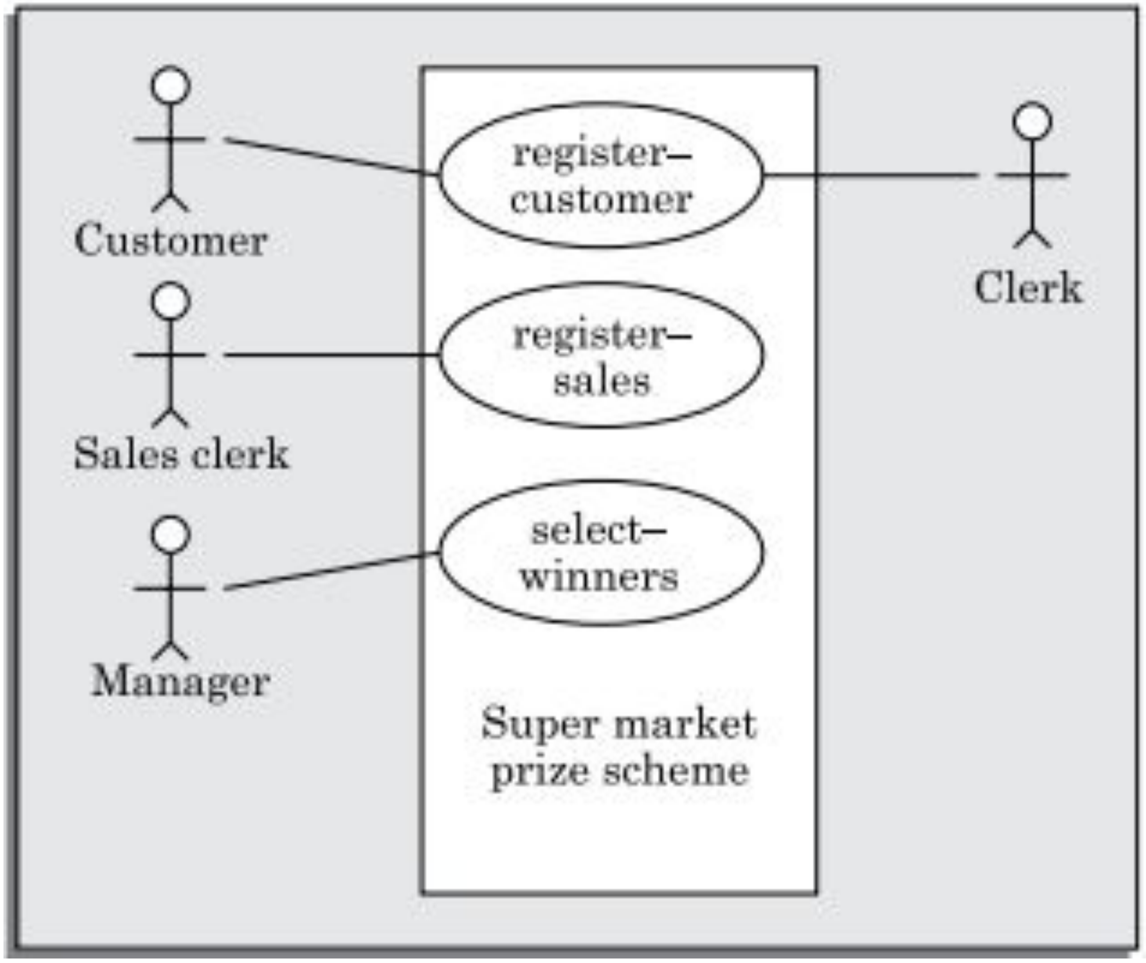

Figure: The use case diagram of the Super market prize scheme