Object-Oriented Systems Development: Survey of Structured Method

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Object-Oriented Concepts

- Three principles that make OOD to improve software design for reliability and maintenance.
- Abstraction: Objects are an abstraction of parts of real-world. More maintainable and reusable.
- Encapsulation: Objects hide their internal contents from other components to improve maintainability.
- Inheritance: By organizing objects in class hierarchies to promote reuse.

Eveluation of Modeling Components

- Object V.S Traditional Concepts of Entities and Functions
  - Objects are close to entity concept. I.e. a collection of attributes, objects add activities to entity
  - Objects are a type with one or more instance of type, same as entity-type concept
  - Object instances may be changed by events and record state changes

Eveluation of Modeling Components

- Booch divides objects into actors, agents, and servers
- Actors are object that perform actions which influence other objects in the system
- Servers are the recipients of an actor's activity and related to the database entity concept
- Agents are an amalgam of both characteristics

Evaluation Procedure

- Conceptual modeling
  - The data and processing control parts of a system are modeled in one unit rather than separately
  - The mehtod produces model of objects commuicating by messages
  - Classification of objects is supported with property inheritance

Evaluation Procedure

- Procedure and Guidance
  - The method should guide the analyst towards identifying and describing objects
  - Guidance should be available for analysis, specification and design phases
- Transformations and products
  - Design transformation should support change of OO specifications into designs implementable in OOP languages

Object-Oriented Methods

- Hierarchical Object-Oriented Design(HOOD)
  - HOOD supports object classes
  - But HOOD Real-Time design method
  - Inheritance specification is not detailed
  - Reuse support is not explicit

Object-Oriented Methods

- Object-Oriented System Design(OOSD)
  - OOSD provides a detailed notation for object class and manage of inheritance
  - OOSD suplies detailed notation for encapsulation
  - The notation can become overcrowded and difficult to read

Object-Oriented Methods

- Object-Oriented System Analysis(OOSA)
  - OOSA is prototyping approach
  - Main criticism of OOSA is its lack of support for inheritance
  - Reuse is not explicitly supported

Object-Oriented Methods

- Object-Oriented Analysis (OOA)
  - OOA cover all OO concepts, although it is an analysis method
  - Abstraction is helped by the structured layer
  - Specification of encapsulation is not as detatiled as in OOSD or HOOD

Object-Oriented Methods

- ObjectOry(Object Oriented Methology)
  - This method supports OO concepts of classification, encapsulation and inheritance
  - ObjectOry adds concepts of “uses case” to OO approach
- Consequently, no complete OO method exists

Object-Oriented Methods

Method	Abstraction	Classification	Inheritance	Encapsulation	Coverage (R-A-S-D-I)
HOOD	Y	Y	Partial	Y	-----
OOSD	Y	Y	Y	Y	------
OOSA	Y	Partial	-	-	------
OOA	Y	Y	Y	-	-------
ObjectOry	Y	Y	Y	Partial	--------

R-A-S-D-I: Requirements, Analysis, Specification, Design and Implementations

Feature analysis of Object-Oriented methods

Structured Methods

- Information Engineering (IE)
  - Encourage data modeling
  - Functional specification uses process dependency and action diagram, separated from data modeling

Structured Methods

- Information System Activity and Change Analysis (ISAC)
  - ISAC advocates top-down functional decomposition of processing and data
- Structure Analysis/Structured Design (SASD)
  - SASD use top-down functional decomposition to analyse system in terms of a network of processes connected by dataflow messages
- Structrued Systems Analysis and Design Method(SSADM)
  - SSADM is a composite method derived from structured analysis, structured design and data analysis.

Structured Methods

- Structured Analysis and Design Technique (SADT)
- Jackson System Development (JSD)
- Nijssen's Information Analysis Method (NIAM)
- Mascot-3

Structured Methods

Method	Functional Process	Data relationship	Event sequence	Coverage (R-A-S-D-I)	Application
IE	Y	Y	Y	----------	IS
ISAC	Y	Y	N	------	IS
SASD	Y	N	Y	---------	IS
SSADM	Y	Y	Y	----------	IS
SADT	Y	Y	N	-----	IS, RT
JSD	N	Y	Y	--------	IS, RT
NIAM	Y	Y	N	--------	IS (data intensive)
Mascot	Y	N	N	--------	RT

IS: Information System, RT: real-time

Summary of method specification models and approaches

Conclusion

- Use of a particular system development method will bias implementation of OO systems, OO design may not derived from any specification
- Data model and OO specification show considerable convergence. It is feasible to migrate from structured method such as JSD, IE and SSADM to OO Method.
- Functionally based development methods are less well suited to development of OO system.
- OO methods have yet proven in practice, they have little CASE tool support, lack of modeling techniques for reuse system development.