CMSC 128

Introduction to Software Engineering
Second Semester AY 2009-2010

jachermocilla@uplb.edu.ph

Analysis Concepts

- Complete understanding of software requirements is essential to project success
- Requirements analysis task is a process of discovery, refinement, modeling, and specification
  - Starting point is the software scope, further refined
  - Models of data, information, control flow, and operational behavior are created

Analysis Concepts

- Both the developer and the customer plays an active role in requirements analysis and specification
  - Customer reformulates software function into concrete detail
  - Developer acts as interrogator, consultant, and problem solver
- Requirements analysis and specification requires heavy communication
  - Misinformation, misinterpretation, ambiguity

Analysis Concepts

Customer:

'I know you believe you understood what you think I said, but I am not sure you realize that what you heard is not what I meant'

Requirements Analysis

- Bridges the gap between system-level software allocation and software design
  - System engineer: specify software function and performance
  - Analyst: refine software allocation and build models
  - Software Designer: use models to create design

Requirements Analysis

- Areas of effort
  1)Problem recognition
  2)Evaluation and synthesis
  3)Modeling
  4)Specification
  5)Review

Requirements Analysis

- Problem Recognition
  - Achieved by communicating with the clients
- Problem Evaluation and Systhesis
  - Define all externally observable data objects, evaluate flow and content of information, define and elaborate all software functions, etc.
  - Solution is synthesized based on the result of evaluation

Requirements Analysis

- Problem Evaluation and Systhesis
  - Stops when customer and analyst feel confident that software can be adequately specified
  - Focus on 'what'
- Modeling
  - Data, functions, flow
  - Model serves as foundation of design and creation of the specification

Communication

- Initiating communication
  - Initial inteview
    - Ask context-free questions to establish scope
- Facilitated Application Specification Techniques (FAST)
  - Forces developers and customers to work as a team
  - Meeting is conducted in a neutral site with a facilitator
  - Goal is to identify problems and propose solutions

Analysis Principles

- Information domain of the problem must be represented and understood
- Functions that the software is to perform must be defined
- Behavior of software must be represented
- Models created must be partitioned in a manner that uncovers detail in a layered fashion
- Analysis should move from essential to implementation view

Analysis Principles

- Understand the problem before creating the analysis model
- Develop prototypes to understand how human-machine interaction will occur
- Record the origin of and reason for every requirement
- Use multiple views of requirements
- Prioritize requirements
- Work to eliminate ambiguity

Information Domain

- Contains data and control
- Three views
  - Information content
    - Individual data and control object objects
    - ex. paycheck
  - Information flow
    - Represents the manner in which data and control change as each moves through a system
  - Information structure
    - Internal organization of various data and control items

Modeling

- Used to gain a better understanding of the actual entity to be built
- Focus on what the system must do and not how it does it
- Uses graphical notation, portions use text, others use specialized languages
- Functional Models and Behavioral Models

Modeling

- Roles of models
  - Aids in understanding the information, function, and behavior of a system, makes requirements analysis more systematic
  - Models become a focal point of review, key to determination of completeness, consistency, and accuracy of specifications
  - Model becomes the foundation of design

Partitioning

- Decomposes a problem into its constituent parts
- Establish a hierarchical representation of information and function
- Partition uppermost element by
  - Exposing increasing detail by moving vertically
  - Decomposing the problem by moving horizontally

Essential and Implementation View

- Essential view
  - Presents the function to be accomplished and information to be processed without regards to implementation details
- Implementation View
  - Presents real-world manifestations of processing functions and information structures
  - Not necessarily the 'how' but represents the current mode of operation

Prototyping

- Model of software to be built is developed
- Throw-away Prototyping
  - When requirements are unstable
  - Requirements are ambiguous
- Evolutionary Prototyping
  - Stable requirements
  - No contradictions in requirements

Prototyping

- Methods and Tools
  - 4GT
  - Reusable software components
  - Formal Specification and Prototyping environments

Specification

- May be viewed as a representation process
- Some principles
  - Separate functionality from implementation
  - Establish the context in which software operates
  - Develop cognitive model as perceived by the user community
  - Must be tolerant of incompleteness
  - Amenable to change

Specification

- Representation
  - Format and content should be relevant to the problem
  - Information contained within the specification should be nested
  - Diagrams and other notational forms should be restricted in number and consistent in use
  - Representations should be revisable

SRS

- Software Requirements Specification
- Produced at the culmination of the analysis task

SRS

I. Introduction

II. Information Description

III. Functional Description

IV. Behavioral Description

V. Validation and Criteria

VI. Bibliography

VII. Appendix

Specification Review

- Conducted by both the developer and customer
- Check to see whether the specification is complete, consistent, and accurate
- Some questions that must be answered
  - Do stated goals and objectives for software remain consistent with system goals and objectives?
  - Have all important interfaces to all system elements been described?

Specification Review

- Some questions that must be answered
  - Is information flow and structure adequately defined?
  - Are design constraints realistic?
  - Have validation criteria been stated in detail?
  - Has the user reviewed the preliminary user's manual or prototype?

Summary

- Requirements analysis is the first technical step in the software engineering process
- Software scope is refined into a concrete specification
- Analysis must focus on the information, functional, and behavioral domains of a problem
- Modeling,partitioning,representation, and specification are important

Reference

- Roger S. Pressman.Software Engineering: A Practitioner's Approach, 4th Ed.McGraw-Hill,1997. Chapter 11