IT Entrepreneurship and Management

Day 4 Designing

Charoen Vongchumyen

Email : charoen.vo@kmitl.ac.th

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Thank to Tsuneo Yamaura

Designing

A bride between specification and source code.

Software design

- Requirement spec. phase
  - The process define “WHAT” of developed software
  - Determines the OUTERNAL interface and function.
  - If you fail in this process, The entire software development will be collapsed.
  - Then move next to Design phase

Software design (con't)

- Design phase
  - The process that defines "HOW" of the developed software.
  - Determines the INTERNAL interface and function
  - If you fail in this process, you can recover.

Func. Spec.	Design	Coding Debug	Test	Maintenance

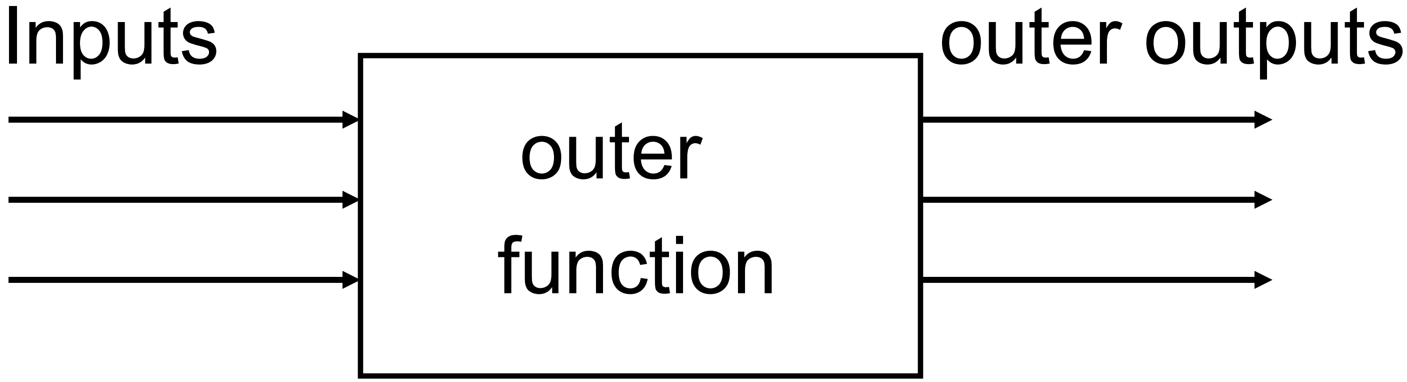
Design Methodology

- In design, do the following based on the required spec.

  1. Structural design
  2. Modularization

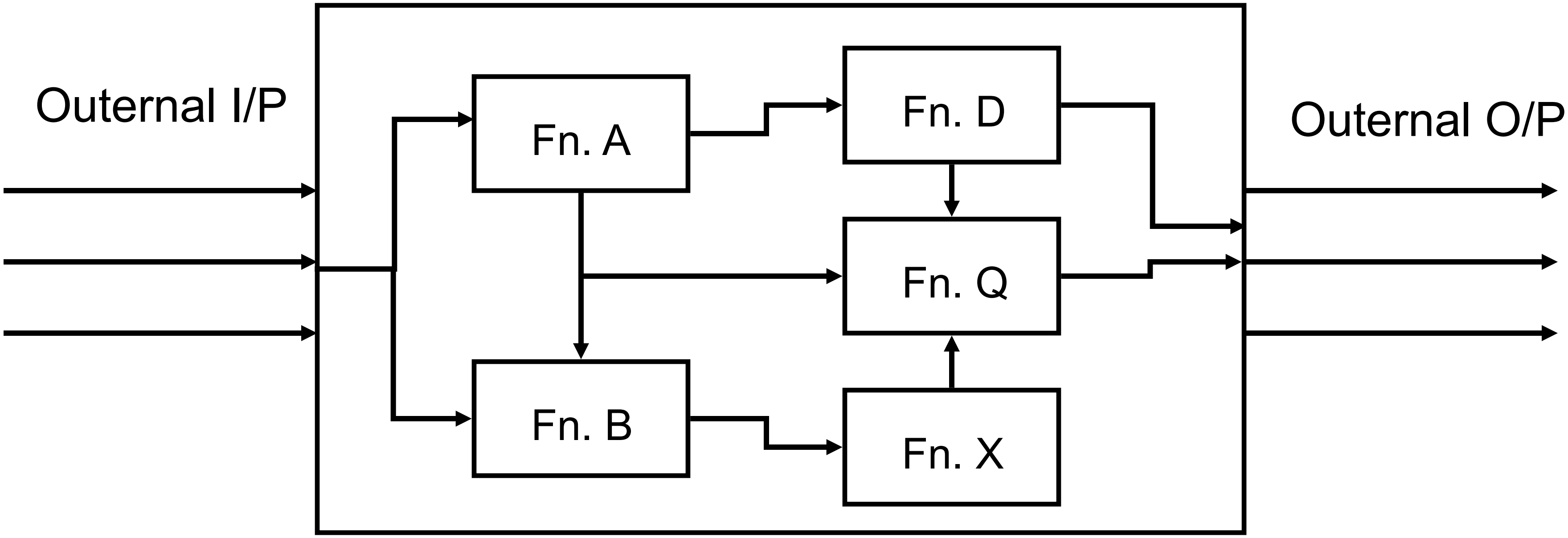
  - Picks up algorithm and determine data structure.
  - Requirement spec. define inputs and outputs.
  - Design phase, define internal inputs and outputs.

Requirement spec.



define by the requirement specification

Design phase



Breaking the req spec into internal function seamlessly

Design process

1. Requirement specification
2. Structural design

   Describe the structure of the entire module

   Step wise decomposition

3. Detailed design

   Describe the detail of each module

   charts, figures, pseudo-code, etc.

What is Modules?

Modules : the smallest unit of the software

Ex. subroutine of ASM, function of C, Java class

How to modularize?

Modularization : For handling the complexity of the software.

1. Layering
2. Modeling
3. Separation
4. Abstraction
5. Isolation

Modularization

1. Layering

   Step wisely breaking the software abstraction → one way

2. Modeling

   Replace a part of the software with know model of easier analysis.

Both are vertical

Modularization

3. Separation

   Break the software function to smaller piece (function wise)

4. Abstraction

   Hide something should not know (information hiding)

5. Isolation

   Get a single function

All are horizontal

Software design method

- Step wise refinement
- The oldest method (Wirth 1971)
- Use flowcharts, pseudo-language, natural language to refine and break the spec.
- When to stop?

→ when you think, you can code.

Four criteria's of modularization

1. Module size
2. Level of information hiding
3. Module coupling
4. Module cohesion

Criteria's of modularization

1. Module size

   Module should be small around 100LOC

2. Level of information hiding
   - Replace with the known module and analyze the model
   - Encapsulation

Criteria's of modularization

3. Module coupling

- How the functions and instructions in module are couple
- Module independence (Higher the better)

4. Module cohesion

How two modules are related (Lower the better)

- Coincidental cohesion
- Inter-module coupling
- Data coupling (the best one)

Data coupling

- Passes only necessary part of data
- The callee uses all of the data structure

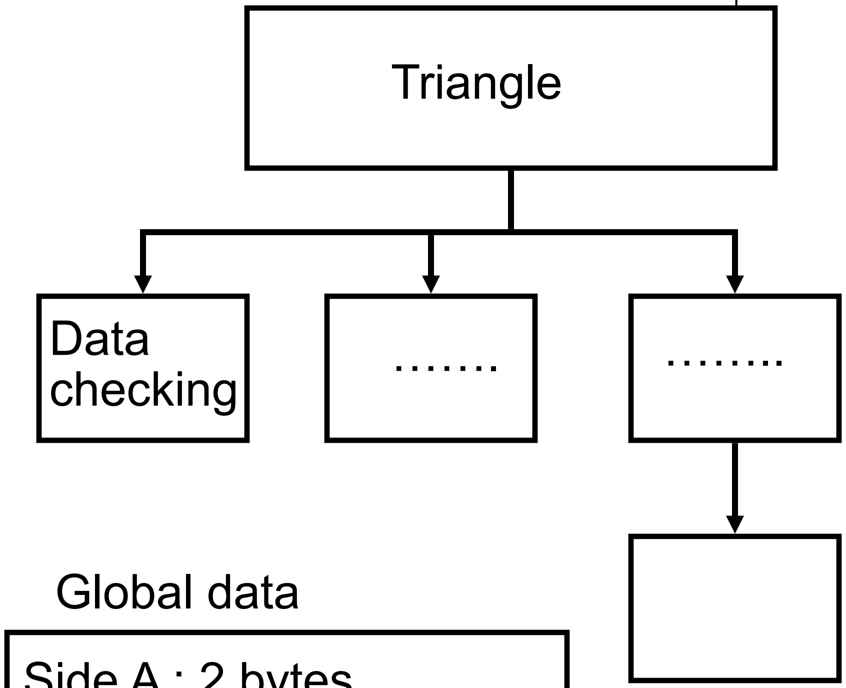
- All the module should be “Data coupling”

Example

Module name
Description
Input data xxxx : used for
Output data yyyy : used for
Details of functions
Callee/ Caller

Module description

Module Relation



Global data

Side A : 2 bytes
4 digits integer
Side B : …….

Practice

Design the Triangle program from your previous specification.