Elective-I Software Engineering(IT05TPE11)
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B. TECH. IT 5TH SEM
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Unit-3 System Design

- Problem Partitioning
- Abstraction
- Top Down & Bottom Up Design
- Structured Approach
- Coupling & Cohesion
- Functional Vs Object Oriented Approach
- Design Specification & Verification
- Metrics

Design

- Bridge between Requirement specification & final solution…
- Produce a model or representation of a system…..
- 2 Levels…
  - System design or Top Level Design or High level design
  - Detailed design or logic Design or Low level design

- Design Methodology……
- Input to design phase…..
- Design can be----
  - Function Oriented
  - Object Oriented

Design Principles

- Verifiable
- Complete
- Traceable
- Important Properties of Design----
  - Efficiency
  - Simplicity
  - Maintainability

Question for Students*

- Difference Between Modeling(DFD) in Problem Analysis Phase & Design Phase???

Problem Partitioning

- Divide & Conquer……
- No of module increase - Communication increase – Complexity increase…..
- Simplicity & understandability……
- Design verification….
- Hierarchy……

Abstraction

- Describes the external behavior without bothering with the internal details…….
- Determines components of a system..
- How component interact each other….
- How they are isolate..
- Functional Abstraction..
- Data Abstraction…

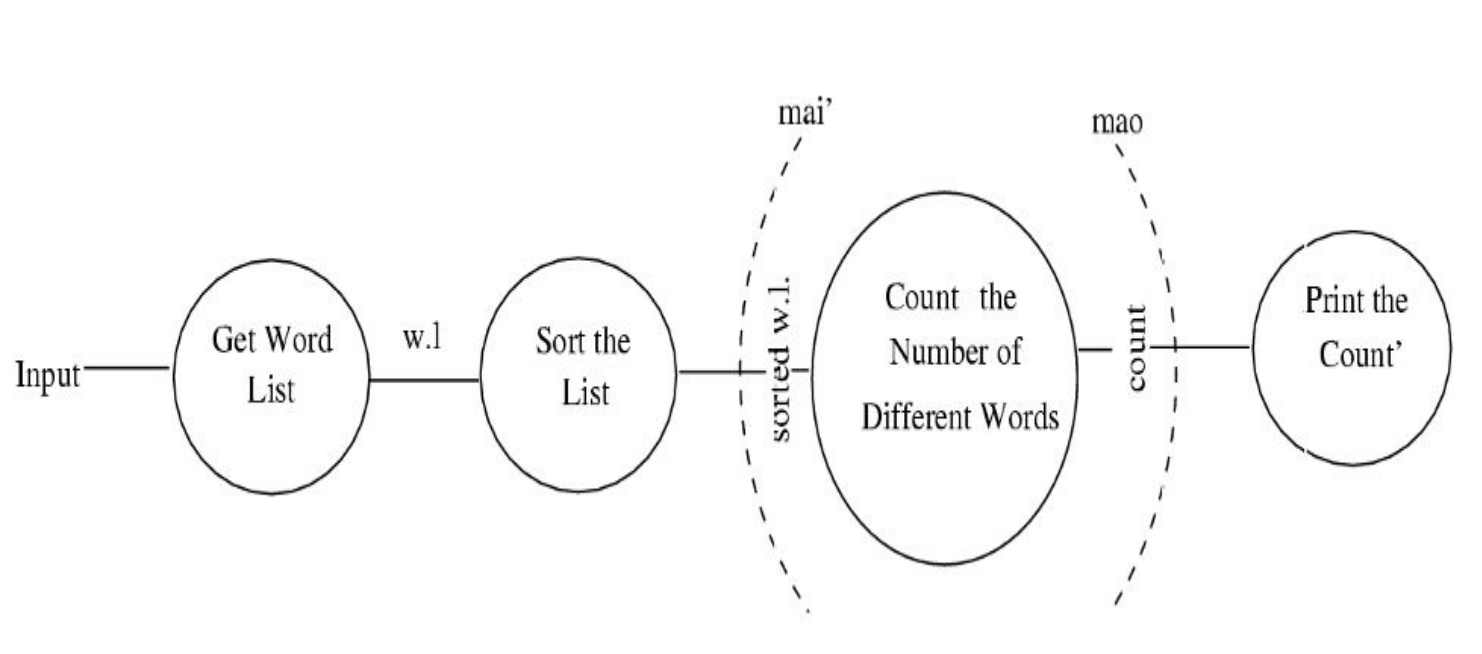
Top Down & Bottom Up Strategy

- Starts from Highest, lowest level component…
- refinement, Layers of abstraction
- Water fall model, Iterative Enhancement model…

Structured Approach

- Restate the problem as a DFD
- Identify the most abstract input &output data element
- 1st level factoring
- Factoring the input, output & transform branches
- Design heuristics
- Transaction analysis

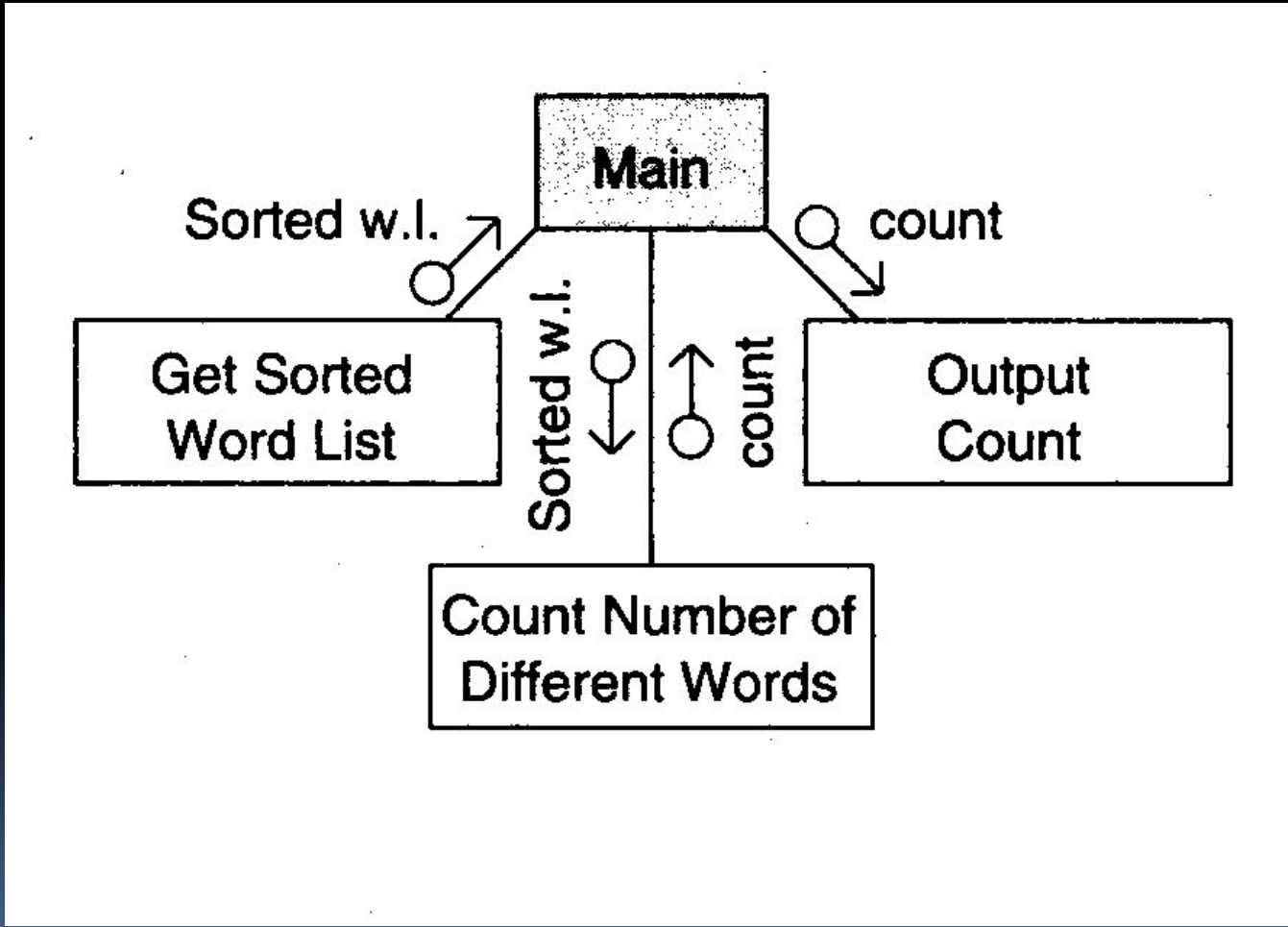
Restate the problem as a DFD



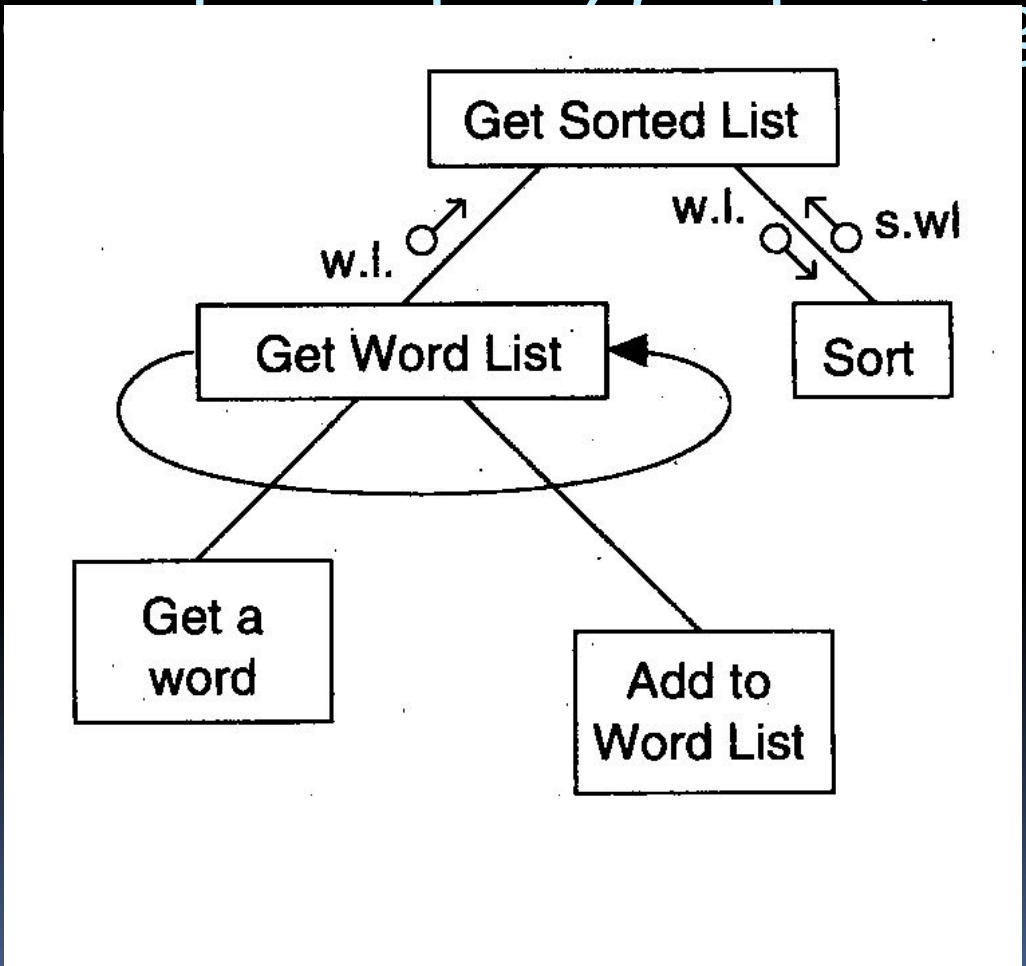
Identify the most abstract input &output data element

- MAI
- MAO

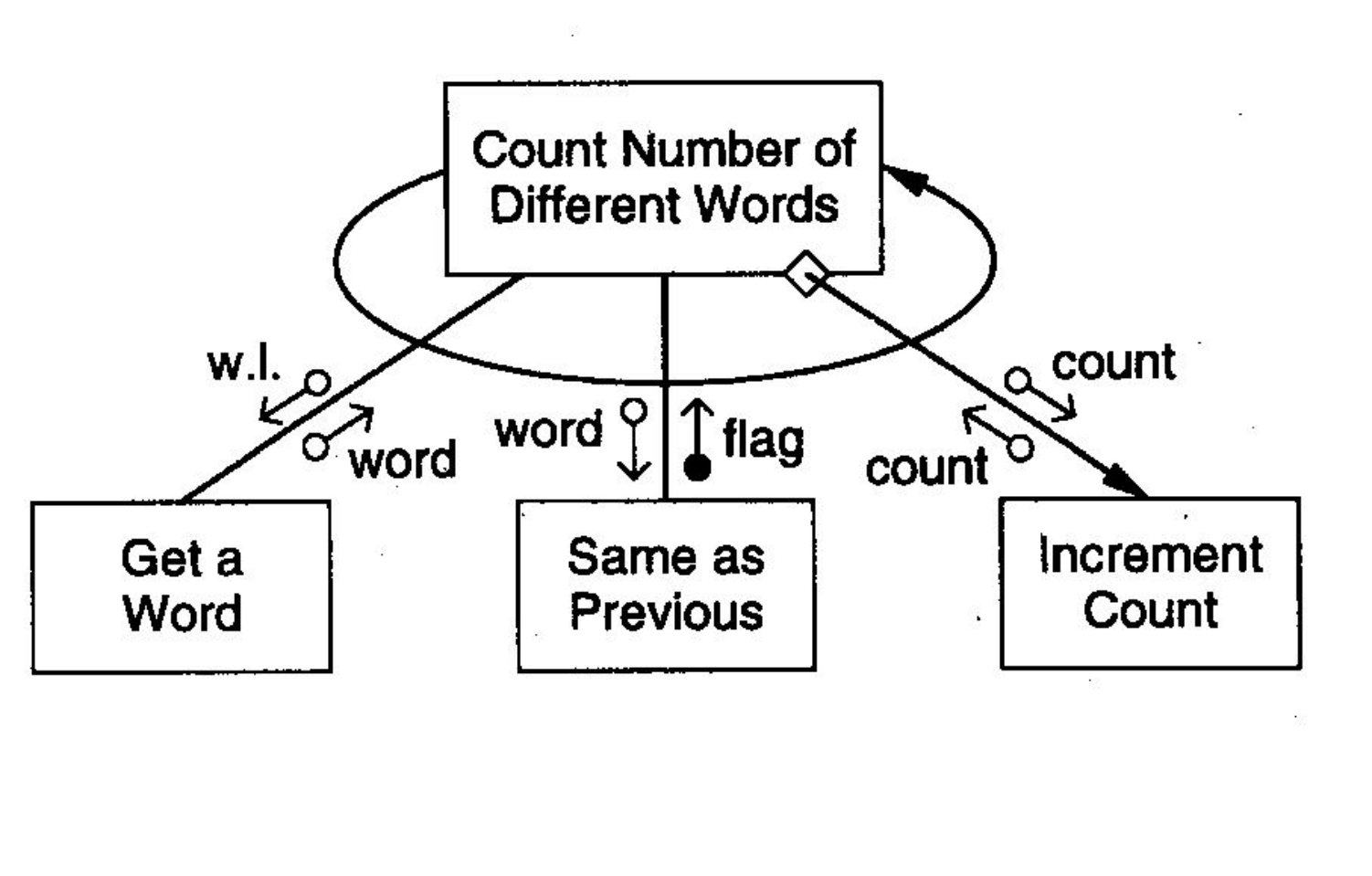
1st level factoring



Factoring the input, output & transf[illegible] the input



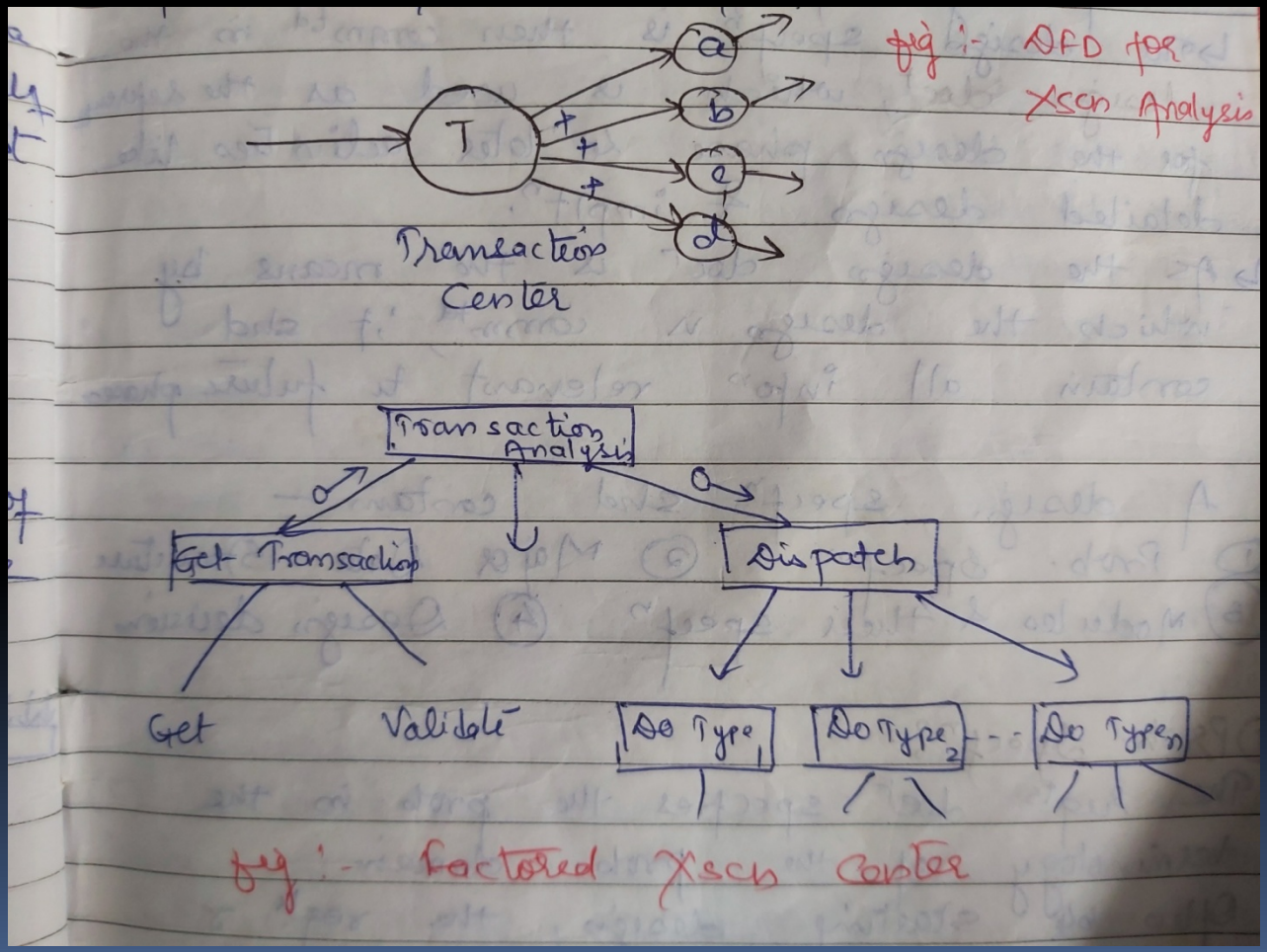
Factoring the Central Transform



Design Heuristics

- Module Size
- Fan In, Fan Out
- Combining, Splitting
- Scope of Effect & Scope of Control

Transaction Analysis



Design Specification

- Design Document……
- Should contains-
  - Problem Specification
  - Major data structure
  - Module Specification
  - Design Decision

Design Verification

- 2 approaches---
  - Design Review
  - Automated Cross Checking

Metrics

- Network Metric
- Stability Metrics
- Information Flow

Network Metrics

- Network metrics is a complexity metric that tries to capture how “good” the structure chart is.
- Graph impurity = $n - e - 1$
- where n is the number of nodes in the structure chart and e is the number of edges.
- As in a pure tree the total number of nodes is one more than the number of edges, the graph impurity for a tree is 0.

Stability Metrics

The procedure 4 determining the stability of a module x & the stability of the pgm can be broken into a series of steps:-

(i) From the design, analyse the module x & all the module that call x or share some file or data struct. with x.

step I I_x = module that involves x

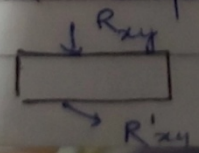
I'_x = module that involved by x

R_{xy} = Passed parameter returned from x to y where $y \in I_x$

R'_{xy} = Passed from x' to y : where $y \in I'_x$

GR_x = Global data referenced in x

GD_x = Global data defined in x



Step II For each module x determines the no. of assumptn made by caller module y abt elements in R_{xy}:

① Initialize the assumptn count to 0

② If i (data element) is structured data element, decompose it into base types & ↑ by 1, else consider i as minimal.

③ Decompose the base types & if they are structured, ↑ the count by 1.

Step III Let T'_{Pxy}, the total no. of assumptn made by module y called by the module x abt the elements in R'_{xy}

Step IV For each data element i.e $\in D_x$ & continuing the same process for computing the no. of count T_{Gx} will be the total no. of assumptions made by other modules abt the elements in G_{Dx}.

Step V For a module x the design logical ripple effect (DLRE) is defined as -

$$DLRE = T_{Gx} + \sum_{y \in S_x} T_{Pxy} + \sum_{y \in S'_x} T'_{Pxy}$$

Thus the design stability of a module x

$$\boxed{DS'x = \frac{1}{1 + DLRE}}$$

$$\boxed{PDS = \frac{1}{1 + \Sigma DLRE}}$$

PDS = Pgm Design Stability.

Information Flow

module & used by other modules)

The module design complexity, D_c defined as

$$D_c = \text{size} * (\text{inflow} * \text{outflow})^2$$

(inflow * outflow) = total no. of combⁿ of i/p src & o/p destⁿ.

squared — as the interconnⁿ b/w the modul is considered a more imp. factor determining the complexity of a module.

The variant of this was proposed based on that complxity also depends up the no. of modules to or from which it is flowing. Size — insignificant. So

$$D_c = \text{fan in} * \text{fan out} + \text{inflow} * \text{outflow}$$

fan in no. of module that call this module

fan out no of — " — this module calls.

Coupling & Cohesion

- Coupling between 2 modules indicates the degree of interdependence between them.
- Highly Coupled…
- Loosely Coupled….

Types of Coupling

- Data Coupling
- Stamp Coupling
- Control Coupling
- External Coupling
- Common Coupling
- Content Coupling

Cohesion

- Measure of the closeness of the relationships between its component. Types---
- Functional Cohesion
- Sequential Cohesion
- Communicational Cohesion
- Procedural Cohesion
- Temporal Cohesion
- Logical Cohesion
- Coincidental Cohesion

Thank You

- Any Query in U-3 Design?????