

CS 1704

Introduction to Data Structures
and Software Engineering

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Lab Information

- 116/118 McBryde Hall

Class Info

- <http://courses.cs.vt.edu/~cs1704/Spring03>
- <http://forum.cs.vt.edu>

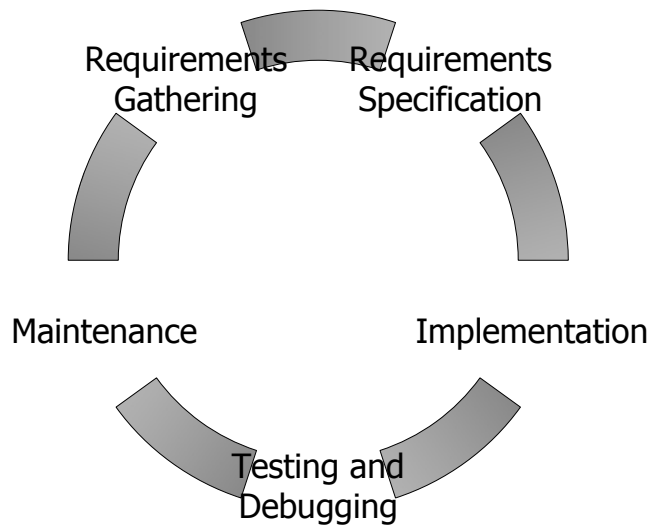
Data Structures

- What is a Data Structure?
- When is it used?
- Examples:
 - List
 - Stack
 - Queue
 - Tree
 - As many more as you can think of...

Software Engineering

- What is it?
- When do you do it?
- How do you do it?
- Why do you do it?

Waterfall Life Cycle Example



Mechanics for SE Representation

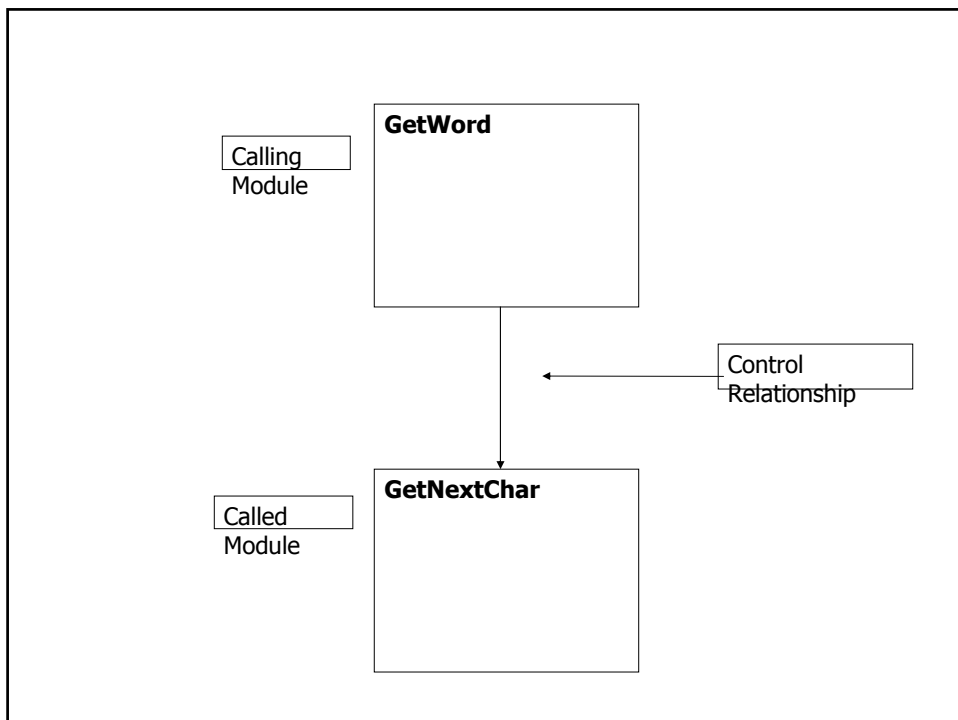
- Design Document
 - Concrete
 - Specific
 - Analyzable
 - Compared to final product
 - Traceable throughout life cycle

Design Documents

- Components
- Procedures
- Functions
 - Suggestive names
- Interfaces
 - Data
 - Control







Examples

- Tool used to show units and how they communicate
- Show information that is passed
- Show interface between the modules








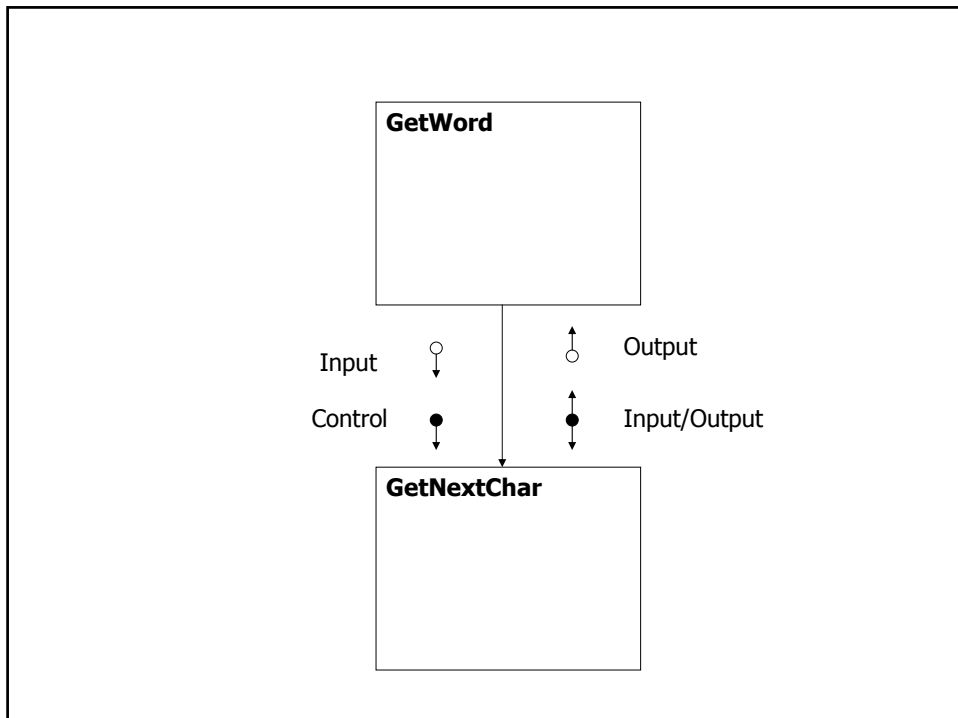
Parameter Notation

- Three types of parameter direction

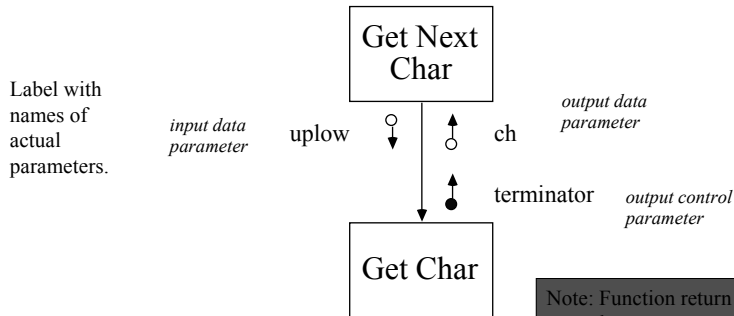
1. Input  
2. Output  
3. Input/Output  

- Two Classes of parameter use

1. Data   
2. Control   



```
void GetNextChar ( . . . ) {
    . . .
    GetChar (ch, uplow, terminator);
    if (terminator) . . .
```

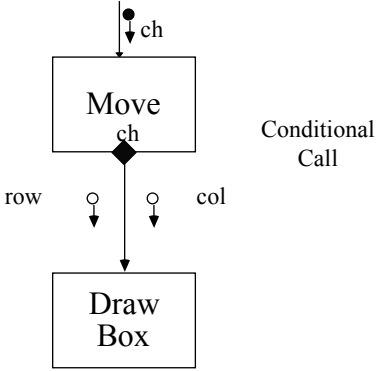


```
void GetChar(char& chact,
             uplowtype uplowCase,
             bool& terminal )
```

Note: Function return values are treated as output parameters (list variable to which they are assigned).
 Calls to multiple functions are usually listed left-right in order of execution.

```
void Move(. . . ) {
    . . .
    if ( ch == plus )
        DrawBox (row, col);
    . . .
```

Label decision with name(s) of variables used in decision.

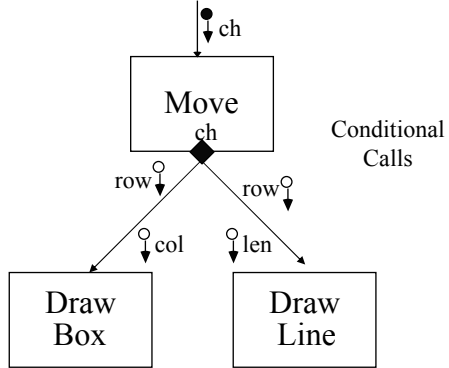


What does the function header for DrawBox look like?

```

void Move( . . . ) {
    ...
    if ( ch == plus )
        DrawBox (row, col);
    else
        DrawLine (row, len);
        DrawLine (row, len);
    ...
}

```



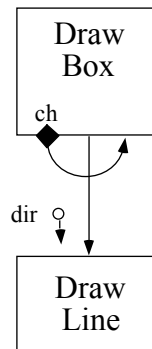
Select statements are diagrammed in a similar manner with multiple calls emanating from the decision diamond.

```

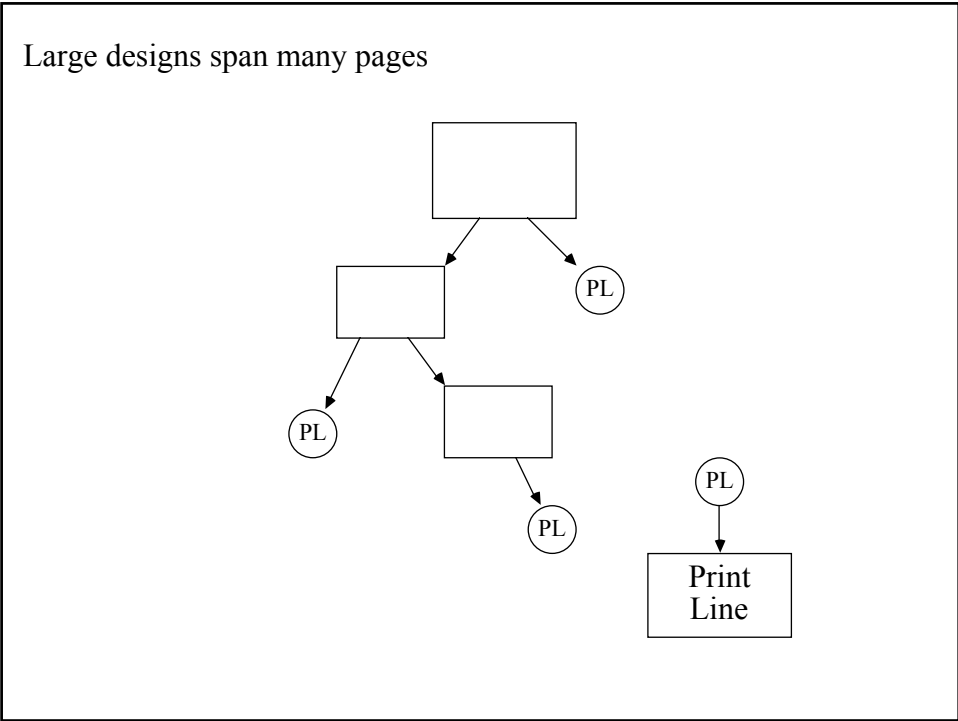
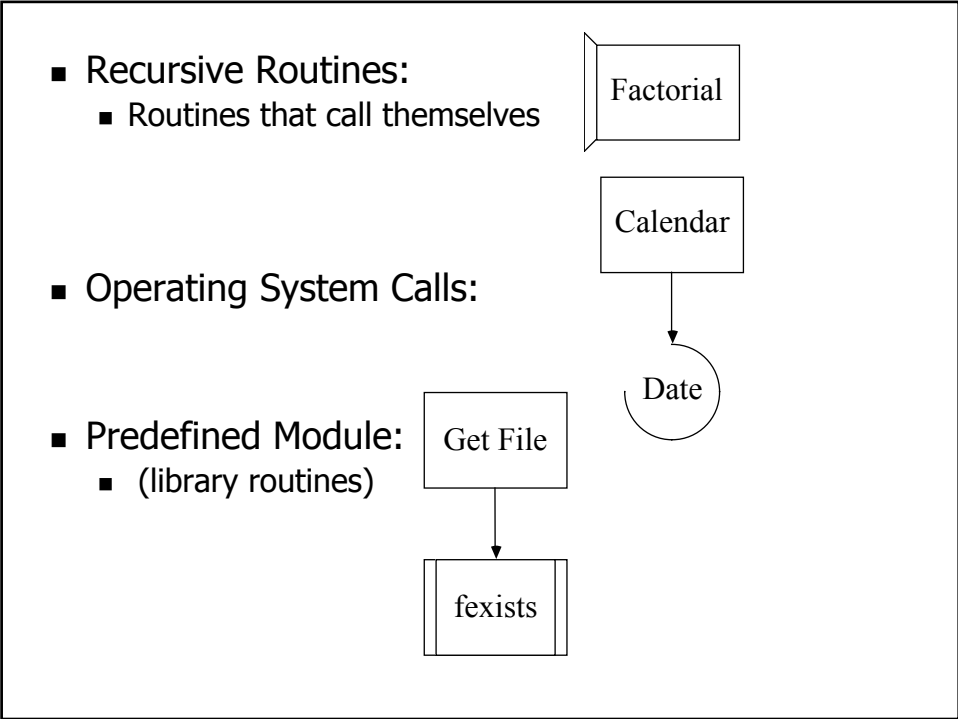
void Drawbox ( . . . ) {
    ...
    while (ch != plus)
    {
        ...
        DrawLine ( dir );
        ...
    }
    ...
}

```

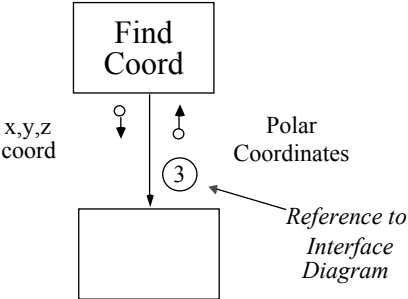
Conditional Loop



Label with name(s) of variables used in decision.



Interface Diagrams

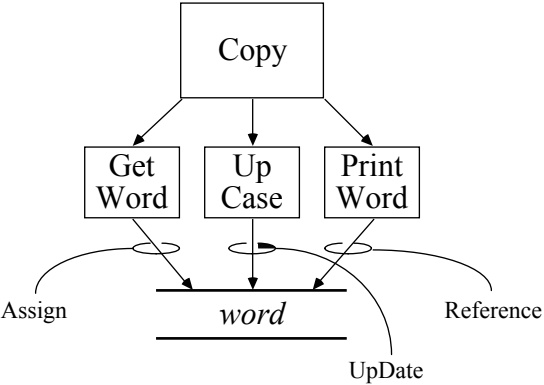


Interface Diagram #3

Parameter	Type	Dir	Description
x	data	in	Cartesian coords
y	data	in	of point
z	data	in	
scale	data	in	scale of axis
angrad	cont	in	angle degrees (rad)
angle	data	out	polar coords
dist	data	out	of point

Global Data (extern)

- Must be highly justifiable (semi-global)
 - separately compiled, module scope
- Operation
 - Assign
 - Update
 - Reference



- Global variables introduce complexities that must be mapped and traceable

Global Structures

	...	Form	Setting	Date	...
⋮					
GetNext		R	U		
Advance		U	A	R	
PutNext		A	R		
Reset			A	A	
⋮					

U : Update A : Assign R : Reference

Quiz

- Why is design such a critical part of software development?