COMP 2710
Software Construction

Chapter2-2: Flow control and Pointers

Dr. Xuechao Li

AUBURN

UNIVERSITY

SAMUEL GINN
COLLEGE OF ENGINEERING

Pointer Introduction

- Pointer definition:
  - ❑a variable whose value is the address of another variable
  - ❑Example:

```
double *p;
```

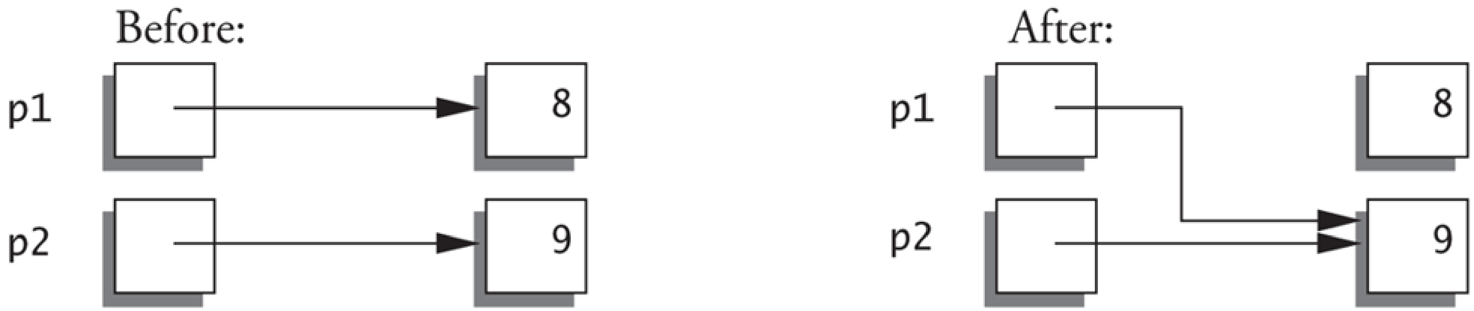
- p is declared a "pointer to double" variable
- Can hold pointers to variables of type double
- Pointers declared like other types
- Add "*" before variable name

Declaration

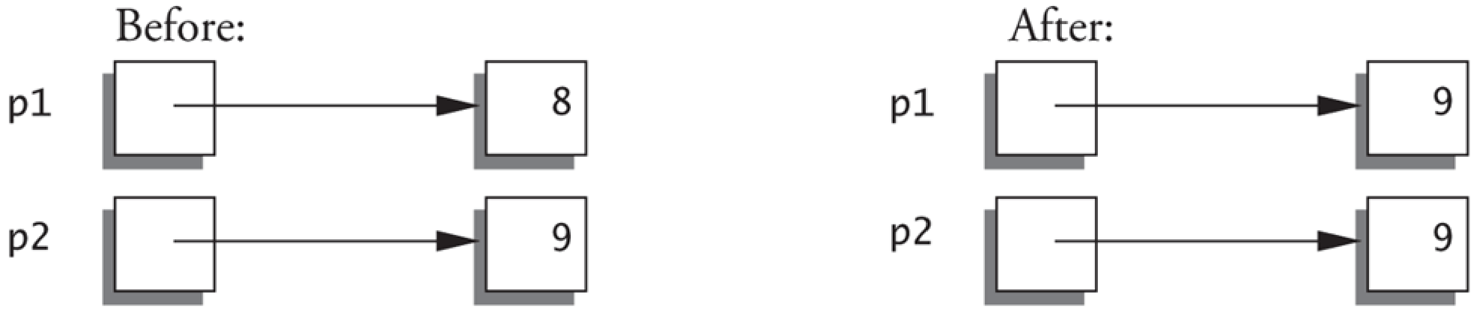
- int *p1, *p2, v1, v2;
  p1 = &v1;
- Sets pointer variable p1 to "point to" int variable v1
- Operator, &, Determines "address of" variable
- Dereference operator, *
  - Pointer variable "dereferenced"

Pointer Assignments Graphic

```
p1 = p2;
```



```
*p1 = *p2;
```

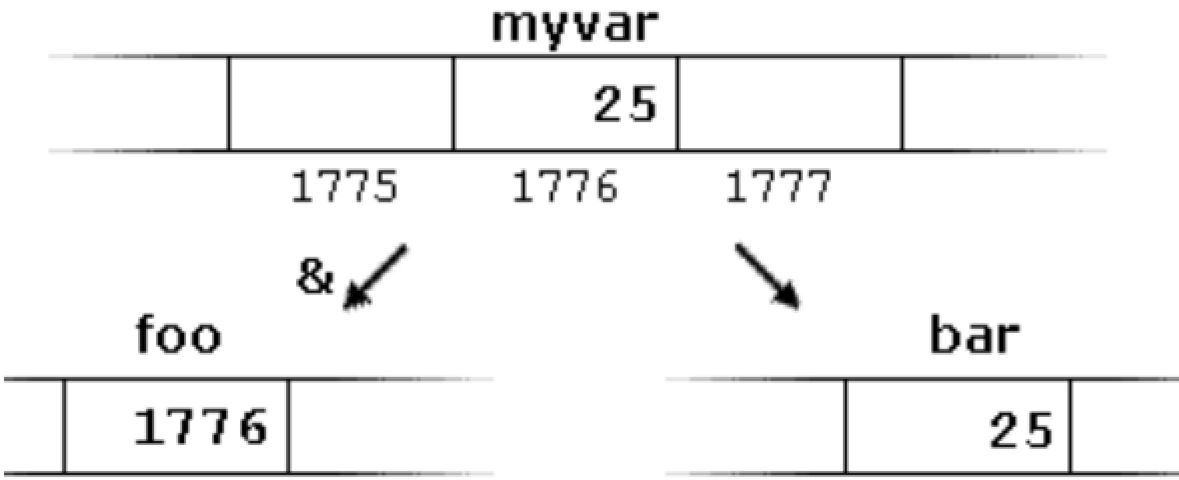


Example 1: Pointer

myvar = 25;

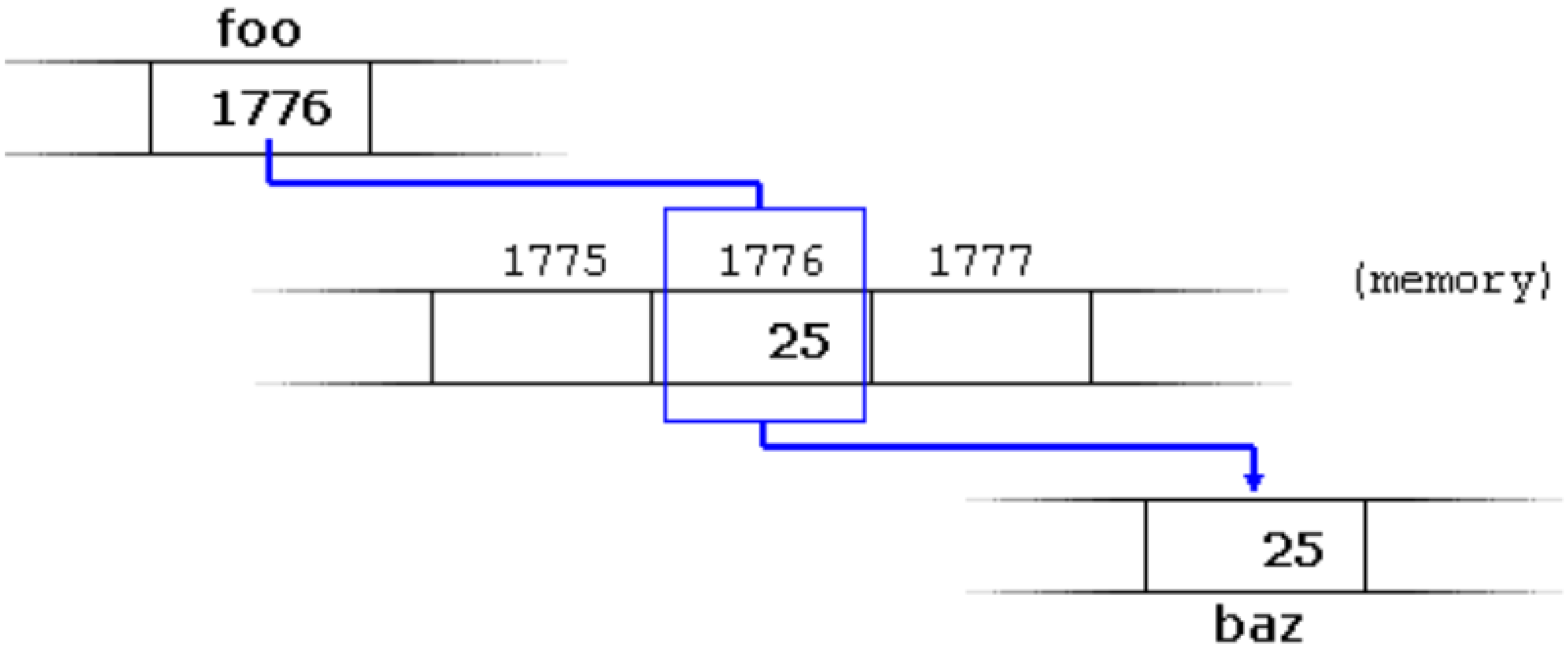
foo = &myvar;

bar = myvar;



Example 2: Pointer

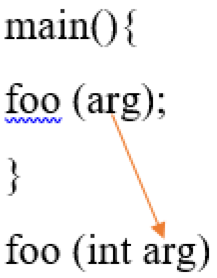
myvar = 25; foo = &myvar;   baz= *foo;



References and Pointers

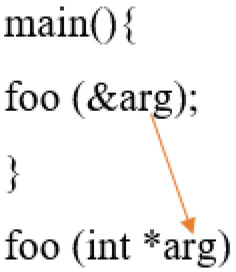
- In functions, there are 3 ways to pass arguments
  - ✓call-by-value
  - ✓call-by-reference with pointer argument
  - ✓call-by-reference with reference argument

See Handouts



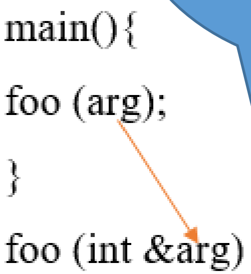
```
main(){
foo (arg);
}
foo (int arg)
```

call-by-value



```
main(){
foo (&arg);
}
foo (int *arg)
```

call-by-reference with pointer

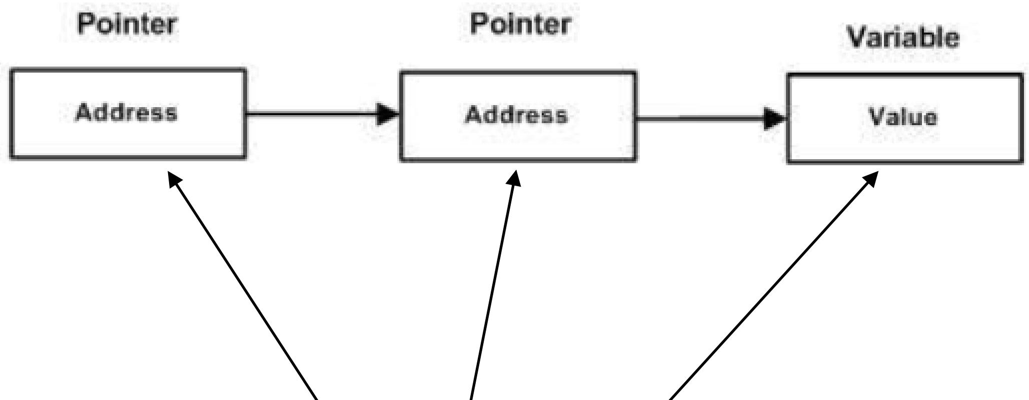


```
main(){
foo (arg);
}
foo (int &arg)
```

call-by-reference with reference

Pointers to pointers

- a form of multiple indirection or a chain of pointers (<=2)



```
int *ptr, **pptr, var; var = 5;
ptr = &var;
pptr = &ptr;
```

The Operator: new

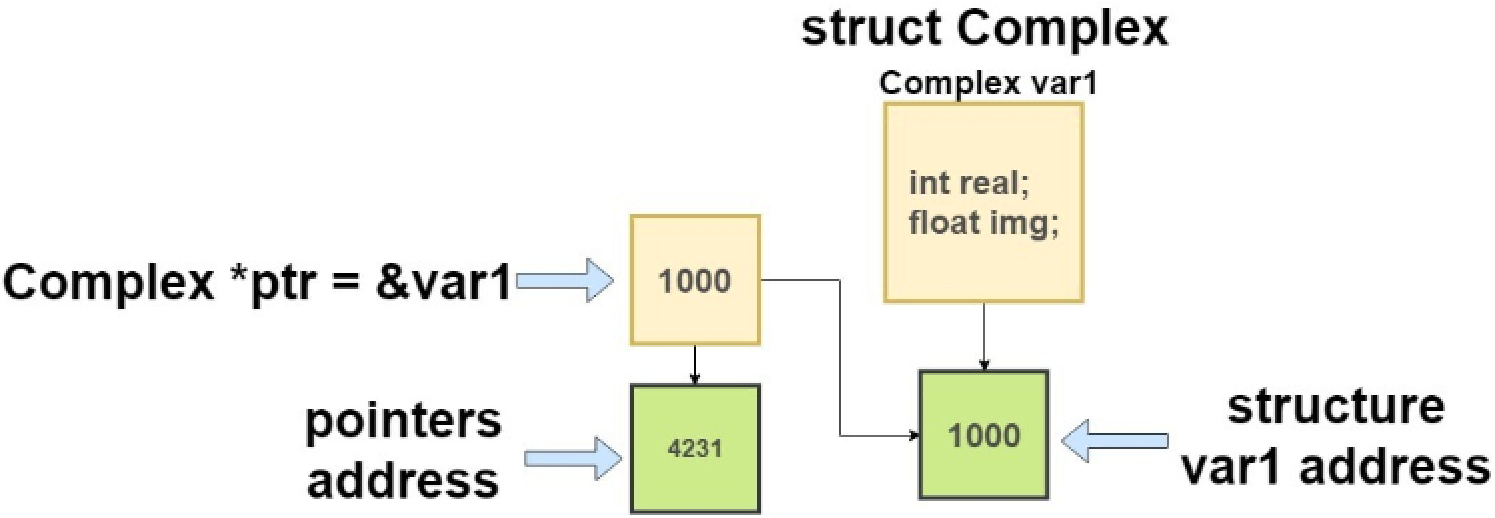
- Since pointers can refer to variables…
  - – No "real" need to have a standard identifier
- Can dynamically allocate variables
  - – Operator new creates variables
    - No identifiers to refer to them
    - Just a pointer!
- p1 = new int;
  - – Creates new "nameless" variable, and assigns p1 to "point to" it

The Operator: new

```
struct Node {
            int data;
            struct Node* next;
           }
  *head = Node;
```

Example

```
struct Complex{
 int real;
 float img;
  };
```



struct Complex

Complex var1

int real;
float img;

Complex *ptr = &var1

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pointers address

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structure var1 address