

COMSW 1003-1

Introduction to Computer Programming in

Lecture 10

Spring 2011

Instructor: Michele Merler

Announcements

Change in Office Hours this week

1 hour Wednesday, Feb 23rd, 12pm-1pm

1 hour Saturday, Feb 26th, 11am-12pm

Today

- Preprocessor (from Lecture 9)
- Advanced C Types

Advanced Types - Struct

- Arrays group variables of the **same** type
- Structs group variables of **different** types

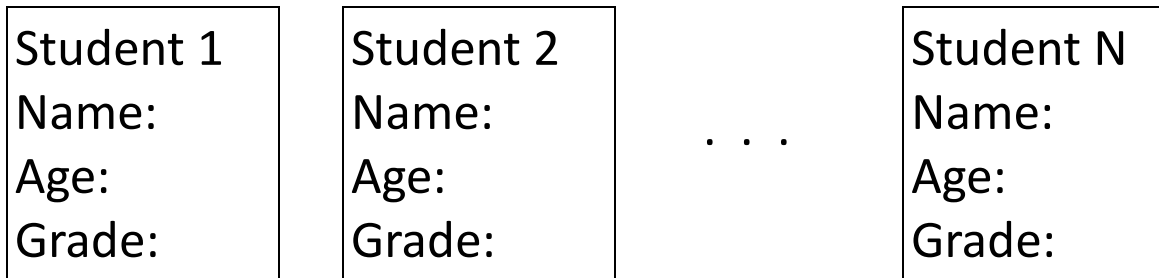
Struct definition

```
struct structName {  
  
    fieldType fieldNameval1;  
    fieldType fieldNameval2;  
    :  
    fieldType fieldNamevalN;  
};
```

Once we define the struct, we can use `structName` as if were a type, to create variables!

Advanced Types - Struct

Example: we want to build a database with the name, age and grade of the students in the class



```
struct student {  
    char name[100];  
    int age;  
    double grade;  
};  
  
struct student st1;
```

st1 is a variable of type struct!

Advanced Types - Struct

In order to access struct fields, we need to use the `.` operator

st1.age is a variable of type `int`, I can use it as a regular variable !

```
struct student {  
    char name[100];  
    int age;  
    double grade;  
};  
  
struct student st1, st2;  
  
st1.age = 3;  
st2.age = st1.age - 10;
```

Advanced Types - Struct

We can initialize a struct variable at declaration time, just like with arrays

```
struct student {  
    char name[100];  
    int age;  
    double grade;  
};
```

```
struct student st1 = {"mike", 22, 77.4};
```

The initialization fields must be consistent with the fields types !

↑ ↑ ↑
char int double
| | |

Advanced types - Typedef

typedef is used to define a new type

```
typedef type nameOfNewType;
```

```
typedef int myInt;
```

```
myInt c = 3;
```



C is of type `myInt`, which is equivalent to `int`

```
typedef int myIntArray[7];
```

```
myIntArray arr;
```



arr is of type `myIntArray`, which is equivalent to an array of 7 `int`

```
for(c=0; c<7; c++){  
    arr[c] = 1;  
}
```


Advanced types - Typedef

typedef is used to define a new type

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    char name[100];  
    int age;  
    double grade;  
};  
  
struct student st1, st2;  
  
st1.age = 3;  
st2.age = st1.age - 10;
```

```
struct student {  
    char name[100];  
    int age;  
    double grade;  
};  
  
typedef struct student stud;  
stud st1, st2;  
  
st1.age = 3;  
st2.age = st1.age - 10;
```

Advanced Types - Union

- Similar to struct, but all fields share same memory
- Same location can be given many different field names

```
struct value{  
    int    iVal;  
    float  fVal;  
};
```



```
union value{  
    int    iVal;  
    float  fVal;  
};
```



We can use the fields of the union only one at a time!



Advanced Types - Enum

- Designed for variables containing only a limited set of values
- Defines a set of **named integer constants**, starting from 0

```
enum name{ item1, item2, ... , itemN};
```

```

                0         1         2         3         4         5         6
enum dwarf { BASHFUL, DOC, DOPEY, GRUMPY, HAPPY, SLEEPY, SNEEZY};

enum dwarf myDwarf = SLEEPY;

myDwarf = 1 + HAPPY;    // myDwarf = SLEEPY = 5;

int x = GRUMPY + 1;    // x = 4;

printf("dwarf %d\n",BASHFUL); // `dwarf 0'
```

Advanced Types - Const

`const` defines a variable whose value cannot be changed

```
const double PI = 3.14;
```

```
double r = 5, circ;
```

```
circ = 2 * PI * r;
```

```
PI = 7;
```

Advanced Types - Const

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```
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```

```
double r = 5, circ;
```

```
circ = 2 * PI * r;
```

```
PI = 7;
```

Once it's initialized, a const variable cannot change value



Advanced Types - Const

`const` defines a variable whose value cannot be changed

```
double computeCirc( const double r, const double PI){  
    r++; PI++;             
    return(2 * r * PI);  
}  
  
/* main function */  
int main(){  
    const double PI = 3.14;  
  
    double r = 5, circ, circ2;  
  
    circ = 2 * PI * r;  
    circ2 = computeCirc(r, PI);  
  
    return 0;  
}
```

Advanced Types - Const

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    r++;   
    PI++;   
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    double r = 5, circ, circ2;  
  
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```